Documentation for Bitbucket Data Center 8.18

ATLASSIAN

Contents

Bitbucket Data Center documentation

Bitbucket Data Center is self-hosted Git repository collaboration and management for professional teams.

Get started

New to using Bitbucket? Get started with some introductory tutorials.

Let's get started!

What’s new in 8.18?

Read all about the latest and greatest changes in Bitbucket.

View release notes

Get started with Bitbucket Data Center

Welcome to the Bitbucket Data Center getting started documentation. Here you'll find tutorials and other information that will be useful for evaluating Bitbucket, and figuring things out when you're just starting.

If you haven't installed Bitbucket yet, but you'd like to try it out (for free!) you're better off starting at the page Install a Bitbucket Data Center trial. Once you have your trial instance up and running, head back here to explore using Bitbucket.

Go ahead – dive in. Let us show you around Bitbucket and some of its handy features.

- Tutorials
  - Tutorial: Work with Bitbucket Data Center
- Git resources
  - Basic Git commands
  - Get started with Git

Tutorials

If you're just starting out with Bitbucket Data Center, then this is the place for you. Come with us on a journey to discover all that Bitbucket has to offer using our Teams in Space scenario.

Before you continue, make sure you've installed Bitbucket Server already.

Teams in Space

For each tutorial in this section, we'll use a fictional organization known as 'Teams in Space'. Their mission is to:

> "Perform flight research and technology integration to revolutionize aviation and pioneer aerospace technology. Also, land the first humans on Mars by 2020."

You're an astronaut in the 'See Space EZ' team, which is working on the upcoming colonization of Mars.

Jump into a tutorial when you're ready:

Work with Bitbucket and SourceTree
With Bitbucket running, learn how to get your work done
More to come!

Tutorial: Work with Bitbucket Data Center

Teams in Space is a fictional company created by Atlassian that specializes in space travel for teams.

Welcome to the Teams in Space web team! You are joining us as a Bitbucket Data Center web developer, and your first assignment is to update our company website to include a link to our Moon Itinerary so that our customers know what to expect on their day trip to the Moon.

Here's what you'll accomplish by the end of this tutorial:

1. Set up Sourcetree to work with Bitbucket
2. Create a personal repository for the tutorial
3. Clone your repository and manage files locally
4. Commit and push changes

For this tutorial we'll be using Sourcetree, a desktop Git client with a graphical interface, to work with Bitbucket. If you're already comfortable using Git from the command line we'll also include the Git command equivalent.

Time needed

5-10 minutes

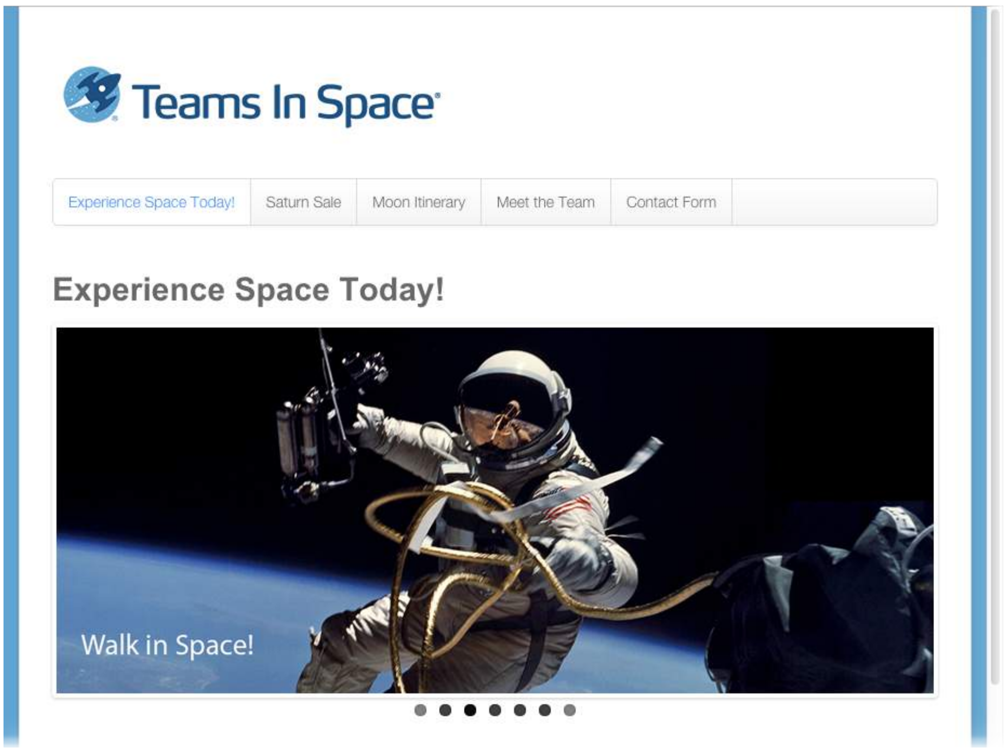
Audience

You're new to working with Bitbucket

Prerequisites

- Bitbucket is installed
- You have login credentials
- You have a project and repo

Here's what the final version of the HTML page will look like when you're finished (and we've got all the files you need to get this end result).



Let's go!

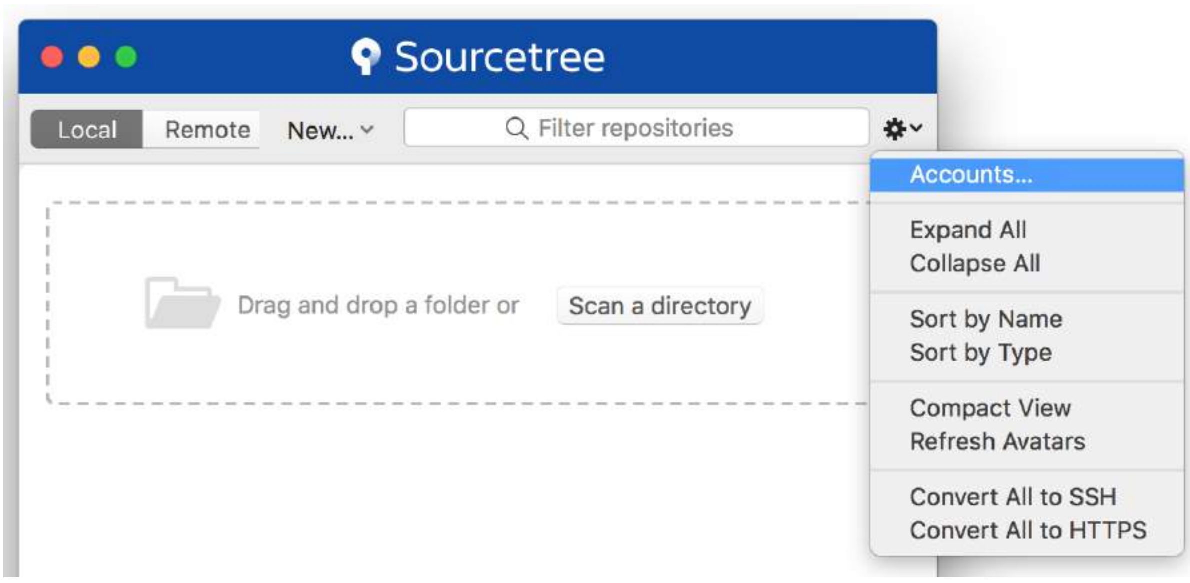
Set up Sourcetree

1. Set up Sourcetree
2. Create a personal repository for the tutorial
3. Clone your repository and manage files locally
4. Commit and push changes

Sourcetree provides you with an interface that gives you the same capabilities you have with Git without the need to use the command line. If you prefer to use Git from the command line, feel free to skip this step.

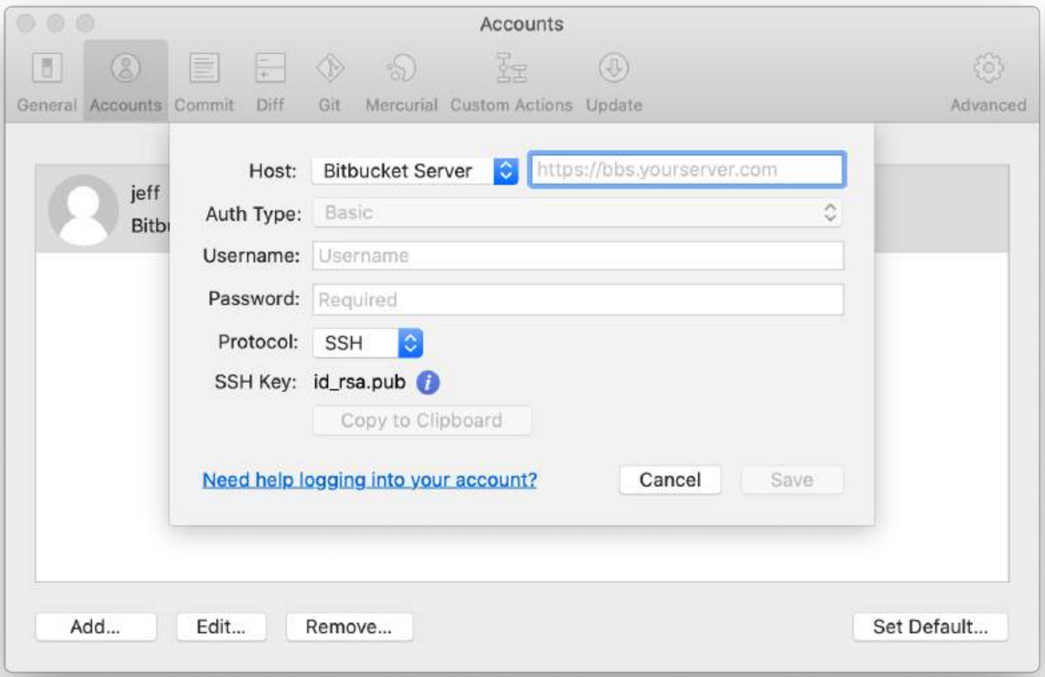
Install Sourcetree for Bitbucket Data Center

1. Select the button for downloading Sourcetree from the Sourcetree website.
2. Double-click the downloaded file to open it.
3. Install Sourcetree as you would any other installation.
4. Open Sourcetree, select the gear icon and then select **Accounts**.



5. Select **Add** from the **Accounts** tab.

6. After you select a **Host**, enter your hosting details. Keep the default **Auth Type** and select **Connect Account** to enter your Bitbucket credentials.



When you enter your account details, you can choose whether you prefer to connect with HTTPS or SSH. For information about setting up SSH for your account, see Set up an SSH key.

7. Select **Skip Setup** from the **Clone your first repo** box (you'll do this from within Bitbucket for this tutorial).

Next step

Create a personal repository for the tutorial

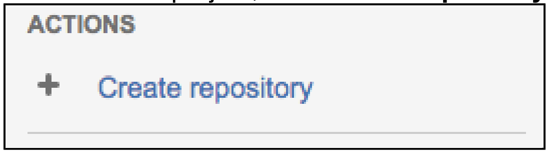
1. Set up Sourcetree
2. Create a personal repository for the tutorial
3. Clone your repository and manage files locally
4. Commit and push changes

In this step you will create a personal repository in Bitbucket Data Center to use to keep track of your work for the Teams in Space website.

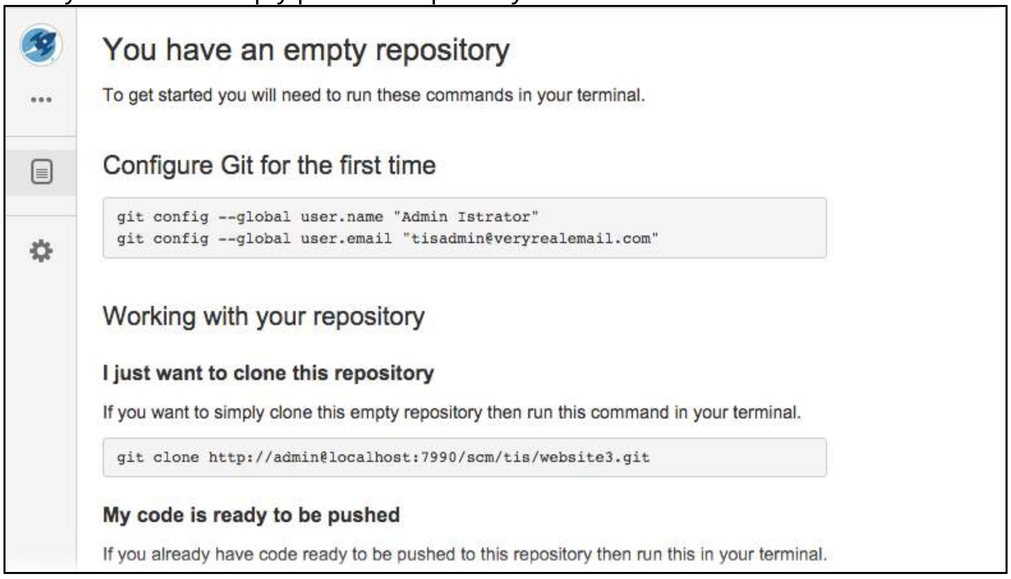
Personal repositories can be used for storing private files or starting your own project and are not visible to other users by default, but you can open access to these repositories whenever you want.

Create a personal repository in Bitbucket

1. From within a project, click **Create repository.**



2. Name your repository *Website*, then click **Create**.
   Now you have an empty personal repository.



You have an empty repository

To get started you will need to run these commands in your terminal.

Configure Git for the first time

```
git config --global user.name "Admin Istrator"
git config --global user.email "tisadmin@veryrealemail.com"
```

Working with your repository

I just want to clone this repository

If you want to simply clone this empty repository then run this command in your terminal.

```
git clone http://admin@localhost:7990/scm/tis/website3.git
```

My code is ready to be pushed

If you already have code ready to be pushed to this repository then run this in your terminal.

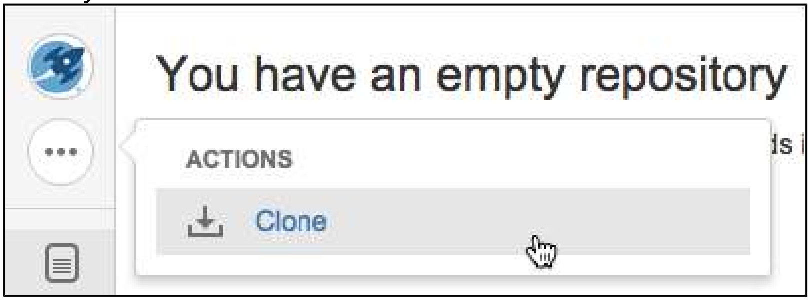
Next step

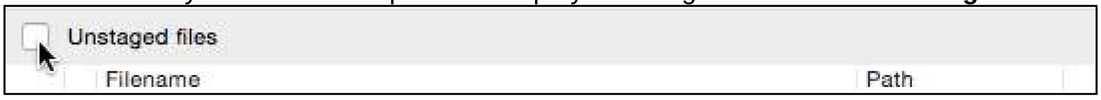
Clone your repository and manage files locally

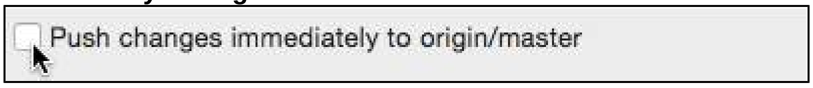
1. Set up Sourcetree
2. Create a personal repository for the tutorial
3. Clone your repository and manage files locally
4. Commit and push changes

In this step you will clone your personal repository to your local computer. Cloning your repository locally creates a file directory on your computer that will kept in synch with your online repository.

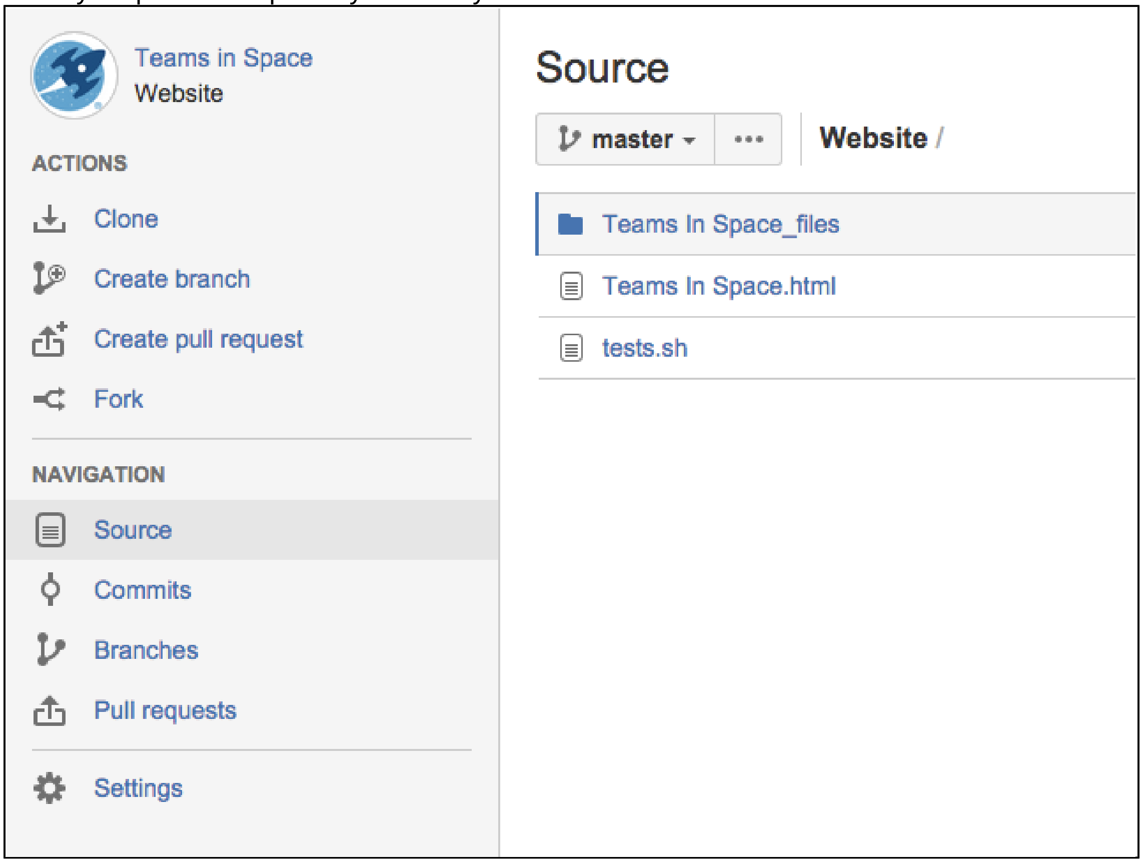
Making changes to live source files makes your website vulnerable to user errors. Since we all make mistakes, we instead clone the source files locally and make our changes on our own computer where we can first test that our changes won't break things in the process. Once we verify things are as they should be we then can push our changes to the live source files (usually a master branch). From there, others can pull in our changes to their local copy, and update files of the website.

1. Clone your personal repository using Sourcetree (or the command line)
   a. On the side navigation, click **Clone**, then **Clone in Sourcetree** to create a local directory where you can store the website files.
      

      This opens the *Clone New* dialog in Sourcetree.
   b. Within Sourcetree, choose the appropriate destination for your personal repository, then click **Cl one**.
      You'll arrive at the empty directory in Sourcetree, and an empty directory named *website* was created on your local computer.
2. Download the source files and unzip them into the empty directory you just created.
3. Add the files to your personal repository using Sourcetree (or the command line).
   a. Select the files you added in the previous step by checking the box named **Unstaged files**.
      

      The files then appear in the Staged files pane.
   b. Click **Commit**, add a message in the comment box, and check the box **Push changes immediately to origin/master**.
      

c. Go to your personal repository and verify the files were added.



Next step

Do it from the command line

1. Clone your personal repository from the command line. You can also copy the command directly from your empty repository. Look under **Working with your repository.**
   From a terminal window, run these commands

```
cd ~
git clone http://<username>@<Bitbucket Data Center URL>/scm/<project key>/website.git
```

`cd ~`	Change directory to your home directory
`git clone`	Command that copies the contents of the repository
`<username>`	Is the username you use to log in to the instance
`<Bitbucket Data Center URL>`	The URL for your Bitbucket Data Center instance
`<project key>`	The project key where your personal repository is
`website.git`	The name of your personal repository

   This creates an empty Git repository named *TISwebsite*
2. Add the files to your personal repository from the command line.
   From a terminal window

```
cd existing-project
git init
git add --all
git commit -m "Initial Commit"
git remote add origin http://<Bitbucket Data Center URL>/scm/tis/website.git
git push -u origin master
```

`cd existing-project`	Change to the directory where you unzipped the files
`git init`	Initialize the Git repository
`git add --all`	Adds the files to the repository
`git commit -m "Initial Commit"`	Adds a comment to the commit

`git remote add origin <url>`
 	
`git push -u origin master`
	Adds the remote repository and pushes your files to the master branch

Next step

Commit and push changes

1. Set up Sourcetree
2. Create a personal repository for the tutorial
3. Clone your repository and manage files locally
4. Commit and push changes

In this step you are going to make some changes to the HTML files added to your repository in Step 3. Once you make the changes and commit them you can add them to your repository on Bitbucket Data Center. It's not enough to just make your changes, you have to share them with the world!

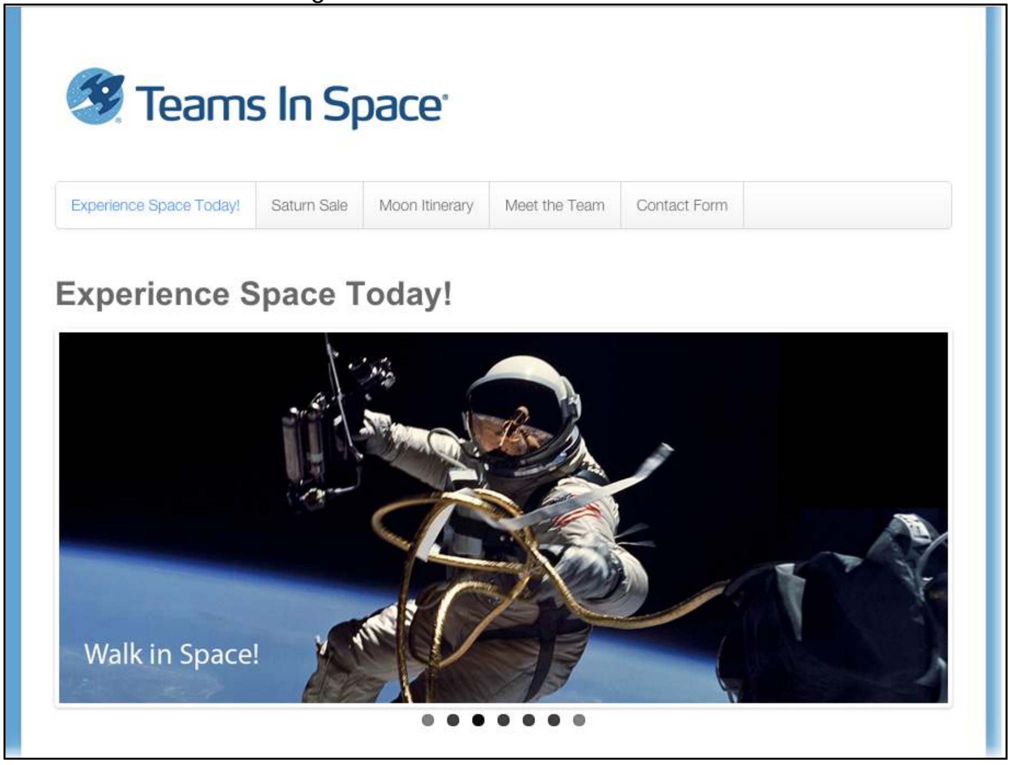
Make the changes

This step explains how to make a simple change in a source file that you'll then commit locally and push to your personal repository.

1. Open the `Teams in Space.html` file in a text editor.
2. Find the `<h3>Main Menu</h3>` line. Within that menu, add another list item to add a link to the itinerary on the main menu.
   (You can copy this code and add it in your HTML file).

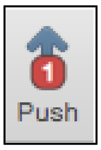
```
<li id="menu-item-65" class="menu-item menu-item-type-post_type menu-item-object-page menu-item-
65"><a href="http://localhost:2431/?page_id=60">Moon Itinerary</a></li>
```

3. Save the file.
4. Check your work by going to the `Teams in Space.html` file and opening it in a web browser. It should now look something like this.



Commit and push the changes

Once you've made the changes and verified they work, you'll now commit the changes and push them to your repository.

1. Commit the changes using Sourcetree (or the command line).
    a. From Sourcetree, click on **Working Copy** in the upper-left. In the Unstaged files pane on the bottom, you should see the `Teams in Space.html` file.
    b. Select the checkbox to left of the file. The file moves to the **Staged files** pane.
    c. Click Commit in the upper-left. The Commit dialog opens at the bottom.
    d. Enter a commit message in the text field (something like "This is my first commit!" would do).
2. Push the changes to the repository.
    a. There is now an indicator within the Branches field on the left that there are changes to push, as well as on the Push button on the top toolbar.
    

    b. Click the **Push** button, and make sure the master branch is selected, then click **Ok** to push the changes.
    c. You can verify the changes were pushed by going to the repository and clicking on **Commits**.

Do it from the command line

Commit the files you changed to your personal repository from the command line.
From a terminal window

```
cd website
git commit -m "Website changes"
git push -u origin master
```

Refer the below table for more details on the above commands. Learn more about how to get started with Git

Command	Description
`cd website`	Changes to the directory where you cloned the repository.
`git commit -m "Website changes"`	The command `git commit` records the changes to the repository and the flag `-m` adds a comment to the commit.
`git push -u origin master`	The command `git push` pushes your files to the master branch and the flag `-u` specifies the remote repository. `origin` is the original repository and `master` is the remote branch.

Git resources

Get Git

See Installing and upgrading Git

On this page:

Learning Git

Git Tutorials and Training

Basic Git commands

Git cheatsheet

Getting started

One "gotcha" when starting with Git is the way in which it pushes branches by default. On older versions of Git, pushing without arguments would push *all* branches that have the same name both locally and remotely. This can result in unexpected behavior if you have old branches that complain when the remote branch is updated. It can even be quite dangerous if you do a force push and it reverts changes on the server. You can see the current value by running:

```
git config push.default
```

If this value is blank or 'matching', it is our recommendation that you reconfigure it to use 'upstream'.

```
git config --global push.default upstream
```

There has been some discussion around changing the default behavior of Git.

Git .mailmap

The Git `.mailmap` feature is useful locally, and in Bitbucket Data Center repositories, to map multiple commit identities to the one Bitbucket user – this can be used to tidy up your Git histories.

The Git documentation for `.mailmap` has configuration details (see the "MAPPING AUTHORS" section).

Basic Git commands

Here is a list of some basic Git commands to get you going with Git.

For more detail, check out the **Atlassian Git Tutorials** for a visual introduction to Git commands and workflows, including examples.

Git task	Notes	Git commands

Tell Git who you are	Configure the author name and email address to be used with your commits. Note that Git strips some characters (for example trailing periods) from `user.name`.	`git config --global user.name "Sam Smith"`
		
		`git config --global user.email sam@example.com`

Create a new local repository		`git init`
Check out a repository	Create a working copy of a local repository:	`git clone /path/to/repository`
	For a remote server, use:	`git clone username@host:/path/to/repository`

Add files	Add one or more files to staging (index):	`git add <filename>`
		
		`git add *`

Commit	Commit changes to head (but not yet to the remote repository):	`git commit -m "Commit message"`
	Commit any files you've added with `git add`, and also commit any files you've changed since then:	`git commit -a`
Push	Send changes to the master branch of your remote repository:	`git push origin master`
Status	List the files you've changed and those you still need to add or commit:	`git status`
Connect to a remote repository	If you haven't connected your local repository to a remote server, add the server to be able to push to it:	`git remote add origin <server>`
	List all currently configured remote repositories:	`git remote -v`

Branches	Create a new branch and switch to it:	`git checkout -b <branchname>`
	Switch from one branch to another:	`git checkout <branchname>`
	List all the branches in your repo, and also tell you what branch you're currently in:	`git branch`
	Delete the feature branch:	`git branch -d <branchname>`
	Push the branch to your remote repository, so others can use it:	`git push origin <branchname>`
	Push all branches to your remote repository:	`git push --all origin`
	Delete a branch on your remote repository:	`git push origin :<branchname>`
Update from the remote repository	Fetch and merge changes on the remote server to your working directory:	`git pull`
	To merge a different branch into your active branch:	`git merge <branchname>`

	View all the merge conflicts: View the conflicts against the base file:
	
	 Preview changes, before merging:
		`git diff`
		 `git diff --base <filename>`
		 `git diff <sourcebranch> <targetbranch>`

	After you have manually resolved any conflicts, you mark the changed file:	`git add <filename>`
Tags	You can use tagging to mark a significant changeset, such as a release:	`git tag 1.0.0 <commitID>`
	CommitId is the leading characters of the changeset ID, up to 10, but must be unique. Get the ID using:	`git log`
	Push all tags to remote repository:	`git push --tags origin`
Undo local changes	If you mess up, you can replace the changes in your working tree with the last content in head: Changes already added to the index, as well as new files, will be kept.	`git checkout -- <filename>`

	Instead, to drop all your local changes and commits, fetch the latest history from the server and point your local master branch at it, do this:	`git fetch origin`
		
		`git reset --hard origin/master`

Search	Search the working directory for `foo()`:	`git grep "foo()"`

Get started with Git

Atlassian Bitbucket Data Center is the Git repository management solution for enterprise teams. It allows everyone in your organization to easily collaborate on your Git repositories.

This page will guide you through the basics of Bitbucket. By the end you should know how to:

- Create accounts for your collaborators, and organize these into groups with permissions.
- Create a project and set up permissions.
- Create repositories, and know the basic commands for interacting with them.

Assumptions

This guide assumes that you don't have prior experience with Git. But we do assume that:

- You have Git version 1.7.6 or higher installed on your local computer.
- You are using a supported browser.
- You have Bitbucket installed and running. If you haven't, see Getting started.

Please read Git resources or check out our Git tutorials for tips on getting started with Git.

Add users to Bitbucket and grant permissions

The first thing you can do is add collaborators.

To add users

1. Go to the **Bitbucket** administration area by clicking the cog ⚙, then click **Users** in the Admin screen (under Accounts):
2. Click **Create user** to go directly to the user creation form.
3. Once you've created a user, click **Change permissions** to set up their access permissions.

There are 4 levels of user authentication:

- **System Administrator** — can access all the configuration settings of the instance.
- **Administrator** — same as System Admins, but they can't modify file paths or the instance settings.
- **Project Creator** — can create, modify and delete projects.
- **Bitbucket User** — active users who can access **Bitbucket**.

See Users and groups for more information about authentication.

See External user directories if you have existing user identities you wish to use with **Bitbucket**.

Create your first project and share it with collaborators

Create your project

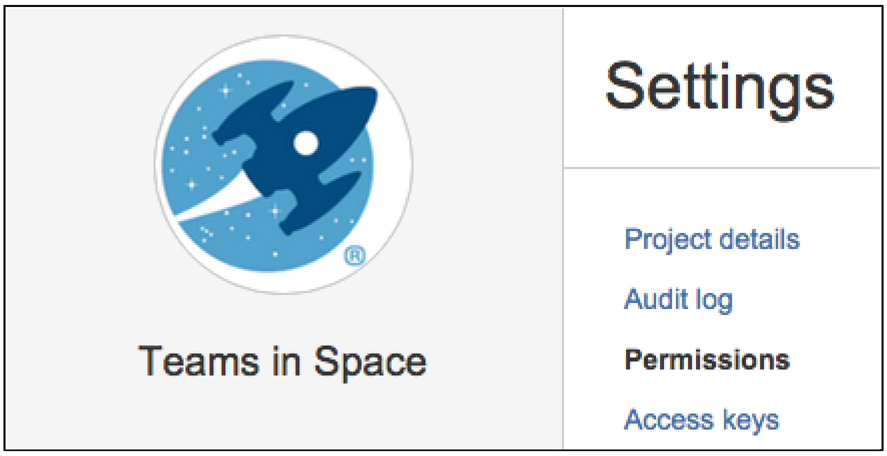
The next thing you do, is create a project. You'll add repositories to this project later.

Go to 'Projects' and click **Create project**. Complete the form and submit it to create your new project. See Creating projects for more information.

Open project access to others

If you are a project administrator, you can grant project permissions to other collaborators.

Click **Settings** then **Permissions** for the project:



The 'Project permissions' page allows you to add users and groups to a project you've already created.

There are 3 levels of project access:

- **Admin** — can create, edit and delete repositories and projects, and configure permissions for projects.
- **Write**— can push to and pull from all the repositories in the project.
- **Read** — can only browse code and comments in, and pull from, the repositories in the project.

See Using project permissions for more information.

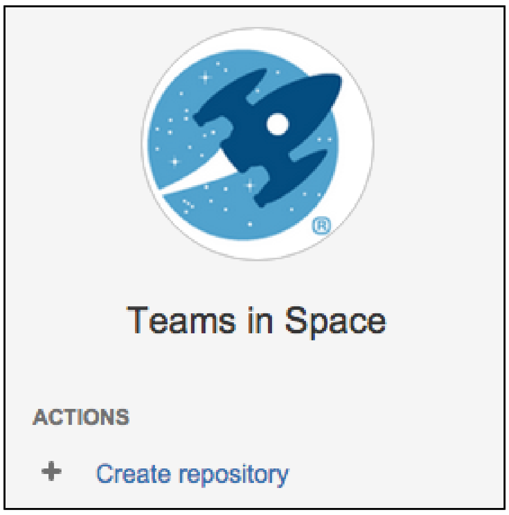
Create a repository and get your code into **Bitbucket**

Create a repository

If you are a project administrator, you can create repositories in the project.

Once a repository is created, the project permissions are applied to the repository. That means all repositories created in a project share the same access and permission settings. If you already have a Git project you'd like to use, see Importing code from an existing project.

Click **Create repository** to open the repository creation form:



Once submitted you will be taken directly to your repository homepage. As there is no content in your repository yet, you'll see some instructions to help you push code to your repository. See Creating repositories for more information.

Clone and push

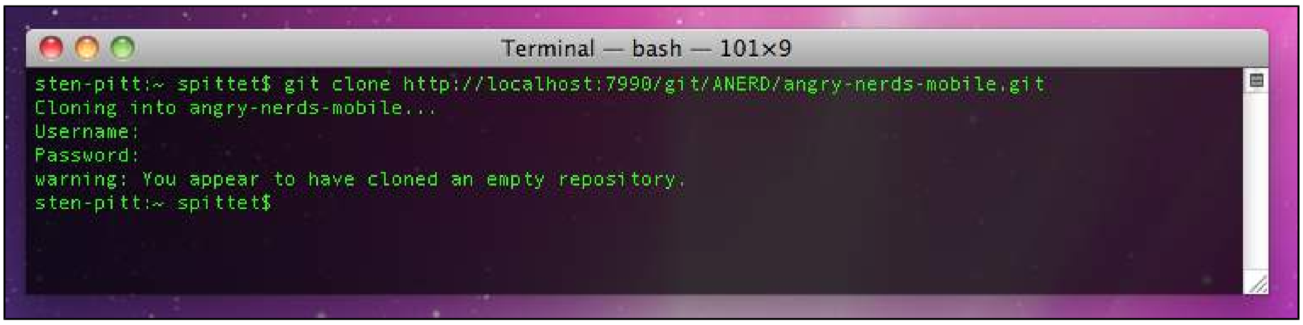
This section describes how to clone the repository you just created and then push a commit back to it. You can see the clone URL to use at the top right of the screen. SSH access may be available.

In a terminal, run the following command (replace `<bitbucketURL>` with the URL for your instance of **Bitbucket**):

```
git clone <bitbucketURL>/git/<projectname>/<reponame>.git
```

Use your **Bitbucket** username and password.

The result in your terminal should be similar to what you can see in the screenshot below.



```
sten-pitt:~ spittet$ git clone http://localhost:7990/git/ANERD/angry-nerds-mobile.git
Cloning into angry-nerds-mobile...
Username:
Password:
warning: You appear to have cloned an empty repository.
sten-pitt:~ spittet$
```

You should now have a new empty directory tracked by Git, in the user space of your local machine. Let's add some content and push it back to **Bitbucket**.

In your <reponame> directory, create a text file named helloworld.txt and write "Hello World" in it.

Now run the following command in your terminal

```
cd <reponame>
git add .
git commit -m "My first commit"
git push origin master
```

If everything went fine, when you refresh the **Bitbucket**screen, you will see that the homepage of your repository has been replaced with a file browser showing you a link to helloworld.txt.

There you go, you're ready to get coding with your collaborators.

For more information about getting your code into **Bitbucket**, see Importing code from an existing project.

Check out our Git tutorials and training for more information, and have a look at this list of basic Git commands that you will probably use often.

Use Bitbucket Data Center

Bitbucket is the on-premises Git repository management solution for enterprise teams. It allows everyone in your organization to easily collaborate on your Git repositories.

This section describes the essentials of using Bitbucket.

If you are setting up Bitbucket see the Install or upgrade Bitbucket section. If you want to configure Bitbucket, see the Administer Bitbucket Data Center section.

See Get started with Git for an overview of how to work with Bitbucket.

Related pages:

- Git Tutorials and Training
- Git resources
- Administer Bitbucket Data Center
- FAQ

Working with projects

Bitbucket manages related repositories as projects. Find out how to set up projects and then give your teams access to those.

Working with repositories

If you have existing projects that you want to manage in Bitbucket, then you'll want to read Importing code from an existing project.

See also:

- Creating repositories
- Controlling access to code
- Pull requests
- Working with Git LFS Files
- Compare changes in Bitbucket Data Center

Git resources

For those who are new to using Git:

- Pull requests
- Basic Git commands
- Permanently authenticating with Git repositories

Importing code from an existing project

This page describes the methods you can use to import code from existing projects into Bitbucket Data Center. When creating a new repository, you can import code from an existing project into Bitbucket using either the terminal or the web interface.

If you're using Bitbucket Cloud, take a look at our Import or convert code from an existing tool page for more information.

On this page

Import code using the web interface

Introduced in Bitbucket Server 4.9, you can import code and its version/branching history into Bitbucket from existing Git projects hosted with Bitbucket Cloud, GitHub, GitHub Enterprise, or a standalone Git repository using the web interface.

To start importing code

1. While viewing a project within Bitbucket click **Import repository** in the sidebar.
2. Select a source to import code from, provide the required information, then click **Connect**.
    a. **For Bitbucket Cloud**, include the Username and App password for the account (set at

       `https://bitbucket.org/account/admin/app-passwords`)
       to import from, and ensure read access for account, team, project, and repository is enabled.
    b. **For GitHub**, include the Username and the GitHub personal access token (set at

       `https://github.com/settings/tokens` not your GitHub password)

       for the account to import from, and ensure the **repo** and **read:org** scopes are enabled.
    c. **For GitHub Enterprise**, provide the Server URL, Username, and the GitHub personal access token (set at `https://github.com/settings/tokens` not your GitHub password`)` for the account to import from, and ensure the **repo** and **read:org** scopes are enabled.
    d. **For a single Git repository**, provide the Clone URL, and Username and Password (if required).
3. Choose which repositories to import.
    a. **All repositories** imports all the repositories owned by the account provided.
    b. **Select repositories** allows you choose specific repositories to import.
4. Click **Import**.

Once importing completes, you can refresh the project page to see the imported repositories.

Import code using the terminal

Import code from an existing project using the terminal by first cloning the repository to your local system and then pushing to an empty Bitbucket repository.

Import an existing, unversioned code project

If you have code on your local machine that is not under source control, you can put it under source control and import it into Bitbucket.

Assuming you have Git installed on your local machine, then:

1. Locally, change to the root directory of your existing source.
2. Initialize the project by running the following commands in the terminal:

```
git init
git add --all
git commit -m "Initial Commit"
```

3. Log into Bitbucket and create a new repository.
4. Locate the clone URL in the nav panel on the left (for example: *https://username@your.bitbucket.domain:7999 /yourproject/repo.git*).
5. Push your files to the repository by running the following commands in the terminal (change the URL accordingly):

```
git remote add origin https://username@your.bitbucket.domain:7999/yourproject/repo.git
git push -u origin master
```

6. Done! Your repository is now available in Bitbucket.

Import an existing Git project

You can import your existing Git repository into an empty repository in Bitbucket. When you do this, Bitbucket maintains your commit history.

1. Check out the repository from your existing Git host. Use the *--bare* parameter:

```
git clone --bare https://username@bitbucket.org/exampleuser/old-repository.git
```

2. Log into Bitbucket and create a new repository (we've called it `repo.git` in this example).
3. Locate the clone URL in the nav panel on the left (for example: *https://username@your.bitbucket.domain:7999 /yourproject/repo.git*).
4. Add Bitbucket as another remote in your local repository:

```
cd old-repository
git remote add bitbucket https://username@your.bitbucket.domain:7999/yourproject/repo.git
```

5. Push all branches and tags to the new repository:

```
git push --all bitbucket
git push --tags bitbucket
```

6. Remove your temporary local repository:

```
cd ..
rm -rf old-repository
```

Mirror an existing Git repository

You can mirror an existing repository into a repository hosted in Bitbucket.

1. Check out the repository from your existing Git host. Use the *--mirror* parameter:

```
git clone --mirror https://username@bitbucket.org/exampleuser/repository-to-mirror.git
```

2. Log into Bitbucket and create a new repository (we've called it `repo.git` in this example).
3. Locate the clone URL in the nav panel on the left (for example: `https://username@your.bitbucket.domain:7999 /yourproject/repo.git`).
4. Add Bitbucket as another remote in your local repository:

```
git remote add bitbucket https://username@your.bitbucket.domain:7999/yourproject/repo.git
```

5. Then push all branches and tags to Bitbucket:

```
git push --all bitbucket
git push --tags bitbucket
```

6. Use `git fetch --prune origin` ('–prune' will remove any branches that no longer exist in the remote) followed by the `git push` commands from step 5 to update the Bitbucket mirror with new changes from the upstream repository.

Creating projects

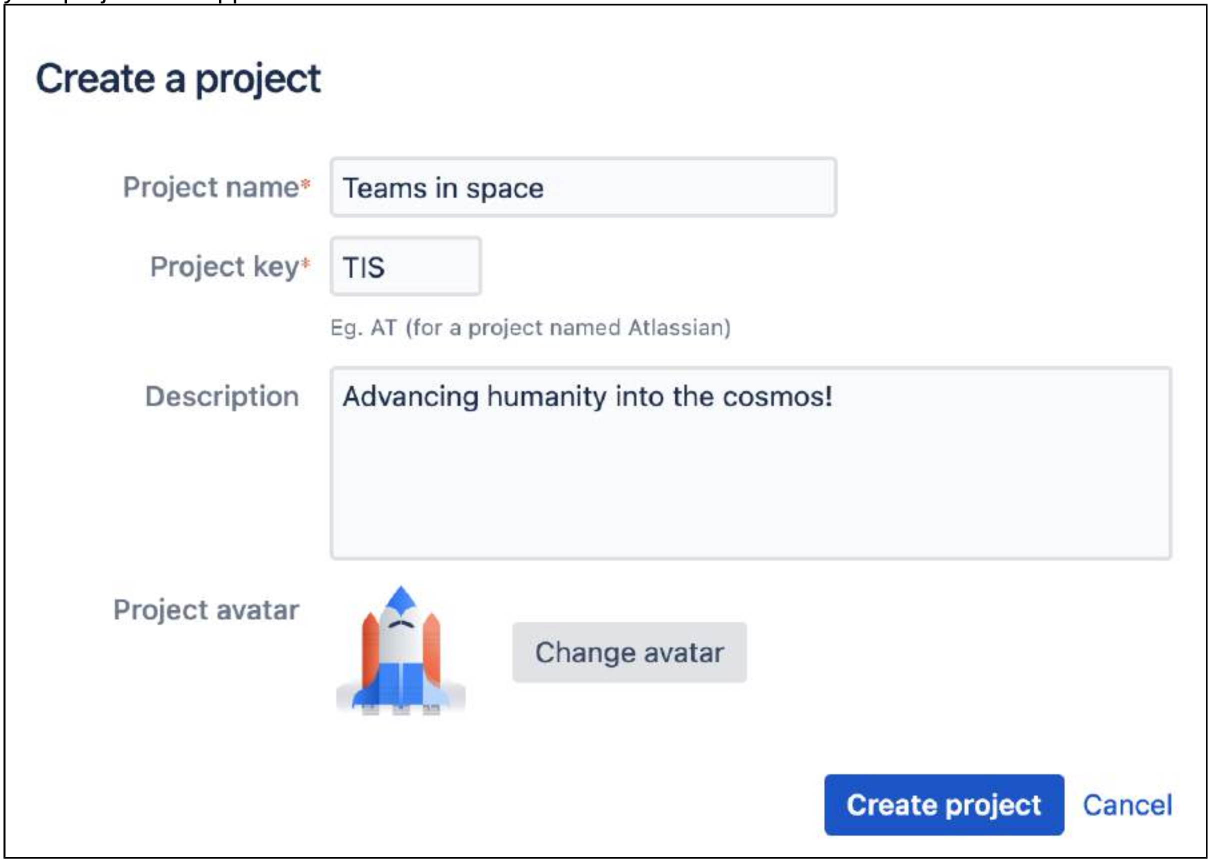
Projects in Bitbucket Data Center allow you to group repositories and manage permissions for them in an aggregated way.

Who can do this?

Users with Project creator permission

To create a project:

1. From the navigation bar, select **Projects** > **Create project**.
2. Fill out the form. We recommend that you use a short project key, which will be used as an identifier for your project and appear in the URLs.



Create a project

Project name*	Teams in space
Project key*	TIS
	Eg. AT (for a project named Atlassian)
Description	Advancing humanity into the cosmos!

3. Optional: You can choose an avatar for the project. This will be displayed throughout **Bitbucket** and helps identify your project.
4. Select **Create project** when you're done.

You may now want to add repositories to the project. Learn how to create repositories

Restrict changes to repository settings

Who can do this?

Project admins

Available in Bitbucket Data Center 8.8 onwards

By default, repository settings inherit project settings and can be modified by repository admins. However, for both new and existing projects, you can choose to restrict or control changes to some of the repository settings (Access keys, HTTP access tokens, Project permissions).

For more information on how this control impacts settings, see:

- Access keys
- HTTP access tokens
- Project permissions
- Branches
- Merge checks
- Merge strategies
- Hooks

Creating repositories

Repositories in Bitbucket Data Center allow you to collaborate on code with your team.

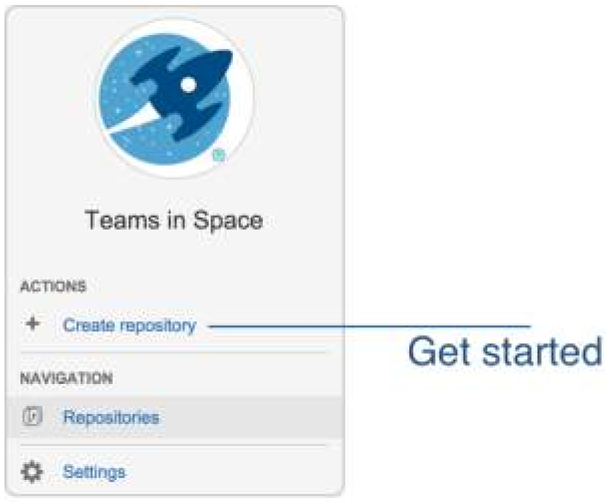
In order to create repositories, you need to have the appropriate permissions for the project to which you want to add a repository.

When a repository in Bitbucket is created, the project permissions are applied to the repository. That means all repositories created in a project share the same access and permission settings.

Related pages:

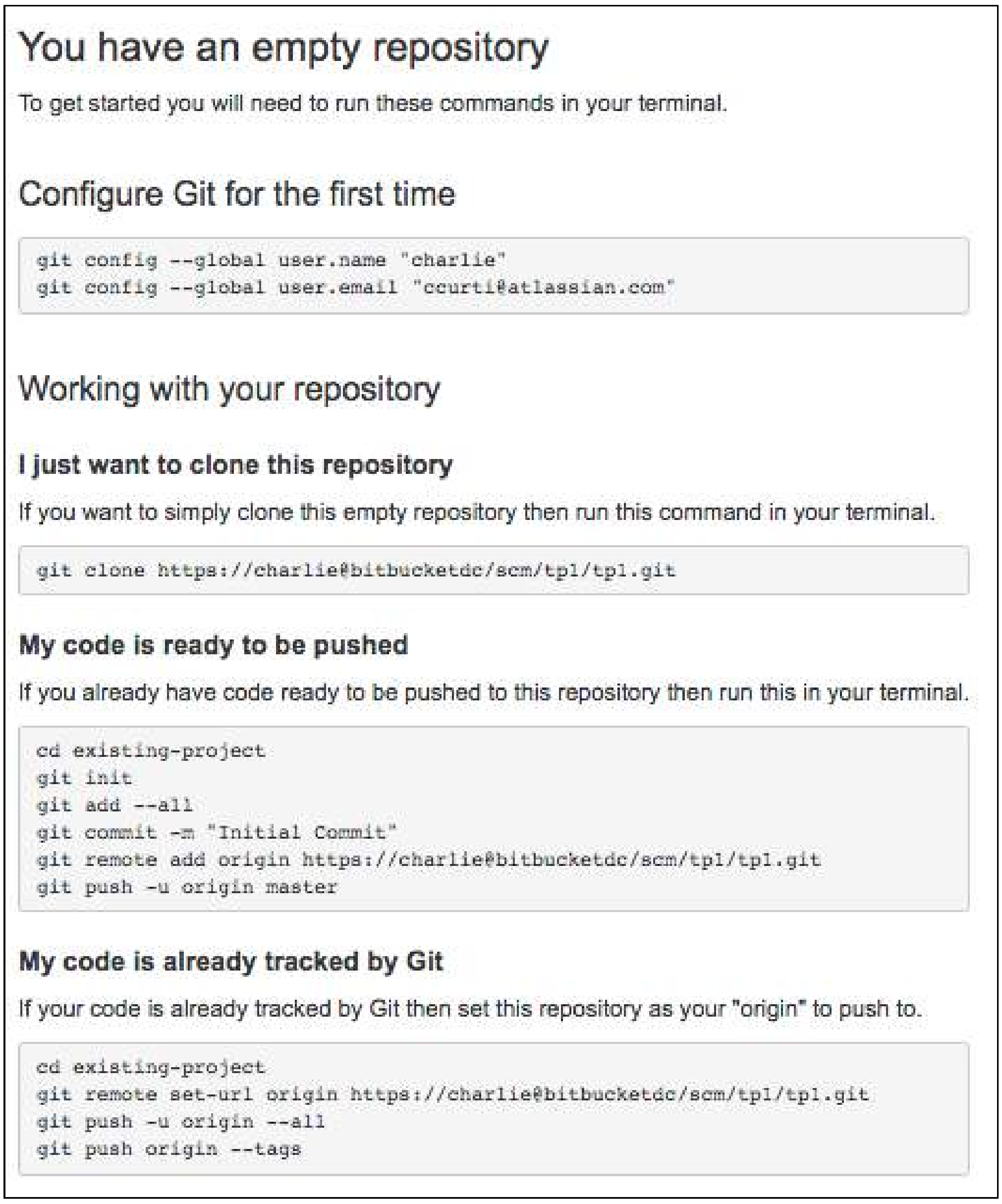
- Creating personal repositories
- Using repository permissions
- Creating projects
- Importing code from an existing project

Go to the project and click **Create repository** to open the repository creation form:



Once submitted you will be taken directly to your repository homepage.

There won't be any content in your repository yet, so you'll see some instructions to help you push code to your repository:



You have an empty repository

To get started you will need to run these commands in your terminal.

Configure Git for the first time

```
git config --global user.name "charlie"
git config --global user.email "ccurti@atlassian.com"
```

Working with your repository

I just want to clone this repository

If you want to simply clone this empty repository then run this command in your terminal.

```
git clone https://charlie@bitbucketdc/scm/tp1/tp1.git
```

My code is ready to be pushed

If you already have code ready to be pushed to this repository then run this in your terminal.

```
cd existing-project
git init
git add --all
git commit -m "Initial Commit"
git remote add origin https://charlie@bitbucketdc/scm/tp1/tp1.git
git push -u origin master
```

My code is already tracked by Git

If your code is already tracked by Git then set this repository as your "origin" to push to.

```
cd existing-project
git remote set-url origin https://charlie@bitbucketdc/scm/tp1/tp1.git
git push -u origin --all
git push origin --tags
```

You will find your clone URL in the lefthand sidebar of the repository homepage. You can use this URL and share it with other people.

Let other people collaborate with you

If your project admin hasn't restricted you from managing repository permissions, you can grant users and groups access to this repository; otherwise, you'll need to ask them to grant the required repository permissions. Learn more about how project admins can restrict changes to repository settings

You can also create a Contributor's guidelines file to add to your repository, where you can add info on what you'd like your contributors to do when contributing to your repository.

Creating personal repositories

Bitbucket Data Center allows you to create personal repositories, unrelated to other projects, that you can use for such purposes as storing private snippets of work, kick-starting your own project, or contributing a bug-fix for a project you are not a member of.

By default, personal repositories are not visible to other Bitbucket users (unless they are a Bitbucket system administrator). However, you can:

- use repository permissions to open up access to other Bitbucket users and groups, for collaboration or review.
- allow public access (read-only) to your project, for anonymous users.

You can create personal repositories in two ways:

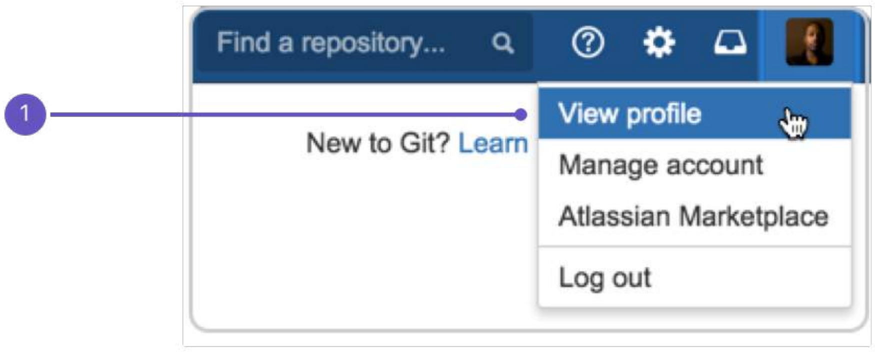
- Directly, from your profile.
- By forking another repository.

Your personal repositories are listed on the **Repositories** tab of your profile page. Every Bitbucket user can see your profile page, but they can only see those repositories that you have given them permission to view.

Directly creating a personal repository

You can create a personal repository at any time from your profile:

1. Choose **View profile** from your user menu in the header.



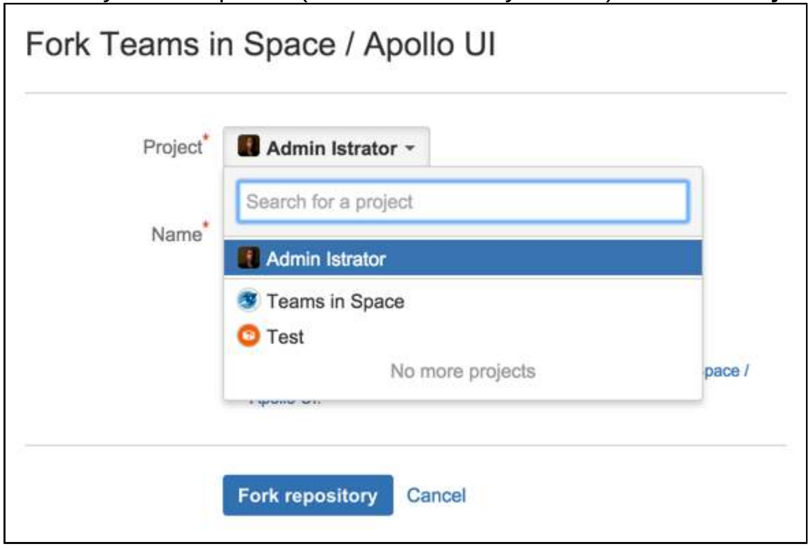
2. Click **Create repository**.
3. Set repository permissions on the new repository, if required.

Forking another repository

You can create a personal fork of any other repository for which you have permission:

1. Go to the repository that you wish to fork.
2. Click **Fork** in the sidebar.

3. Choose your own profile (this is selected by default) from the **Project** list:



4. Click **Fork repository**.
5. Set repository permissions on the new repository, if required.

Using repository hooks

Hooks let you to extend what Bitbucket Data Center does every time a repository changes, allow you to customize your team's workflow, and enable you to integrate with other systems.

You can configure a hook to run automatically every time a particular event occurs in a repository, for instance when code is pushed or a pull request is merged.

Bitbucket supports two types of hooks, pre-receive and post-receive hooks. Hooks are installed by system administrators and can be enabled for all repositories in a project, or for an individual repository.

On this page:

Pre-receive hooks

Pre-receive hooks allow you to control which commits go into your repository before pushes are committed or pull requests are merged. For example, a pre-receive hook can reject pushes to the repository if certain conditions are not fulfilled. It could prevent force pushes to the repository or check whether all commits contain a valid Jira application issue key.

Default pre-receive hooks

Bitbucket comes with some pre-receive hooks installed by default that are disabled, but can be enabled at the project level for all repositories in a project, or for individual repositories.

The default hooks that come with Bitbucket are:

- **Reject Force Push** - rejects all force pushes to a repository.
- **Verify Commit Signature** - rejects commits and tags without a verified GPG signature.
- **Verify Committer** - rejects commits not committed by the user pushing to a repository.

The **Verify Committer** hook uses the mappings in the `Git .mailmap` file to verify commits, and based on how this file has been set up in your repository, multiple Git committers may be associated with a single Bitbucket user account.

When using this hook, we recommend that you use **Branch permissions** (available in Project and Repository settings) to prevent changes without pull requests to your base/production branch. This will allow you to review and prevent unwanted changes to your `Git.mailmap` file.

You can also use the **Push log** page (available in Repository settings) to identify committers. Note that this log doesn't use mappings from the Git `.mailmap` file.

Post-receive hooks

Post-receive hooks run after commits are processed, and are typically used to update external services or send notifications. For example, the Web Post Hooks Plugin can send a message to a chat client or notify a continuous integration server changes.

For releases prior to 5.0, Bitbucket supported two types of post-receive hook:

- PostReceiveHooks used to map to Git's `post-receive` hooks. They ran on the Bitbucket instance after a push.
- AsyncPostReceiveRepositoryHooks, was executed by the Bitbucket instance.

From 5.0 onwards, these are now both deprecated and have been replaced by:

- PostRepositoryHooks, which gets called for both PR merge and post-receive.

Configure hooks for all repositories in a project

By default, hook settings from the project level are inherited by the repositories. Repository admins can either set a hook to inherit the project-level setting or override it (by enabling or disabling the hook at the repository-level).

Later when you modify a project-level hook (enable or disable a hook), only hooks in repositories that are set to inherit the project-level setting change to match the project-level hooks. Hooks that've been set to override project-level settings will not change.

Starting from Bitbucket 8.10, project admins can also restrict repository-level customization of a hook. Note that when you restrict changes, any custom settings saved at the repository-level for that hook are deleted and the hook inherits project settings.

To enable (or disable) hooks for repositories in a project (requires project admin permissions):

1. Go to **Project settings** > **Hooks**.
2. Select **More actions ...** > **Enable** or **Disable**.
3. Optional: To disable repository-level customization, select **More actions ...** > **Don't allow**.

Configure hooks for an individual repository

If your project admin hasn't restricted repository-level customization for a hook, you can configure it to override the project-level setting (enabled or disabled) or set it to inherit the project-level setting.

To enable (or disable) hooks for a single repository (requires repository admin permissions):

1. Go to **Repository settings** > **Hooks**.
2. Select **More actions ...** >
   a. **Inherit from project**, to use the project-level setting
   b. **Enable** or **Disable** to override the project-level setting

Add a new hook

Additional hooks can be installed by system administrators and can also be enabled for all repositories in a project, or for individual repositories.

To add hooks from the Atlassian Marketplace (requires system admin permission):

1. Go to **Project settings** > **Hooks**.
2. Click **Add hook**.
3. Search for a hook to add, and click **Install**.

Once you add a new hook, you can enable (or disable) it in the same way as the default hooks.

Create a hook

You can also write your own hooks. Here are some useful resources to help you get started.

- Repository hooks
- Repository hook plugin module
- Blog post about hooks for Bitbucket

- Video demo on how to get started on Bitbucket hooks

Permanently authenticating with Git repositories

In addition to SSH, Bitbucket Data Center supports HTTP or HTTPS for pushing and pulling from managed Git repositories. However, Git does not cache the user's credentials by default, so you need to re-enter them each time you perform a clone, push, or pull.

This page describes two methods for permanently authenticating with Git repositories so that you can avoid typing your username and password each time you are pushing to or pulling from Bitbucket.

On this page

Using credential caching

You need Git 1.7.9 or above to use the HTTPS Credentials Caching feature.

Windows

On Windows you can use the application git-credential-winstore.

1. Download the software.
2. Run it.
3. You will be prompted for credentials the first time you access a repository, and Windows will store your credentials for use in the future.

Linux

On Linux you can use the 'cache' authentication helper that is bundled with Git 1.7.9 and higher. From the Git documentation:

> *This command caches credentials in memory for use by future git programs. The stored credentials never touch the disk, and are forgotten after a configurable timeout. The cache is accessible over a Unix domain socket,*
> *restricted to the current user by filesystem permissions.*

Run the command below to enable credential caching. After enabling credential caching any time you enter your password it will be cached for 1 hour (3600 seconds):

```
git config --global credential.helper 'cache --timeout 3600'
```

Run the command below for an overview of all configuration options for the 'cache' authentication helper:

```
git help credential-cache
```

macOS

If you’re using macOS, Git comes with an "oxykeychain" mode. For more instructions, see credential storage.

Using the .netrc file

The `.netrc` file is a mechanism that allows you to specify which credentials to use for which server. This method allows you to avoid entering a username and password every time you push to or pull from Git, but your Git password is stored in plain text.

Warning!

- Git uses a utility called cURL under the covers, which respects the use of the .netrc file. Be aware that other applications that use cURL to make requests to servers defined in your `.netrc` file will also now be authenticated using these credentials. Also, this method of authentication is potentially unsuitable if you are accessing your Bitbucket instance via a proxy, as all cURL requests that target a path on that proxy server will be authenticated using your `.netrc` credenti als.
- cURL will not match the machine name in your .netrc if it has a username in it, so make sure you edit your `.git/config` file in the root of your clone of the repository and remove the user and '@' part from any clone URL's (URL fields) that look like `https://user@machine.domain.com/...` to make them look like `http://machine.domain.com/...`

Windows

1. Create a text file called `_netrc` in your home directory (e.g. `c:\users\kannonboy\_netrc`). cURL has problems resolving your home directory if it contains spaces in its path (e.g. `c:\Documents and Settings\kannonboy`). However, you can update your `%HOME%` environment variable to point to any directory, so create your `_netrc` in a directory with no spaces in it (for example `c:\curl-auth\`) then set your `%HOME%` environment variable to point to the newly created directory.
2. Add credentials to the file for the server or servers you want to store credentials for, using the format described below:

```
machine stash1.mycompany.com
login myusername
password mypassword
machine stash2.mycompany.com
login myotherusername
password myotherpassword
```

Linux or macOS

1. Create a file called `.netrc` in your home directory (`~/.netrc`). Unfortunately, the syntax requires you to store your passwords in plain text - so make sure you modify the file permissions to make it readable only to you.
2. Add credentials to the file for the server or servers you want to store credentials for, using the format described in the 'Windows' section above. You may use either IP addresses or hostnames, and you do *not* need to specify a port number, even if you're running Bitbucket on a non-standard port.
3. And that's it! Subsequent `git clone`, `git pull` and `git push` requests will now be authenticated using the credentials specified in this file.

Clone a repository

Cloning a repository

You can use Sourcetree, Git from the terminal, or any client you like to clone your Git repository. These instructions show you how to clone your repository using Git from the terminal.

1. From the repository, click **Clone** in the sidebar to display the Clone dialog. If there's contributor's guidelines available for the repository, have a look to make sure you're onboard with what's expected for contributions to the repository.
2. Copy the clone command (either the SSH format or the HTTPS).
   If you are using the SSH protocol, ensure your public key is in Bitbucket Data Center and loaded on the local system to which you are cloning.
3. From a terminal window, change to the local directory where you want to clone your repository.
4. Paste the command you copied from Bitbucket, for example:

   Clone over HTTPS:

   ```
    $ git clone https://username@bitbucket.org/teamsinspace/documentation-tests.git
   ```

   Clone over SSH:

   ```
   $ git clone git@bitbucket.org:teamsinspace/documentation-tests.git
   ```

If the clone was successful, a new sub-directory appears on your local drive. This directory has the same name as the Bitbucket repository that you cloned. The clone contains the files and metadata that Git requires to maintain the changes you make to the source files.

Cloning a mirror repository

You can use Sourcetree, Git from the terminal, or any client you like to clone your Git repository. These instructions show you how to clone a mirrored repository using Git from the terminal. Read more about Smart Mirrors.

1. Navigate to the repository in Bitbucket Data Center.
2. Click the **Clone** button.
3. If mirrors are configured, use the **Clone from** dropdown to select the mirror closest to you–the clone URL changes.
4. Copy the clone URL (either SSH or HTTPS).
   If you are using the SSH protocol, ensure your public key is correctly configured.
5. Launch a terminal window.
6. Change to the local directory where you want to clone your repository.
7. Enter `git clone` followed by the copied clone URL.
   The command and clone URL together would look like this:

   ```
   $ git clone ssh://git@bitbucket-au.example.com:7999/upstream/PROJ/repo.git
   ```

If the clone was successful, a new sub-directory appears on your local drive. This directory has the same name as the Bitbucket repository that you cloned. The clone contains the files and metadata that Git requires to maintain the changes you make to the source files.

Archive a repository

A Data Center license is required to use this feature. Get an evaluation license to try it out, or purcha se a license now.

If you'd rather not delete a repository, you can archive it instead. This helps to declutter the list of repositories and ensure more accurate code search results.

Repositories can be archived:

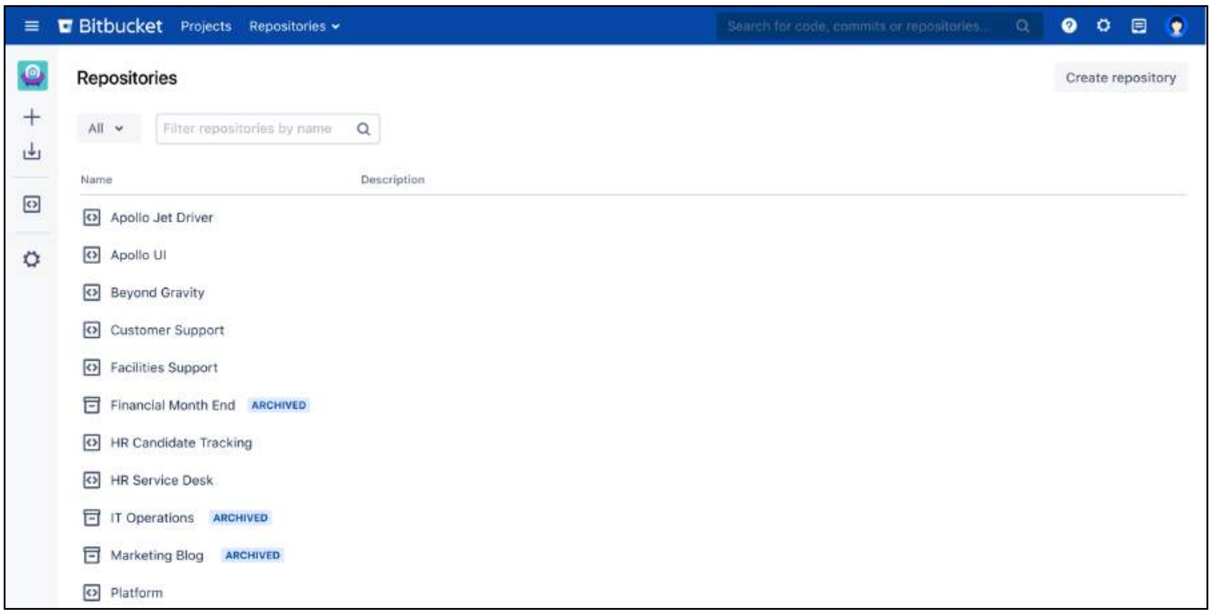
- from Repository settings by repository admins.
- in bulk from the Administration area by system and global admins.

Archiving a repository makes it read-only and excludes it from searches and comparison. It also means that **y ou can't**:

- create pull requests
- create branches
- add comments
- change repository details
- move the repository

Here's some more things to note about archiving repositories:

- You can still fork and clone an archived repository.
- You can't archive a repository with open pull requests.
- Repository admins can unarchive archived repositories.
- Archiving a repository doesn't reduce the disk space.
- You can search for code in archived repositories. Learn more about how to perform code search
- You'll still be able to see the repositories you've archived.


Bitbucket
Projects
Repositories
Search for code, commits or repositories...
Create repository
All
Filter repositories by name

Repositories

Name	Description
Apollo Jet Driver	
Apollo UI	
Beyond Gravity	
Customer Support	
Facilities Support	
Financial Month End ARCHIVED	
HR Candidate Tracking	
HR Service Desk	
IT Operations ARCHIVED	
Marketing Blog ARCHIVED	
Platform	

Repositories list that includes archived repositories

Archive or unarchive a single repository from Repository settings

Who can use this procedure?

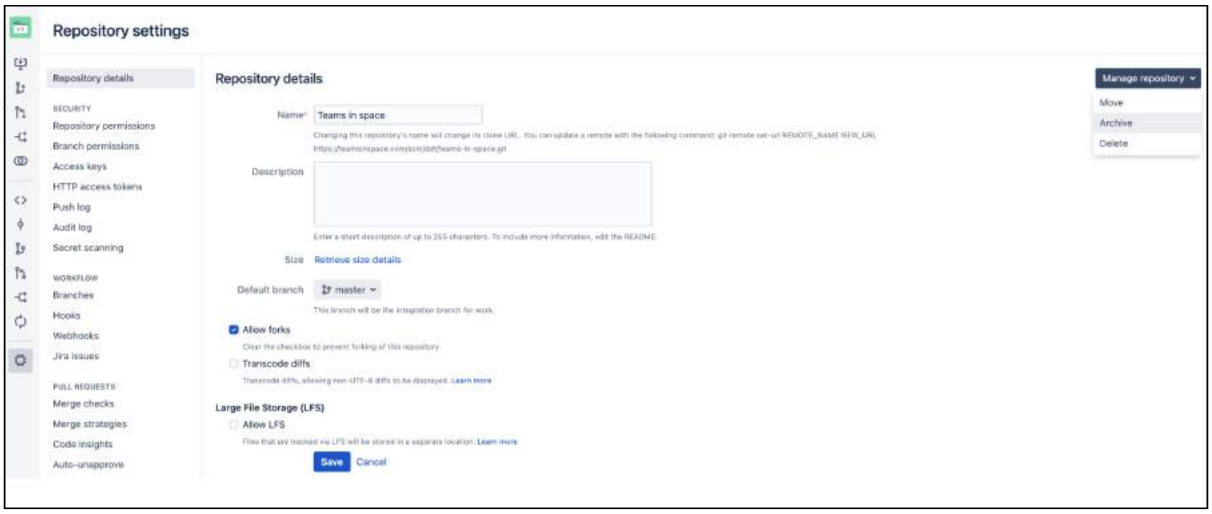
Repository admins

Available in Bitbucket Data Center 8.0 onwards

To archive a single repository:

1. Navigate to **Repository settings** > **Repository details**.
2. Select **Manage repository** > **Archive**.
3. In the confirmation modal, select **Archive**.

To unarchive, select **Manage repository** > **Unarchive**.



Repository details

Name* Teams in space

Changing this repository's name will change its clone URL. You can update a remote with the following command: git remote set-url REMOTE_NAME NEW_URL https://teamsinspace.com/scm/dot/teams-in-space.git

Description

Enter a short description of up to 255 characters. To include more information, edit the README

Size Retrieve size details

Default branch master

This branch will be the integration branch for work.

☑ Allow forks

Clear the checkbox to prevent forking of this repository

☐ Transcode diffs

Transcode diffs, allowing non-UTF-8 diffs to be displayed. Learn more

Large File Storage (LFS)

☐ Allow LFS

Files that are tracked via LFS will be stored in a separate location. Learn more

Archive or unarchive repositories in bulk from the Administration area

Who can use this procedure?

System and global admins

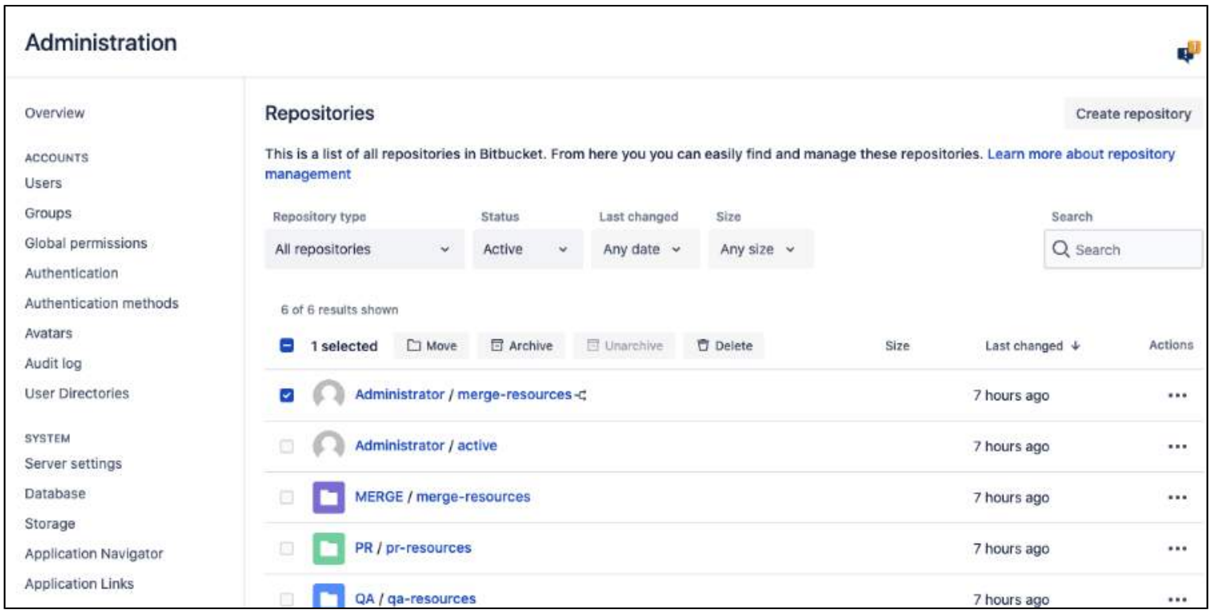
Available in Bitbucket Data Center 8.0 onwards

You can archive a single repository or multiple repositories at once.

To archive multiple repositories:

1. Navigate to **Administration** > **Git** > **Repositories**.
2. Select the checkboxes next to the repositories you want to archive.
3. Select **Archive**.
4. In the confirmation modal, select **Archive**.

To unarchive, select **More actions •••** > **Unarchive** next to the repository you want to unarchive.



Administration

Overview

ACCOUNTS
- Users
- Groups
- Global permissions
- Authentication
- Authentication methods
- Avatars
- Audit log
- User Directories

SYSTEM
- Server settings
- Database
- Storage
- Application Navigator
- Application Links

Repositories

Create repository

This is a list of all repositories in Bitbucket. From here you you can easily find and manage these repositories. Learn more about repository management

Repository type: All repositories | Status: Active | Last changed: Any date | Size: Any size | Search: Search

6 of 6 results shown

1 selected | Move | Archive | Unarchive | Delete

	Repository	Size	Last changed ↓	Actions
✓	Administrator / merge-resources		7 hours ago	•••
	Administrator / active		7 hours ago	•••
	MERGE / merge-resources		7 hours ago	•••
	PR / pr-resources		7 hours ago	•••
	QA / qa-resources		7 hours ago	•••

HTTP access tokens

HTTP access tokens in Bitbucket Data Center can be created for users as well as for teams working in projects and repositories. Use them in place of passwords for Git over HTTPS, or to authenticate when using the Bitbucket REST API.

- You can't use a token to log in via the web UI
- You can't use a token to perform changes on behalf of a user (for example, create new tokens or update user account details)
- You can't use a token to merge a pull request as the merge creates a commit (only users with a valid e-mail address can create a commit)

On this page:

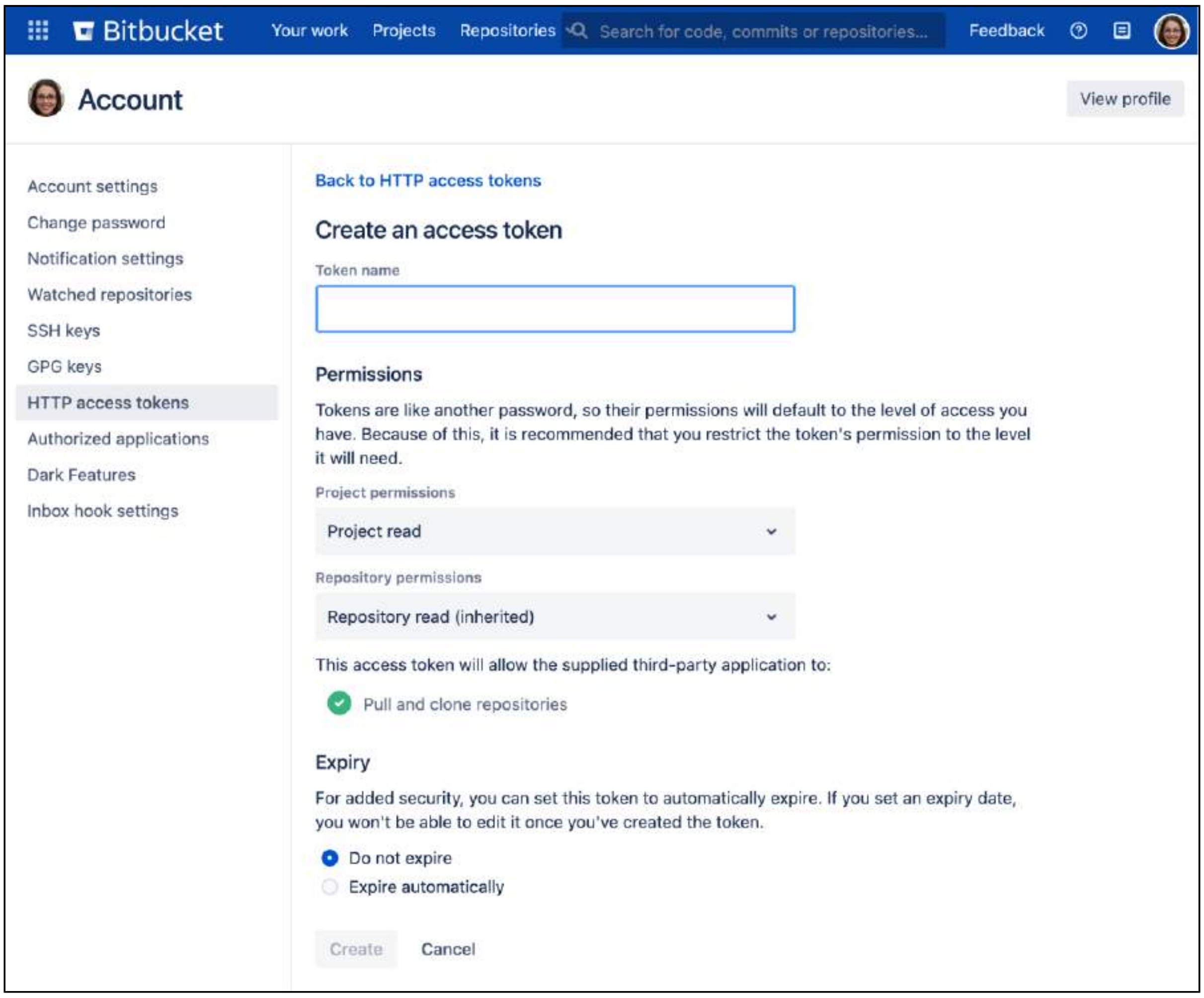
Related pages:

- Managing HTTP access tokens
- Controlling access to code
- SSH access keys for system use

Create HTTP access tokens

To create an HTTP access token for your user account:

1. Go to **Profile picture** > **Manage account** > **HTTP access tokens**.
2. Select **Create token.**
3. Set the token name, permissions, and expiry.



Create an access token

Token name

Permissions

Tokens are like another password, so their permissions will default to the level of access you have. Because of this, it is recommended that you restrict the token's permission to the level it will need.

Project permissions: Project read

Repository permissions: Repository read (inherited)

This access token will allow the supplied third-party application to:

✓ Pull and clone repositories

Expiry

For added security, you can set this token to automatically expire. If you set an expiry date, you won't be able to edit it once you've created the token.

[✓ Do not expire]
Expire automatically

Create HTTP access tokens for projects or repositories

⚠ A Data Center license is required to create HTTP access tokens for projects and repositories. Get an evaluation license to try it out, or purchase a license now.

HTTP access tokens can be created for teams to grant permissions at the project or repository level rather than for specific users.

Starting from Bitbucket 8.8, project admins can also restrict repository admins from managing repository-level tokens using the **Restrict changes to repository settings** dropdown. Note that when project admins restrict changes, any existing access tokens added by the repository admins are not deleted automatically.

To create an HTTP access token for a project or repository (requires project or repository admin permissions):

1. From either the **Project** or **Repository settings**, select **HTTP access tokens**.
2. Select **Create token**.
3. Set the token name, permissions, and expiry.

Permissions

Permissions restrict what a token can do. As tokens are like passwords, your token's permissions will be set at your current level of access by default. We recommend, however, restricting your token's permissions to only the level it will need.

Here are the permission combinations you can assign to a token:

Repo permissions are inherited from the project permissions

A token's repository permission must be as high as its project permission.

If you give a token *project write* permission, you cannot give it only *repository read* permissions (it must be write-level or higher).

For repository tokens, you cannot give it any project-level permissions.

	Project read	**Project write**	**Project admin**
Repository read	✓ Pull and clone repositories	✗ Combination not possible	✗ Combination not possible
Repository write	✓ Perform pull request actions ✓ Push, pull, and clone repositories (except merge)	✓ Perform pull request actions ✓ Push, pull, and clone repositories (except merge)	✗ Combination not possible
Repository admin	✓ Perform pull request actions ✓ Update repository settings and permissions ✓ Push, pull, and clone repositories (except merge)	✓ Perform pull request actions ✓ Update repository settings and permissions ✓ Push, pull, and clone repositories (except merge)	✓ Perform pull request actions ✓ Update repository settings and permissions ✓ Update project settings and permissions ✓ Push, pull, clone, and fork repositories (except merge) ✓ Create repositories

You can modify a token’s permissions or revoke a token from within the **HTTP access tokens** page list.

Expiry

For added security, when you’re creating a token you can also set it to automatically expire. This is optional, but if your administrator has made this a requirement you’ll need to choose an expiry date that’s within the limits they’ve set.

Once a token has been created, its expiry date cannot be changed. You can see the expiry dates for all your tokens in the **HTTP access tokens** page list**.**

Using HTTP access tokens

Map one token per integration

HTTP access tokens are a secure way to use scripts and to integrate external applications with Bitbucket. We recommend only mapping one token per integration. This way, if the system is compromised, you can simply revoke the token and not affect other integrations.

For Git operations, you can use your user's access token as a substitute for your password. For example, to clone using an access token you can enter:

```
> git clone https://example.com/scm/projectname/teamsinspace.git
Cloning into 'teamsinspace'...
Username for 'https://example.com':username
Password for 'https://username@example.com':MDM0MjM5NDc2MDxxxxxxxxxxxxxxxxxxxxx
```

Or using Basic Auth:

```
git clone https://username:MDM0MjM5NDc2MDxxxxxxxxxxxxxxxxxxxxx@example.com/
scm/projectname/teamsinspace.git
```

In addition, for REST operations, you can use Basic Auth:

```
curl -u username:MDM0MjM5NDc2MDxxxxxxxxxxxxxxxxxxxxx https://example.com/rest/api/latest/resource/path
```

For project or repository tokens, we recommend only using Bearer Auth without your username:

```
curl -H 'Authorization: Bearer MDM0MjM5NDc2MDxxxxxxxxxxxxxxxxxxxxx' https://example.com/rest/api/latest
/resource/path
```

Bearer Auth example for HTTP Git operations:

```
git clone -c http.extraHeader='Authorization: Bearer MDM0MjM5NDc2MDxxxxxxxxxxxxxxxxxxxxx'
https://example.com/scm/projectname/teamsinspace.git
```

Controlling access to code

Bitbucket Data Center provides the following types of permissions to allow fully customizable control of access to code.

Note that you can also:

- allow public (anonymous) access to projects and repositories. See Allowing public access to code.
- use SSH keys to allow user accounts and other systems to connect securely to Bitbucket repositories for Git operations. See Using SSH keys to secure Git operations.
- restrict changes to repository-level settings to meet your security and compliance needs and ensure code quality. Learn more about how project admins can restrict changes to repository settings

Global permissions

Control user and group access to Bitbucket projects and to the Bitbucket instance configuration. For example, these can be used to control the number of user accounts that can access Bitbucket for licensing purposes.

See Global permissions.

Project permissions

Apply the same access permissions to all repositories in a project. For example, these can be used to define the core development team for a project.

See Using project permissions.

Repository permissions

Extend access to a particular repository for other, non-core, users. For example, these can be used to allow external developers or consultants access to a repository for special tasks or responsibilities.

See Using repository permissions.

Branch permissions

Control commits to specific branches within a repository. For example, these can provide a way to enforce workflow roles such as the Release Manager, who needs to control merges to the release branch.

See Using branch permissions.

Permissions matrix

The table below summarizes the cumulative effect of the permissions described above for anonymous and logged in users. In general, repository permissions override project permissions. A personal project can not be made public.

Key

Permission	Effect
Browse	Can view repository files, clone, pull to local
Read	Can browse, clone, pull, create pull requests, fork to a personal project
Write	Can merge pull requests
Create repository	Can create repositories in a project and become repository admins for the repos they create

Admin	Can edit settings and permissions

Global (logged in)	Project	Repository	Branch	Effective permission
✗	Personal	Personal	NA	No access
✗	Personal	Public access	NA	**Browse** just that repo
✗	No access	No access	NA	No access
✗	No access	Public access	NA	**Browse** just that repo
✗	Public access	Public access	NA	**Browse** all repos in project
✓	Personal	Personal	NA	No access
✓	Personal	Public access	NA	**Read** just that repo
✓	No access	No access	NA	No access
✓	No access	Public access	NA	**Read** just that repo
✓	Public access	No access	NA	**Read** all repos in project
✓	Public access	Public access	NA	**Read**
✓	Public access	Public access	For this user	**Read** that branch, no **Write**
✓	No access	Read	NA	**Read** just that repo
✓	Public access	Read	NA	**Read** just that repo
✓	Read	No access	NA	**Read** all repos in project
✓	Read	Public access	NA	**Read** all repos in project
✓	Read	Read	NA	**Read** all repos in project
✓	Read	No access	For this user	**Read** that branch, no **Write**
✓	No access	Write	NA	**Write** just that repo
✓	Public access	Write	NA	**Write** just that repo
✓	Write	No access	NA	**Write** all repos in project
✓	Write	Write	NA	**Write** all repos in project

✓	Write	Write	For other users	**Write** to other branches only
✓	Create repository	No access	NA	**Write** all repos and create new repos in project. Users become admins of the repositories they create.
✓	Create repository	Write	NA	**Write** all repos and create new repos in project. Users become admins of the repositories they create.
✓	Create repository	Write	For other users	**Write** to other branches only and create new repos in project. Users become admins of the repositories they create.
✓	Admin			Can edit settings and permissions

Allowing public access to code

Starting from Bitbucket Data Center 8.18, public access is globally disabled by default. However, you can enable the feature at any time.

If public access support is an integral part of your workflow, we strongly recommend setting the relevant property to enable the feature **prior** to the upgrade.

To do this, in the `bitbucket.properties` file, set the property `feature.public.access=true`. Then, **restart Bitbucket** for the changes to take effect. If you run a Bitbucket cluster, a rolling restart is enough to pick up the configuration properties you set to enable the features.

On this page:

Related pages:

- Using project permissions
- Using repository permissions

You can open up public access for anonymous (unauthenticated) users to projects and repositories in Bitbucket Data Center. This allows you to:

- Broadcast your repositories to a wider audience who generally don't have access to your source.
- Utilize unauthenticated cloning of repositories when setting up continuous integration servers to work with Bitbucket.
- Link from other systems, for example Jira applications or Confluence, to give users access to code without requiring authentication.
- Create opensource projects or repositories.

Public access allows anonymous users to browse the files and commits for a specific repository or an entire project, and to clone repositories, without needing to log in, or have an account in Bitbucket.

In Bitbucket, you can:

- configure a specific repository for public access.
- configure a project to allow public access to all repositories in the project.
- disable anonymous access by setting a global system property.

Making a repository publicly accessible

If you have **admin level permissions** for a specific repository, and your project admin hasn't restricted you from managing repository permissions, you can make it publicly available for **anonymous** access. Otherwise, you'll need to ask them to make your repository publicly accessible. Learn more about how project admins can restrict changes to repository settings

Go to the repository and click **Settings**, then **Repository** (under 'Permissions'). Check **Enable** (under 'Public Access') to allow users without a Bitbucket account to clone and browse the repository.

Making a project publicly accessible

If you have **admin level permissions** for a project, you can make the project publicly available for **anonymous** access.

This doesn't apply to private projects.

Go to the project and choose **Settings**, then **Permissions**. Check **Enable** (under 'Public Access') to allow users without a Bitbucket account to clone and browse any repository in the project.

Viewing public repositories

Bitbucket displays a list of repositories for which anonymous access has been enabled.

Anonymous and logged-in users can choose **Repositories** > **View all public repositories** to see these.

Disabling public access globally

Bitbucket provides a system property that allows you to turn off public access for the whole instance.

To do this, set the `feature.public.access` property to false in the `bitbucket.properties` file in your Set the home directory.

Using project permissions

Related pages:

- Creating projects
- Global permissions
- Using branch permissions
- Using repository permissions
- Allowing public access to code

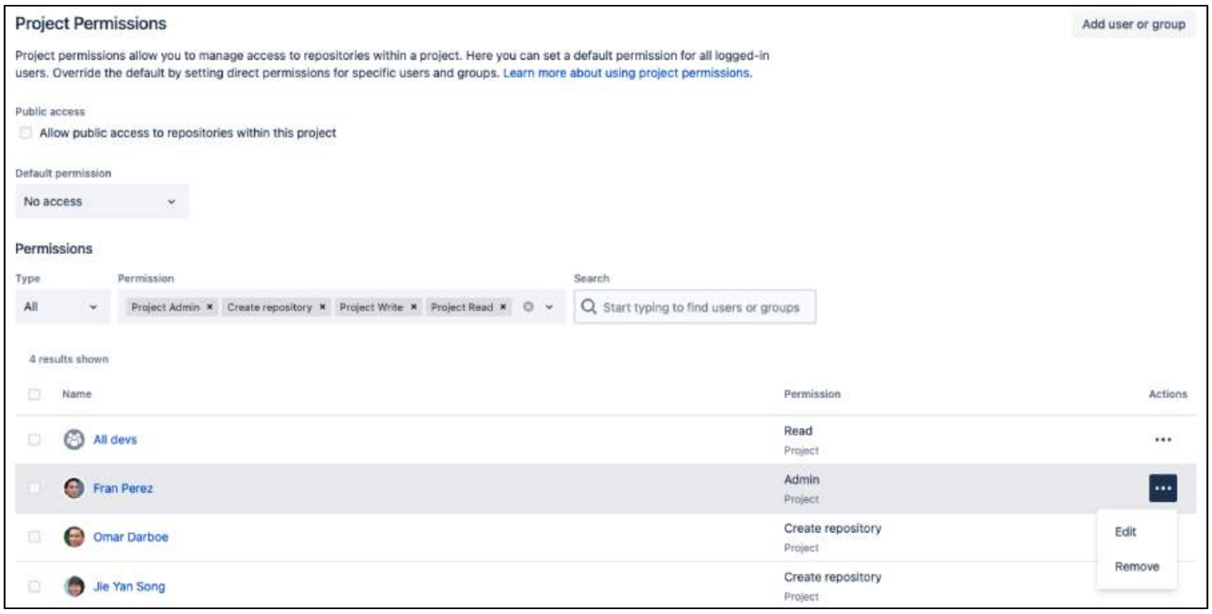
Project permissions in Bitbucket Data Center allow you to manage access to repositories within a project in an aggregated way.

By default, permissions set at the project level are inherited by the repositories and repository admins can manage repository permissions. However, starting from Bitbucket 8.8, you can restrict repository admins from managing repository permissions using the **Restrict changes to repository settings** dropdown. Note that when you restrict changes, existing repository-level permissions are unaffected.

To modify permissions for a project

1. Go to **Settings** > **Project permissions** for the project.
2. Select **Add user or group** and search for, and add either single or multiple users or groups.
3. Choose a permission from the menu, and then select **Add**.

Once added, you can use the checkboxes and then use the **Remove** button to remove users in bulk or select **More actions ...** > **Edit** to edit permissions for a particular Bitbucket user or group.


Project Permissions

Add user or group

Project permissions allow you to manage access to repositories within a project. Here you can set a default permission for all logged-in users. Override the default by setting direct permissions for specific users and groups. Learn more about using project permissions.

Public access
☐ Allow public access to repositories within this project

Default permission
No access

Permissions

Type: All
Permission: Project Admin, Create repository, Project Write, Project Read
Search: Start typing to find users or groups

4 results shown

Name	Permission	Actions
All devs	Read Project	•••
Fran Perez	Admin Project	•••
Omar Darboe	Create repository Project	Edit
Jie Yan Song	Create repository Project	Remove

There are four levels of project permissions you can grant to a user or group for a project: Admin, Write, Crea te repository and Read.

	Browse	Clone / Pull	Create, browse, comment on pull request	Merge pull request	Push	Create repositories	Edit settings / permissions
Admin	✓	✓	✓	✓	✓	✓	✓

Create repository	✓	✓	✓	✓	✓	✓ and become repository admins for the repositories they create	✗
Write	✓	✓	✓	✓	✓	✗	✗
Read	✓	✓	✓	✗	✗	✗	✗

Using repository permissions

Repository permissions in Bitbucket Data Center allow you to manage access to a repository for an individual user or a user group beyond that already granted from project permissions.

Note that project admins can also restrict repository admins from managing repository permissions. Learn more about how project admins can restrict changes to repository settings

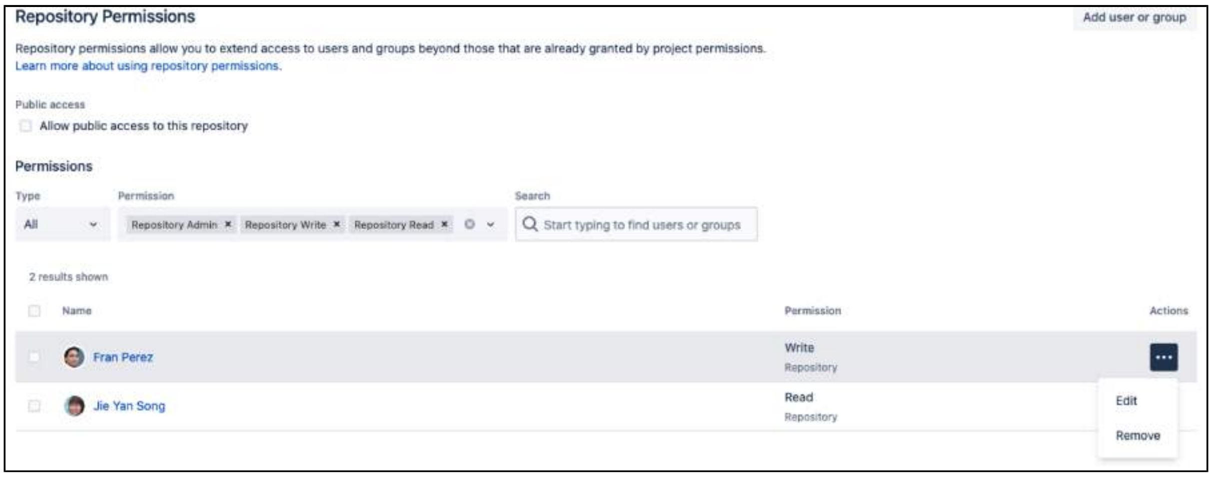
Related pages:

- Using project permissions
- Using branch permissions
- Global permissions
- Allowing public access to code

To modify permissions for a repository

1. Go to **Settings** > **Repository permissions** for the repository.
2. Select **Add user or group** and search for, and add either single or multiple users or groups.
3. Choose a permission from the menu, then select **Add**.

Once added, you can use the checkboxes and then use the **Remove** button to remove users in bulk or select **More actions ...** > **Edit** to edit permissions for a particular Bitbucket user or group.



Repository Permissions

Repository permissions allow you to extend access to users and groups beyond those that are already granted by project permissions.
Learn more about using repository permissions.

Public access

Allow public access to this repository

Permissions

Type	Permission	Search
All	Repository Admin × Repository Write × Repository Read ×	Start typing to find users or groups

2 results shown

Name	Permission	Actions
Fran Perez	Write Repository	···
Jie Yan Song	Read Repository	

There are three levels of permissions you can grant to a Bitbucket user or group for a repository: *Admin*, *Write* and *Read*.

	Browse	Clone, fork, pull	Create, browse or comment on a pull request	Merge a pull request	Push	Delete a pull request, edit settings and permissions
Admin	✓	✓	✓	✓	✓	✓
Write	✓	✓	✓	✓	✓	✗
Read	✓	✓	✓	✗	✗	✗

Permissions regarding tasks

- Anyone with permission to browse a pull request can create a task on any comment, and can browse, resolve and reopen existing tasks in the pull request.
- Repository admins and pull request authors can edit and delete *any* task in the pull request. Reviewers and others can only edit or delete their *own* tasks.

Granting access to all repositories within a project

If you have a large number of repositories in a project, project level permissions provide a convenient w ay to grant access to *all* repositories within that project. For example you can grant a group, say "Team A", *Write* access at the project level, which will automatically give them *Write* access to all existing repositories in the project, as well as any repositories that are subsequently created in the project.

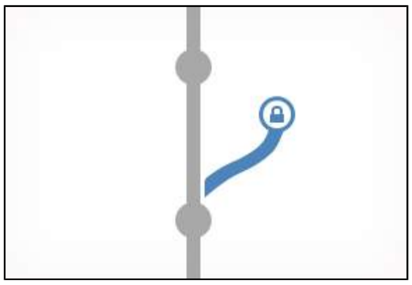
To modify permissions for a project, click the **Permissions** tab when viewing the project. You can add, or modify, permissions for individual users, and groups, in the same way as described above for a single repository.

Granting permission to create repositories

For more details on which users can create new repositories, see Using project permissions.

Using branch permissions

Branch permissions in Bitbucket Data Center control access to repository branches. This page describes branch permissions, and how to add branch permissions for an entire project or a single repository.



On this page:

Related pages:

- Branches
- Cascading merge
- Branch permission patterns

About branch permissions

Branch permissions provide another level of security in Bitbucket, with user authentication and project, repository and global permissions, that together allow you to control or enforce your own workflow or process. With branch permissions you can control the actions users can perform on a single branch, branch type, or branch pattern within a repository or project.

If a user does not have commit access to the branch, an error message will be shown on the Git command line when they try to push a change to the branch. If no branch permissions are defined then anyone with commit access to the repository can push to any branch.

Good to know:

- Branch permissions are based on users or groups, and are actually restrictions, which are checked after project and repository level permissions, and prevent unauthorized pushing to or deleting a branch.
- They do not prevent branch creation. Branch permissions will only be enforced on updates to existing branches and tags.

Adding branch permissions

You can add branch permissions for all repositories in a project, or for individual repositories. Also, you can add multiple branch permissions for a project or repository. When creating a branch permission, you need to specify how to apply the permission, by either branch name, branch pattern, or branching model. You can also create exceptions for specific users, groups, or access key when creating or editing branch permissions.

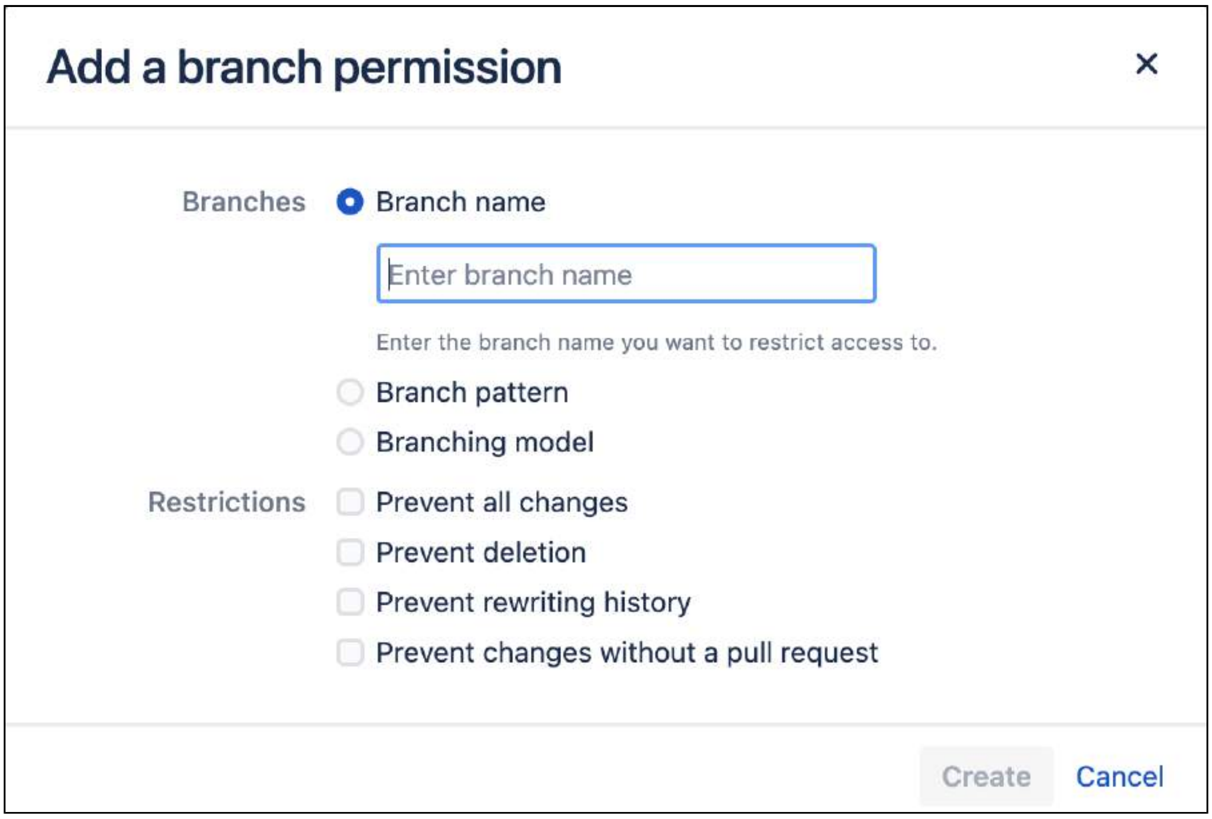
Add branch permissions for all repositories in a project

To add branch permissions for all repositories in a project (requires project admin permission):

1. Go to **Project settings** > **Branch permissions**.
2. Click **Add permission**.
3. In the Branches field, specify which branches the permission applies to, either by **Branch name**, **Branch pattern**, or **Branching model**.
4. In the Restrictions field, select the type of actions to prevent and add exemptions for any of the selected restrictions.
   Adding a user, group, or access key as an exemption means that restriction will *not* apply to them.

   Not adding any exemptions means the restriction will apply to everyone.

5. Click **Create** to finish.



'Add a branch permission' dialog for a project

There are several ways to configure your branch permissions scheme when adding branch permissions for your project or repository. The section above outlines how to add branch permissions, however this section outlines the various options that are available from the **Add a branch permission** dialog.

'Branches' field options

For each branch permission, first determine which branch (or branches) to apply the permission to by either selecting a branch by name, branch pattern, or branching model.

Branch name
Enter the name of an existing branch to apply to restrict access to. Used to restrict access to a single branch.

Branch pattern
Use branch pattern syntax to select matching brances. Read more about Branch permission patterns.

Branching model
Select a branch type to restrict access to multiple branches. Read more about branching models.

'Restrictions' field options

Once you determine which branches a permission applies to, you then determine which actions to prevent, and optionally set exceptions to this permission.

Prevent all changes
Prevents pushes to the specified branch(es) and restricts creating new (duplicate) branches that match the branch(es) or pattern.

Prevent deletion
Prevents branch and tag deletion. Read Branch permission patterns for information about specifying tags.

Prevent rewriting history
Prevents history rewrites on the specified branch(es) - for example by a force push or rebase.

Prevent changes without a pull request
Prevents pushing changes directly to the specified branch(es); changes are allowed only with a pull request.

Add branch permissions for a single repository

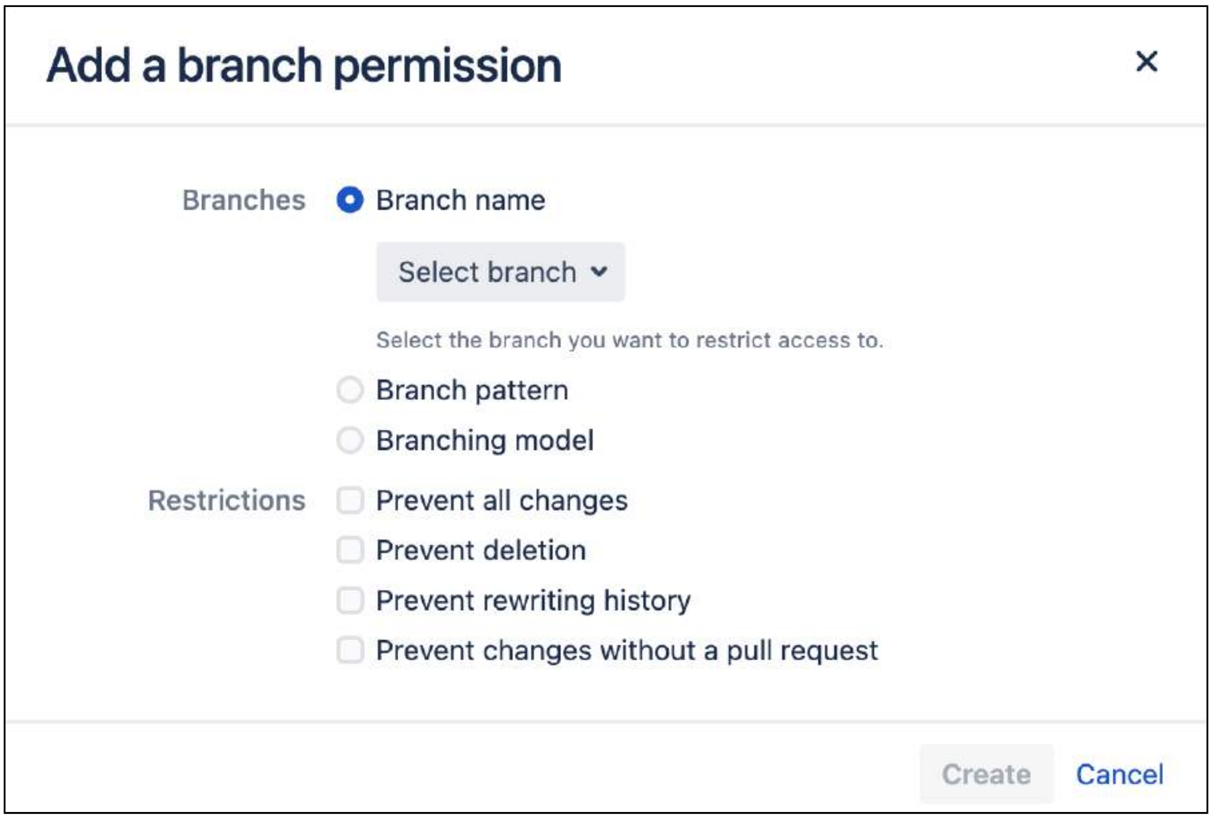
Adding branch permissions for an individual repository creates an additional branch permission. This means that the repository will have branch permissions from the project settings, and any additional branch permissions specifically set for a repository.

To add branch permissions for a single repository (requires repo admin permission):

1. Go to **Repository settings** > **Branch permissions**.
2. Click **Add permission**.
3. In the Branches field, specify which branches the permission applies to, either by **Branch name**, **Branch pattern**, or **Branching model**.
4. In the Restrictions field, select the type of actions to prevent and add exemptions for any of the selected restrictions.
   Adding a user, group, or access key as an exemption means that restriction will *not* apply to them.

   Not adding any exemptions means the restriction will apply to everyone.

5. Click **Create** to finish.



Add a branch permission

Branches: Branch name (selected)
Select branch
Select the branch you want to restrict access to.
Branch pattern
Branching model

Restrictions:
Prevent all changes
Prevent deletion
Prevent rewriting history
Prevent changes without a pull request

Create Cancel

'Add a branch permission' dialog for a repository

There are several ways to configure your branch permissions scheme when adding branch permissions for your project or repository. The section above outlines how to add branch permissions, however this section outlines the various options that are available from the **Add a branch permission** dialog.

'Branches' field options

For each branch permission, first determine which branch (or branches) to apply the permission to by either selecting a branch by name, branch pattern, or branching model.

Branch name
Enter the name of an existing branch to apply to restrict access to. Used to restrict access to a single branch.

Branch pattern
Use branch pattern syntax to select matching brances. Read more about Branch permission patterns.

Branching model
Select a branch type to restrict access to multiple branches. Read more about branching models.

'Restrictions' field options

Once you determine which branches a permission applies to, you then determine which actions to prevent, and optionally set exceptions to this permission.

Prevent all changes
Prevents pushes to the specified branch(es) and restricts creating new branches that match the branch (es) or pattern.

Prevent deletion
Prevents branch and tag deletion. Read Branch permission patterns for information about specifying tags.

Prevent rewriting history
Prevents history rewrites on the specified branch(es) - for example by a force push or rebase.

Prevent changes without a pull request
Prevents pushing changes directly to the specified branch(es); changes are allowed only with a pull request.

Branch permission patterns

Bitbucket Data Center supports a powerful type of pattern syntax for matching branch names (similar to pattern matching in Apache Ant). You can use branch permission patterns when adding branch permissions at the project or repository level to apply a branch permission to multiple branches.

Related pages:

- Using branch permissions
- Branches

These expressions can use the following wild cards:

?	Matches one character (any character except path separators)
*	Matches zero or more characters (not including path separators)
**	Matches zero or more *path segments*.

Pattern used in branch permissions match against all refs pushed to Bitbucket (i.e. branches and tags).

In Git, branch and tag names can be nested in a namespace by using directory syntax within your branch names, e.g. `stable/1.1`. The '`**`' wild card selector enables you to match arbitrary directories.

- A pattern can contain any number of wild cards.
- If the pattern ends with `/` then `**` is automatically appended - e.g. `foo/` will match any branches or tags containing a `foo` path segment
- Patterns only need to match a suffix of the fully qualified branch or tag name. Fully qualified branch names look like `refs/heads/master`, while fully qualified tags look like `refs/tags/1.1`.

Also see the Ant documentation.

Examples

*	Matches everything
PROJECT-*	Matches any branch or tag named PROJECT-*, even in a name space. e.g. refs/heads/PROJECT-1234, refs/heads/stable/PROJECT-new or refs/tags/PROJECT-1.1
?.?	Matches any branch or tag of 2 characters separated by a '.'. e.g. refs/heads/1.1, refs/heads/stable/2.X or refs/tags/3.1
tags/ or tags/**	Matches all tags and any branches with 'tags' as a namespace. e.g. refs/heads/stable/tags/some_branch, refs/tags/project-1.1.0
heads/**/master	Matches all branches called master. e.g. refs/heads/master, refs/heads/stable/master

Using SSH keys to secure Git operations

Bitbucket Data Center provides a simple way for users and other systems to connect securely to Bitbucket repositories, using SSH keys, in order to perform Git operations. You can:

- add a personal SSH key to your user account to easily authenticate when performing read operations from your local machine. A Bitbucket user can add any number of keys to their account. Read more at SSH user keys for personal use.
- add an SSH access key to a Bitbucket project or repository to allow other systems, such as build servers like Atlassian's Bamboo, to authenticate for either read-only (pull, clone) or read-write (push, merge) operations, without the need to store user credentials. Read more at SSH access keys for system use.

Related pages:

- Creating SSH keys
- Enable SSH access to Git repositories
- Permanently authenticating with Git repositories

Before you can use SSH keys to secure a connection with Bitbucket the following must have already been done:

- your Bitbucket administrator must have already enabled SSH access in Bitbucket.
- your Bitbucket administrator has allowed the SSH key type and length you wish to use. Learn more about how your admin can manage settings for SSH keys
- you need an SSH key! See Creating SSH keys. Alternatively, you can use an existing key, if it isn't already being used as a repository or project access key in Bitbucket.

Note that:

- You can use the same SSH system access key for multiple repositories or projects.
- A Bitbucket user can add any number of keys to their account.
- Keys used for personal user accounts can't be re-used as a project or repository access key, and keys used as a project or repository access key can't be re-used for user accounts.
- Bitbucket supports DSA, ECDSA, RSA2, and Ed25519 key types – RSA1 is not supported.

Creating SSH keys

This page describes how to create SSH keys.

SSH keys can be used to establish a secure connection with Bitbucket Data Center for:

- when you are performing Git operations from your local machine
- when another system or process needs access to repositories in Bitbucket (for example your build server)

The SSH key needs to be added to Bitbucket, and your Bitbucket administrator must have enabled SSH access to Git repositories before you can make use of the key.

Bitbucket supports the following SSH key types:

- ED25519
- RSA2
- ECDSA
- DSA (we recommend you use other key types)
- ED25519-SK
- ECDSA-SK

You can use an existing SSH key with Bitbucket if you want, in which case you can go straight to either SSH user keys for personal use or SSH access keys for system use.

On this page:

Related pages:

- Using SSH keys to secure Git operations
- Enable SSH access to Git repositories
- Permanently authenticating with Git repositories

Creating an SSH key on Windows

1. Check for existing SSH keys

You should check for existing SSH keys on your local computer. *You can use an existing SSH key with Bitbucket if you want, in which case you can go straight to either SSH user keys for personal use or SSH access keys for system use.*

Open a command prompt, and run:

```
cd %userprofile%/.ssh
```

- If you see "No such file or directory", then there aren't any existing keys: ***go to step 3***.
- Check to see if you have a key already:

  ```
  dir id_*
  ```

  If there are existing keys, you may want to use those: go to either SSH user keys for personal use or SSH access keys for system use.

2. Back up old SSH keys

If you have existing SSH keys, but you don't want to use them when connecting to Bitbucket, you should back those up.

In a command prompt on your local computer, run:

```
mkdir key_backup
copy id_ed25519* key_backup
```

3. Generate a new SSH key

If you don't have an existing SSH key that you wish to use, generate one as follows:

1. Log in to your local computer as an administrator.
2. In a command prompt, run:

   ```
   ssh-keygen -t ed25519 -C "your_email@example.com"
   ```

   Note: If you're using a legacy system that doesn't support the ED25519 algorithm, run:

   ```
   ssh-keygen -t rsa -b 4096 -C "your_email@example.com"
   ```

   Associating the key with your email address helps you to identify the key later on.

   Note that the `ssh-keygen` command is only available if you have already installed Git (with Git Bash). You'll see a response similar to this:

   ```
   C:\Users\fperez>ssh-keygen -t ed25519 -C "your_email@example.com"
   Generating public/private ed25519 key pair.
   Enter file in which to save the key (/c/Users/fperez/.ssh/id_ed25519):
   ```

3. Just press <Enter> to accept the default location and file name. If the `.ssh` directory doesn't exist, the system creates one for you.
4. Enter, and re-enter, a passphrase when prompted. The whole interaction will look similar to this:

   ```
   C:\Users\fperez>ssh-keygen -t ed25519 -C "your_email@example.com"
   Generating public/private ed25519 key pair.
   Enter file in which to save the key (/c/Users/fperez/.ssh/id_ed25519):
   Created directory '/c/Users/fperez/.ssh'.
   Enter passphrase (empty for no passphrase):
   Enter same passphrase again:
   Your identification has been saved in c/Users/fperez/.ssh/id_ed25519.
   Your public key has been saved in c/Users/fperez/.ssh/id_ed25519.pub.
   The key fingerprint is:
   SHA256:wvaHYeLtY6+DlvV5sFZgDi3abcdefghijklmnopqrstuvw your_email@example.com
   ```

5. You're done and you can now go to either SSH user keys for personal use or SSH access keys for system use.

Creating an SSH key on Linux & macOS

1. Check for existing SSH keys

You should check for existing SSH keys on your local computer. *You can use an existing SSH key with Bitbucket if you want, in which case you can go straight to either SSH user keys for personal use or SSH access keys for system use.*

Open a terminal and run the following:

```
cd ~/.ssh
```

- If you see "No such file or directory, then there aren't any existing keys: ***go to step 3***.
- Check to see if you have a key already:

```
ls id_*
```

- If there are existing keys, you may want to use them; go to either SSH user keys for personal use or SSH access keys for system use.

2. Back up old SSH keys

If you have existing SSH keys, but you don't want to use them when connecting to Bitbucket, you should back those up.

Do this in a terminal on your local computer, by running:

```
mkdir key_backup
cp id_ed25519* key_backup
```

3. Generate a new key

If you don't have an existing SSH key that you wish to use, generate one as follows:

1. Open a terminal on your local computer and enter the following:

   ```
   ssh-keygen -t ed25519 -C "your_email@example.com"
   ```

   Note: If you're using a legacy system that doesn't support the ED25519 algorithm, use:

   ```
   ssh-keygen -t rsa -b 4096 -C "your_email@example.com"
   ```

   Associating the key with your email address helps you to identify the key later on.

   You'll see a response similar to this:

   ```
   fperez@homemac ~ % ssh-keygen -t ed25519 -C fperez@email.com
   Generating public/private ed25519 key pair.
   Enter file in which to save the key (/Users/fperez/.ssh/id_ed25519):
   ```

2. Just press <Enter> to accept the default location and file name. If the `.ssh` directory doesn't exist, the system creates one for you.
3. Enter, and re-enter, a passphrase when prompted.
   The whole interaction will look similar to this:

```
fperez@homemac ~ % ssh-keygen -t ed25519 -C fperez@email.com
Generating public/private ed25519 key pair.
Enter file in which to save the key (/Users/fperez/.ssh/id_ed25519):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /Users/fperez/.ssh/id_ed25519.
Your public key has been saved in /Users/fperez/.ssh/id_ed25519.pub.
The key fingerprint is:
SHA256:gTVWKbn41z6JgBNu3wYjLC4abcdefghijklmnopqrstuvwxy fperez@email.com
The key's randomart image is:
+--[ED25519 256]--+
|==+.    +o..     |
|.oE.   +o..      |
|    . ...o       |
|     .o...       |
|     oo+S  .     |
|  + ..B = . .    |
|.+.+.oo+ * o .   |
|o++.o+  . + +    |
|B+ o.    .   .   |
+----[SHA256]-----+
fperez@homemac ~ %
```

4. You're done and you can now go to either SSH user keys for personal use or SSH access keys for system use.

Creating a new SSH key for a hardware security key

SSH keys for hardware authenticators are a safer alternative to traditional SSH keys and protect you from accidental private key exposure or theft. You tap the hardware authenticator when you need to perform a Git operation, which provides evidence of user presence.

1. Before you start

Before generating a security key based SSH key, make sure you meet the following pre-requisites.

OpenSSH

To generate an SSH key backed by a hardware authenticator, you need to have a version of OpenSSH later than 8.2p1.

Bitbucket Data Center

Bitbucket Data Center supports the use of security key based SSH keys since version 8.13. If your environment consists of mirrors, they must be updated to this version too. Otherwise, you won’t be able to use the key you registered on an upstream for Git SSH operations via the mirror.

Hardware authenticator

You need a compatible hardware authenticator to back the new SSH key. You can choose between Yubikey, Nitrokey, Solokey, etc.

2. Generate the key

You can select from two algorithms:

- `ecdsa-sk` based on ECDSA keys
- `ed25519-sk` based on ED25519 keys

You can generate `ecdsa-sk` on most keys but `ed25519-sk` is generally supported only on newer hardware.

In both cases, the only supported key length is 256 bits. To generate a key of the chosen type:

1. Make sure your hardware authenticator is plugged in.
2. Generate the SSH key with `ssh-keygen` using the following command. The `-C` argument is optional and specifies a comment to identify the key.

   ```
   ssh-keygen -t ed25519-sk -C <your-email>
   ```

   If the command fails, your hardware authenticator might not support the ED25519 algorithm. Repeat the command replacing `ed25519-sk` with `ecdsa-sk`.

3. When you're prompted, touch the button on your hardware authenticator to confirm user presence.
4. You can optionally choose a passphrase for the key.

   ```
   > Enter passphrase (empty for no passphrase): [Type a passphrase]
   > Enter same passphrase again: [Type passphrase again]
   ```

After the SSH key has been generated successfully, you can copy the public key and register it with Bitbucket Data Center like any other SSH key, following the instructions:

- SSH user keys for personal use
- SSH access keys for system user

FAQ

Find answers to frequently asked questions about the generation of security key based SSH keys.

I receive an error while performing Git operations with these keys. How do I resolve it?

The most common reason for seeing the `Permission denied (Public Key)` error is that the key is simply not being used to perform the authentication. Check the following:

- The user presence is confirmed while performing the Git command.
- You don't have a large number of generated keys. If you do, try removing unused keys.

I generated and registered an SSH key but can't perform Git operations using it via the mirror

If you receive the `Permission denied (Public Key)` error while performing a Git command with a registered key, the mirror you're using might not have been updated to version 8.13. Contact the administrator about the issue.

Do I have to tap the key every time I perform a Git operation?

Yes, you do. While OpenSSH has the option to generate a key that doesn't require a tap, Bitbucket Data Center doesn't support such keys. We also don't recommend using the keys that don't require a tap on a hardware authenticator because their security is comparably low.

SSH user keys for personal use

You can use SSH keys to establish a secure connection between your computer and Bitbucket Data Center when you are performing Git operations (pull, clone, push) from your local machine. In Bitbucket 8.15 and later, you can also use SSH keys to sign your commits and tags.

Personal keys are attached to your Bitbucket account – they are bound by that account's permissions and use the account's identity for any operations.

Before you can use SSH keys to secure a connection with Bitbucket the following must have already been done:

- your Bitbucket administrator must have already enabled SSH access i n Bitbucket.
- you need an SSH key! See Creating SSH keys. Alternatively, you can use an existing key, if it isn't already being used as a repository or project access key.
- you need to have added your personal SSH key to your Bitbucket account – see the following section.

Once you have an SSH key associated with your Bitbucket account, using it is easy! See Use SSH keys to connect to Bitbucket repositories below.

Related pages:

- Creating SSH keys
- Enable SSH access to Git repositories
- Permanently authenticating with Git repositories

Bitbucket supports the following SSH key types:

- ED25519
- RSA2
- ECDSA
- DSA (we recommend you use other key types)
- ED25519-SK
- ECDSA-SK

Although Bitbucket supports the above key types, your admin can restrict specific key types and mandate minimum key lengths to make sure you're using secure SSH keys. Learn more about how your admin can manage settings for SSH keys

Note that:

- A Bitbucket user can add any number of keys to their account.
- You can use the same SSH access key for multiple repositories or projects.
- Keys used for personal user accounts can't be re-used as a project or repository access key, and keys used as a project or repository access key can't be re-used for user accounts.
- If you've already cloned a repository, you'll need to make sure you're accessing it via the SSH URL. Le arn more about how Git remote works

Add an SSH key to your Bitbucket account

1. On Windows, in your command prompt, change directory to your .ssh directory, and copy the public key file to your clipboard by running:

   Windows

   ```
   cd %userprofile%/.ssh
   clip < id_ed25519.pub
   ```

   On macOS or Linux simply run the following in a terminal:

Mac OS X

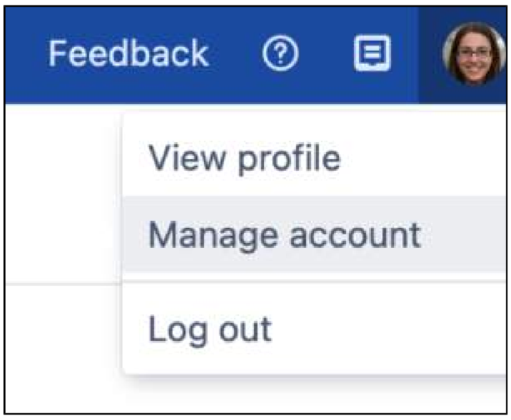
```
pbcopy < ~/.ssh/id_ed25519.pub
```

If `pbcopy` isn't working, locate the hidden `.ssh` folder, open the file in a text editor, and copy it to your clipboard.
Note that on Linux, you may need to download and install xclip, then use that, as shown in this code snippet:

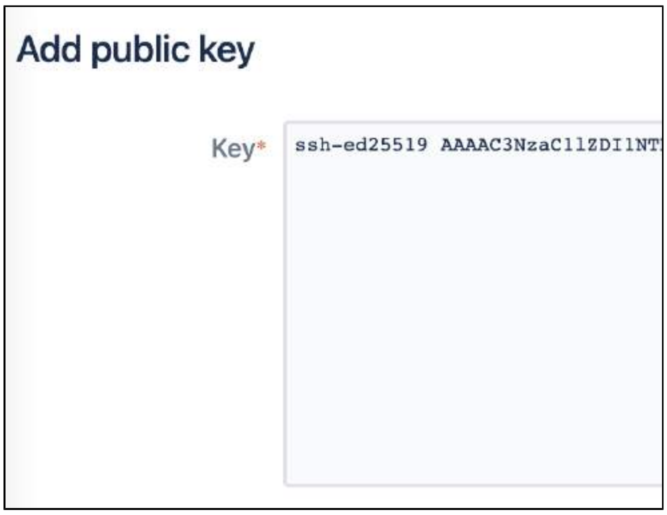
Linux

```
sudo apt-get install xclip
xclip -sel clip < ~/.ssh/id_ed25519.pub
```

2. In Bitbucket, go to your profile picture and select **Manage account**.



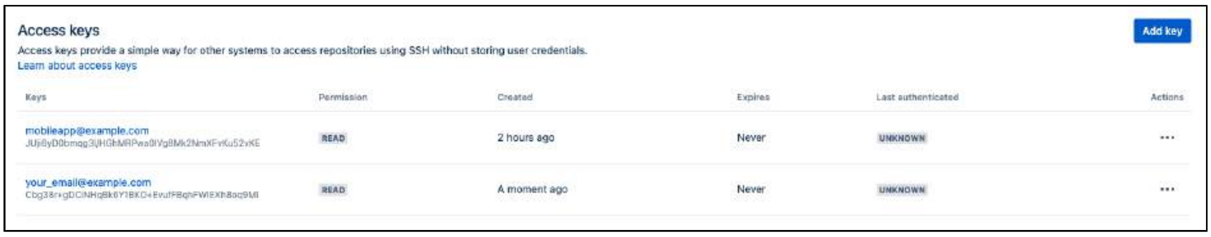
3. Select **SSH keys** > **Add key**.
4. Paste the key into the text box.



```
ssh-ed25519 AAAAC3NzaC1lZDI1NT
```

5. (Optional) Use the **Key label** field to name your key and identify it easily.
6. (Optional) Set an expiry limit so your key expires automatically. If your admin has set automatic expiry for all keys across Bitbucket, the key will expire based on the configured limits. If required, you can set the key to expire earlier. Note that you can't edit the expiry limit after you create the key.
7. Select **Add key**. You're done!

After you create the key, it’ll be automatically assigned its own uneditable fingerprint – an SHA-256 hash for better readability. The fingerprint will replace the public key on the SSH keys list page, as well as display on the SSH key edit page and in the commit verification dialog.



Access keys

Access keys provide a simple way for other systems to access repositories using SSH without storing user credentials.
Learn about access keys

Keys	Permission	Created	Expires	Last authenticated	Actions
mobileapp@example.com JUj6yD0bmqg3UHGhMRPwa0lVg8Mk2NmXFvKu52vKE	READ	2 hours ago	Never	UNKNOWN	•••
your_email@example.com Cbg38r+gDCINHqBk6Y1BKO+EvufFBqhFWIEXh8oq9MI	READ	A moment ago	Never	UNKNOWN	•••

Use SSH keys to connect to Bitbucket repositories

SSH access needs to have been set up, as described above. Once this is done, you can use SSH keys as follows:

1. Go to **Projects**, click a project, and choose a repository from the list.
2. Click **Clone** in the sidebar to see the clone URLs for the repository.
3. Choose the clone URL you want to use. SSH is available if you have already added an SSH key to your account. If you haven't done that yet, see Add an SSH key to your Bitbucket account, above.

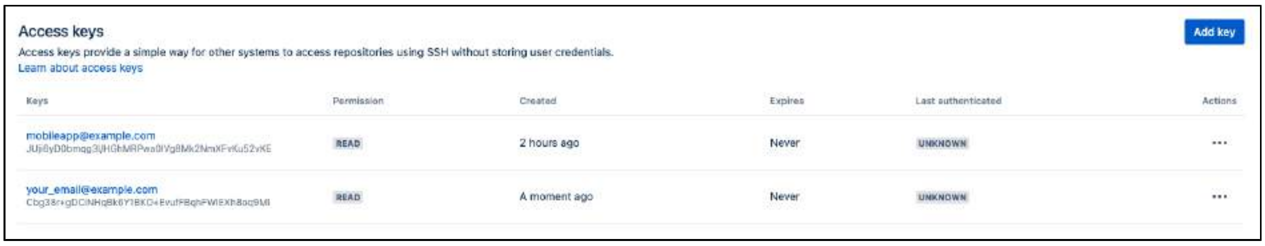
SSH access keys for system use

Bitbucket Data Center administrators can set up SSH access keys to secure the Git operations that other systems perform on the repositories managed in Bitbucket. Using access keys avoids the need to store user credentials on another system, and means that the other system doesn't have to use a specific user account in Bitbucket. For example, access keys can be used to allow your build and deploy server to authenticate with Bitbucket to check out and test source code.

- Project admins can add and manage SSH access keys for a project. These keys apply to every repository in the project. And repository admins can add and manage SSH access keys for a particular repository.
  Starting from Bitbucket 8.8, project admins can also restrict repository admins from managing repository-level access keys using the **Restrict changes to repository settings** dropdown. Note that when project admins restrict changes, any existing repository-level access keys added by the repository admins are not deleted automatically.
- The access key can allow either *read-only* or *read-write* Git operations.
- Because they are designed to be used for system access, SSH access keys may push commits that are not signed with a GPG key e ven if the "Verify Commit Signature" hook is enabled.

Related pages:

- Creating SSH keys
- Enable SSH access to Git repositories
- Permanently authenticating with Git repositories



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Learn about access keys

Keys	Permission	Created	Expires	Last authenticated	Actions
mobileapp@example.com JUj6yD0bmqg3UHGhMRPwa0lVg8Mk2NmXFvKu52vKE	READ	2 hours ago	Never	UNKNOWN	•••
your_email@example.com Cbg38r+gDCINHqBk6Y1BKO+EvufFBqhFWIEXh8oq9MI	READ	A moment ago	Never	UNKNOWN	•••

Bitbucket supports the following SSH key types:

- ED25519
- RSA2
- ECDSA
- DSA (we recommend you use other key types)
- ED25519-SK
- ECDSA-SK

Although Bitbucket supports the above key types, your admin can restrict specific key types and mandate minimum key lengths to make sure you're using secure SSH keys. Learn more about how your admin can manage settings for SSH keys

Before you can use SSH keys to secure a connection with Bitbucket the following must have already been done:

- Your Bitbucket administrator must have already enabled SSH access, on Bitbucket.
- Your Bitbucket administrator must already have enabled the option **SSH access keys enabled** on Bitbucket.
- You must have already created an SSL key. See Creating SSH keys. Alternatively, you can use an existing key, if it isn't already being used for a personal account in Bitbucket.

Using SSH keys to allow access to Bitbucket repositories

To get the SSH key to work with your build, or other, system, you need to:

- Add the private key to that system. For Bamboo, see this page: Shared credentials.
- Add the public key to Bitbucket as described below.

Add an SSH access key to either a Bitbucket project or repository

You simply copy the public key, from the system for which you want to allow access, and paste it into Bitbucket.

1. Copy the public key. One approach is to display the key on-screen using `cat`, and copy it from there:

   ```
   cat < ~/.ssh/id_ed25519.pub
   ```

2. Now, in Bitbucket, go to the **Settings** tab for the project or repository.
3. Click **Access keys** and then **Add key**.
4. Paste the key into the text box.
5. (Optional) Name your key to identify it easily.
6. Choose the **Read** permission, for `git pull` or `git clone` operations for example, where you want to be sure that the system will *not* be able to write back to the Bitbucket repository.
   Choose the **Read / Write** permission, for `git push` or `git merge` operations for example, where you may want your build system to merge successful feature branch builds to the default branch in the Bitbucket repository, or so that deployments can be tagged.
   Note that if you attempt to add a key already present on a project or repository but with a different permission to what it currently has, the permission and label will simply be updated.
7. (Optional) Set an expiry so your key expires automatically.
   If your admin has set automatic expiry for all keys across Bitbucket, the key expires based on the limits they've set. If required, you can set the key to expire earlier than the limit they've set.
   Note that you can't edit the expiry after you create the key.
8. Click **Add key**.

Bitbucket license implications

- System access keys do not require an additional Bitbucket user license.

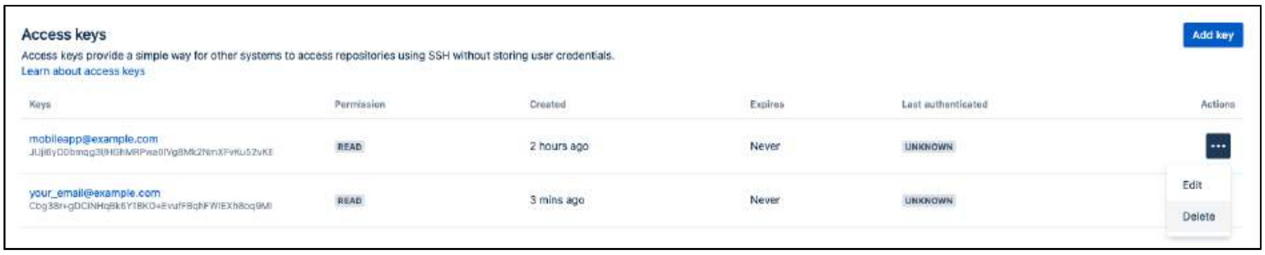
Reusing access keys

- You can use the same SSH access key for multiple repositories or projects.
- Keys used for personal user accounts can't be re-used as a project or repository system access key, and keys used as a project or repository access key can't be re-used for user accounts.

Deleting an access key

To delete an access key:

1. Navigate to **Repository Settings** or **Project Settings** > **Access keys**.
2. Select **More actions** > **Delete**.

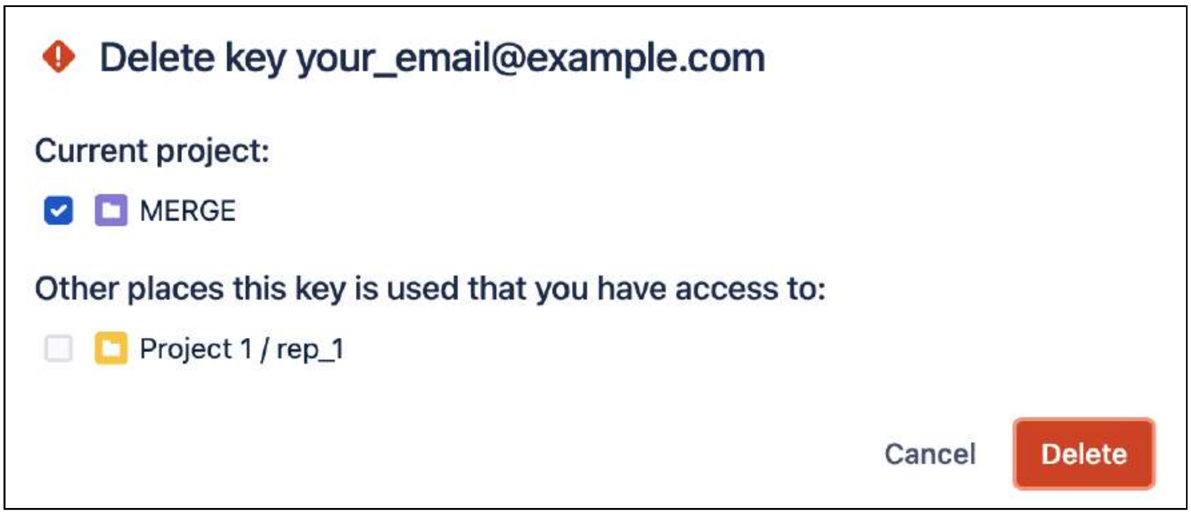


Access keys

Access keys provide a simple way for other systems to access repositories using SSH without storing user credentials.
Learn about access keys

Keys	Permission	Created	Expires	Last authenticated	Actions
mobileapp@example.com JUjl6yD0bmqg3l/HGhMRPwa0lVgBMk2NmXFvKu52vKE	READ	2 hours ago	Never	UNKNOWN	•••
your_email@example.com Cbg38r+gDCINHqBk6Y1BKO+EvufF8qhFWIEXh8oq9MI	READ	3 mins ago	Never	UNKNOWN	

If the key is used for multiple projects or repositories, you can select the other places that you want the key to be deleted from:


Delete key your_email@example.com

Current project:

☑ MERGE

Other places this key is used that you have access to:

☐ Project 1 / rep_1

Note that the dialog only displays the projects and repositories that you have permission to see. Be aware that the key may also be used in other places that are not listed in the dialog. To be 100% sure that *all* uses of the key are deleted, this operation must be performed by someone with the administrator or sysadmin global permission .

Sign commits and tags with SSH keys

In Bitbucket Data Center, you can use personal SSH keys not only to access a Bitbucket instance but also to sign your commits and tags.

Prerequisites

Here’s what you need to start signing your commits and tags with SSH keys:

- Git version 2.34 or later
- OpenSSH 8.0 or later
- A personal SSH key added to your Bitbucket account to sign your tags and commits. If you don’t yet have an SSH key to use, learn how to create it and add it to your account.

Configure Git

If you would like to configure signing your commits and tags with SSH keys globally for all repositories, follow the steps from the Global configuration section below. If you would like to configure signing your commits and tags with SSH keys locally for a single repository, follow the steps from the Local configuration section below.

Global configuration

You first need to tell git that you’re going to use an SSH key for signing commits:

```
git config --global gpg.format ssh
```

Next, specify the SSH key that you wish to sign commits and tags with:

```
git config --global user.signingkey ~/.ssh/<name_of_ssh_key>.pub
```

Local configuration

You first need to tell git that you’re going to use an SSH key for signing commits. Run the following command s in the directory of the repository for which you want to enable commit and tag signing with SSH keys:

```
git config gpg.format ssh
```

Next, specify the SSH key that you wish to sign commits and tags with:

```
git config user.signingkey ~/.ssh/<name_of_ssh_key>.pub
```

Sign commits

To sign a single commit, add the `-S` flag when making a commit.

```
git commit -S -m "My signed commit"
```

If you want to sign all commits for a single repository by default, run the following command in a directory within the repository:

```
git config commit.gpgsign true
```

If you want to enable the setting for all repositories, you can run this command from anywhere on your computer:

```
git config --global commit.gpgsign true
```

Sign tags

To sign a tag, add the `-s` flag when making a tag:

```
git tag -s my-signed-tag
```

Sign commits and tags with X.509 certificates

In Bitbucket Data Centre 8.15 and later, you can use X.509 certificates to sign your commits and tags.

Signature trust

To determine whether a signed commit or tag is trusted (verified) or not trusted (not verified), Bitbucket needs to know the X.509 certificates that issue any signing X.509 certificates. Bitbucket Data Center stores specific information about the issuing X.509 certificates in its database. To store this information, you need to add your root and intermediate X.509 certificates through the REST API.

Verification of a signed commit or tag

For a signed commit or tag to be considered verified in Bitbucket Data Center, the following conditions should be met:

1. The signed Git content hasn’t been modified by a malicious third party and can be processed successfully.
2. There is a matching user known in Bitbucket Data Center that has the same email address as the one defined on the X.509 certificate used for signing.
    a. Note that if there is more than one email address listed on the X.509 certificate, only the first email address will be used for matching to the user in Bitbucket Data Center.
3. The X.509 certificate has never been revoked.
    a. Bitbucket Data Center will use the CRL (Certificate Revocation List) information of an issuing X.509 certificate to determine whether the signing X.509 certificate has been revoked or not.
    b. CRL entries are fetched every 24 hours for freshness from a specified CRL distribution point from the issuing X.509 certificate. But if a manual update of the CRL entries is warranted, the fetching of CRL entries can be performed through the REST API for the given issuing X.509 certificate.
4. The X.509 certificate meets the defined validity period.

For any other case, the signature will be determined as not verified.

Installing smimesign

For the instructions to install `smimesign`, check the official GitHub documentation: smimesign (S/MIME Sign).

Configuring Git

You should configure Git globally or locally before using X.509 certificates to sign and verify commits and to sign tags.

Specify your X.509 key

If you're using an X.509 key that matches your committer identity, you can begin signing commits and tags without any further configuration.

However, if you aren’t using an X.509 certificate that matches your committer identity, you can list all your X.509 certificates that can be used by running the following command:

```
smimesign --list-keys
```

From the list of X.509 keys, copy the `ID` value of the X.509 key that you'd like to use. For example, from the following sample output, the used `ID` is `4df4ce209319b0904fb3f2813115d5e4438e8c3c`.

```
       ID: 4df4ce209319b0904fb3f2813115d5e4438e8c3c
      S/N: 468e1711b4ade3fc
Algorithm: SHA256-RSA
 Validity: 2023-10-08 23:35:00 +0000 UTC - 2024-10-08 23:35:00 +0000 UTC
   Issuer: CN=DigiCert SHA2 Assured ID CA,OU=www.digicert.com,O=DigiCert Inc,C=US
  Subject: CN=Bitbucket,OU=Enterprise,O=Atlassian,L=Sydney,ST=NSW,C=AU
   Emails: bitbucket@example.com
```

Global configuration

If you’d like to configure the global signing of your commits and tags with X.509 keys for all repositories, use the following commands:

```
git config --global gpg.x509.program smimesign
git config --global gpg.format x509
git config --global user.signingkey <ID>
```

The `<ID>` in the last command corresponds to the `ID` of your X.509 key. In the example, the value for `<ID>` is `4df4ce209319b0904fb3f2813115d5e4438e8c3c`.

Local configuration

If you’d like to configure signing your commits and tags with X.509 keys locally for a single repository then navigate to that repository you would like to use and use the following commands:

```
git config --local gpg.x509.program smimesign
git config --local gpg.format x509
git config --local user.signingkey <ID>
```

The `<ID>` in the last command corresponds to the `ID` of your X.509 key. In the example, the value for `<ID>` is `4df4ce209319b0904fb3f2813115d5e4438e8c3c`.

Signing and verifying commits with X.509 certificates

Once your Git configuration has been set up with an X.509 certificate, you can begin signing your commits and tags and verifying the signed commits and tags locally.

Sign commits

To sign commits, run the following command:

```
git commit -S -m "Signed with an X.509 certificate"
```

Verify commits locally

To verify commits locally, run the following command:

```
git log --show-signature
```

After running the command, you should see a message similar to the following:

```
commit 29463c73b2bf9d9be670b24c5c64d213117cb748
smimesign: Signature made using certificate ID 0x298d2e3a40096cdf3c8855c7f1a85dbc08c59ab6
...
```

The `certificate ID` from the Git command should match both of the following SHA-1s:

- the SHA-1 in the Bitbucket Data Center verification dialog for the verified commit
- the SHA-1 of the signing X.509 certificate

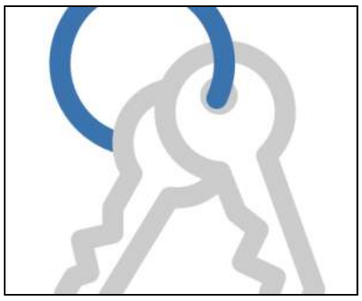
Sign tags

To sign tags, run the following command:

```
git tag -s v1.0.0 -m "Tag signed with an X.509 certificate"
```

Using GPG keys

GPG keys are a way to sign and verify work from trusted collaborators. This page describes how to generate a GPG key to sign and verify commits and tags for use with Bitbucket Data Center.



On this page:

About GPG keys

GPG is a command line tool used together with Git to encrypt and sign commits or tags to verify contributions in Bitbucket. In order to use GPG keys with Bitbucket, you'll need generate a GPG key locally, add it to your Bitbucket account, and also set it up for use with Git. If you already have a GPG key ready to go, you can jump straight to the Add a GPG key to Bitbucket section.

Administrators can also add GPG keys on behalf of their Bitbucket users, which can be useful if your organization manages public-key certificates with a keyserver.

Requiring GPG keys

Project and repository administrators can enable the "Verify Commit Signature" hook to require that commits are signed with GPG keys. When this hook is enabled, only SSH access keys are allowed to push unsigned commits.

Install GPG

If you don't already have GPG, you'll need to install it locally. You can install GPG manually using binaries for your operating system on the GnuPG Download page, or use a package manager like Homebrew.

Check for existing GPG keys

If you're not sure if you have a GPG key already, you can check for existing GPG keys locally.

To check if you have existing GPG keys:

1. In a terminal, use this command to list GPG keys you have access to:

   ```
   gpg --list-secret-keys --keyid-format LONG
   ```

2. Check the output to see if you have a GPG key pair.
3. **If there are no GPG key pairs**, you'll need to generate a new GPG key.

   If there are GPG key pairs you want to use, you'll need to add them to your Bitbucket account.

Generate a new GPG key

In order to generate a new GPG to sign commits and tags you need to have GPG installed already.

To generate a new GPG key:

1. In a terminal, use this command to generate a GPG key:

   ```
   gpg --gen-key
   ```

2. Provide the information asked at the prompts.
   a. Enter your identifying information.
   b. Enter a secure passphrase.

3. Use this command to list your GPG keys.

   ```
   gpg --list-secret-keys --keyid-format LONG
   ```

4. Copy the GPG key ID to use with Bitbucket. For example, below the GPG key ID is **`7FFFC09ACAC05FD0`**.

   ```
   gpg --list-secret-keys --keyid-format LONG
   /Users/bitbucketbot/.gnupg/pubring.gpg
   ------------------------------
   sec rsa2048/7FFFC09ACAC05FD0 2017-06-02 [SC] [expires: 2019-06-02]
   5538B0F643277336BA7F0E457FFFC09ACAC05FD0
   uid [ultimate] BitbucketBot <bitbucket@realaddress.com>
   ssb rsa2048/95E8A289DFE77A84 2017-06-02 [E] [expires: 2019-06-02]
   ```

5. Get your public key you'll add to Bitbucket.

   a. Paste the GPG key ID into this command to export the public key you will enter in Bitbucket.

      ```
      gpg --armor --export 7FFFC09ACAC05FD0
      ```

   b. From the output, copy your public GPG key, which starts at `-----BEGIN PGP PUBLIC KEY BLOCK-----`
      and ends at `-----END PGP PUBLIC KEY BLOCK-----`.

You can now add your public GPG key to your Bitbucket account.

Add a GPG key

In order to use your GPG key with Bitbucket, you need to have GPG installed, and have generated a GPG key to add.

To add your GPG key to:

1. From within Bitbucket, go to your account by clicking your profile picture in the upper-right, and select **Manage account**.

2. Click **GPG keys**. > **Add key**.

3. Copy your GPG key.

From a terminal, use this command to copy your GPG key to your clipboard:

```
gpg --armor --export MY_KEY_ID | pbcopy
```

4. Paste your GPG key in the **Key** field, then click **Add key**.

Configure Git to use your GPG key

In order to use GPG keys with Bitbucket, you need to configure your local version of Git which GPG key to use.

To configure Git to use your GPG key:

1. Copy your GPG key ID.

   To list your GPG keys, use this command:

   ```
   gpg --list-secret-keys --keyid-format LONG
   ```

   Copy the GPG key ID to use with Bitbucket. For example, below the GPG key ID is **`7FFFC09ACAC05FD0`**.

   ```
   gpg --list-secret-keys --keyid-format LONG
   /Users/bitbucketbot/.gnupg/pubring.gpg
   ------------------------------
   sec rsa2048/7FFFC09ACAC05FD0 2017-06-02 [SC] [expires: 2019-06-02]
   5538B0F643277336BA7F0E457FFFC09ACAC05FD0
   uid [ultimate] BitbucketBot <bitbucket@realaddress.com>
   ssb rsa2048/95E8A289DFE77A84 2017-06-02 [E] [expires: 2019-06-02]
   ```

2. Paste your GPG key ID into this command to set your GPG key in Git.

   ```
   git config --global user.signingkey MY_KEY_ID
   ```

Sign commits and tags with a GPG key

In order to sign commits and tags with a GPG key in Bitbucket, you need to have:

- installed GPG locally,
- added a GPG key to your Bitbucket account, and
- configured your local version of Git which GPG key to use.

To sign commits with your GPG key:

1. When committing changes to a local branch, use the `-S` flag to the `git commit` command:

   ```
   git commit -S -m your commit message
   ```

2. Enter the passphrase for your GPG key.

To sign tags with your GPG key, add the `-S` flag to your `git tag` command:

```
git tag -S yourtag
```

You can verify a tag was signed using this command:

```
git tag -v yourtag
```

Learn how to check if a commit has been signed and verified

Workflow strategies

Various Git workflows are supported by Bitbucket Data Center:

- Centralized Workflow
- Feature Branch Workflow
- Gitflow Workflow
- Forking Workflow

For information about setting up Git workflows in Bitbucket see Branches and Forks.

Centralized Workflow

Like Subversion, the Centralized Workflow uses a central repository to serve as the single point-of-entry for all changes to the project. Instead of `trunk`, the default development branch can be customized and all changes are committed into this branch. This workflow doesn't require any other branches besides the default branch.

Read more about the Centralized Workflow...

Feature Branch Workflow

The core idea behind the Feature Branch Workflow is that all feature development should take place in a dedicated branch instead of the default branch. This encapsulation makes it easy for multiple developers to work on a particular feature without disturbing the main codebase. It also means the default branch will never contain broken code, which is a huge advantage for continuous integration environments.

Read more about the Feature Branch Workflow...

Gitflow Workflow

The Gitflow Workflow defines a strict branching model designed around the project release. While somewhat more complicated than the Feature Branch Workflow, this provides a robust framework for managing larger projects.

Read more about the Gitflow Workflow...

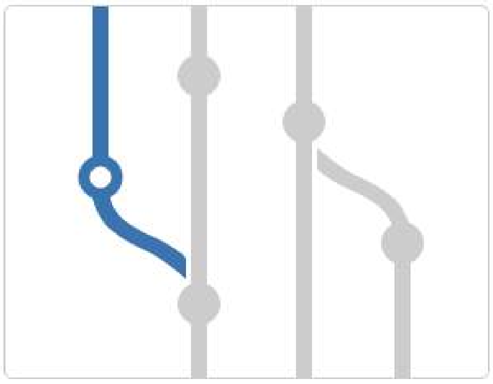
Forking Workflow

The Forking Workflow is fundamentally different than the other workflows discussed in this tutorial. Instead of using a single server-side repository to act as the "central" codebase, it gives every developer a server-side repository. This means that each contributor has not one, but two Git repositories: a private local one and a public server-side one.

Read more about the Forking Workflow...

Branches

Bitbucket Data Center makes it easy to use a branching workflow for your Git development process. This page describes how to use to use branches with Bitbucket.



On this page:

Related pages:

- Using branch permissions
- Cascading merge
- Branch permission patterns

Create a branch

You can create a new branch from within JIRA Software or in Bitbucket. Bitbucket suggests the Branch type and Branch name based on where you are creating the branch from in the application. You can change these values depending on your branching model.

When creating a branch, you will provide this information for each branch:

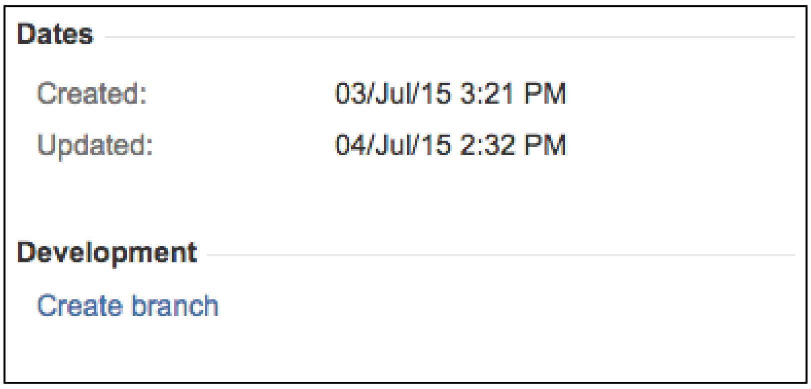
- the **Repository**
- the **Branch type**, if a branching model has been previously configured – choose **Custom** if you need an *ad hoc* branch type
- the **Branch from** point – you can choose either a branch or a tag.
- the **Branch name** – the prefix is based on the branch type you selected, and as defined by the branching model.

Create a branch from JIRA Software

To create a branch when viewing an issue in JIRA Software:

Must have JIRA Software version 6.1 or above, and it must be connected with Bitbucket by an application link.

1. In the Development pane, click **Create Branch** (requires the View Development Tools project permission).



Dates

Created:	03/Jul/15 3:21 PM
Updated:	04/Jul/15 2:32 PM

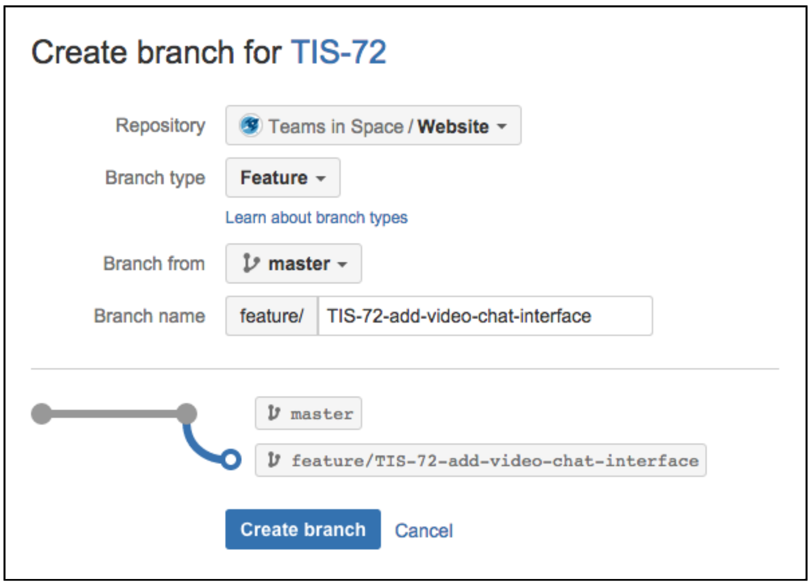
Development

Create branch

2. Choose the SCM, if more than one is available, where you want to create the branch.

3. Select the **Branch type** and **Branch name**, then click **Create branch**. Bitbucket suggests a **Branch type** based on the JIRA Software issue type, when a branching model is configured.

JIRA Software issue type	Bitbucket branch type
Bug	Bugfix
Story	Feature
New Feature	Feature


Create branch for TIS-72

Repository: Teams in Space / Website
Branch type: Feature

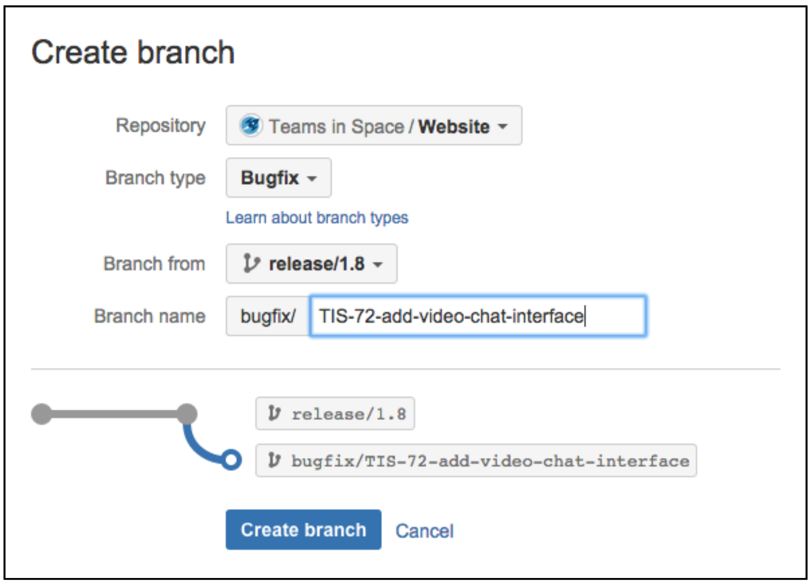
Branch from: master
Branch name: feature/ TIS-72-add-video-chat-interface

4. Once the new branch is created, Bitbucket takes you to the file listing for that. You can now pull to your local repository and switch to the new branch.

Create a branch from Bitbucket

To create a branch:

1. In Bitbucket, choose **Create branch** from the sidebar.
2. Select the **Branch type** and **Branch name**.


Create branch

Repository: Teams in Space / Website
Branch type: Bugfix

Branch from: release/1.8
Branch name: bugfix/ TIS-72-add-video-chat-interface

3. Click **Create branch**. Once the new branch is created, Bitbucket takes you to the file listing for that. You can now pull to your local repository and switch to the new branch.

Configure branching models

With Bitbucket you can use branching models to define a branch workflow for repositories. When you map your workflow to repository branches with a branching model, admins can guide developers to name branches consistently by configuring which branch types to make available. There are a number of branch types available, and several branch types have default branch naming prefixes (described below). You can also specify your own naming convention for each branch type. A consistent naming convention makes it easier to identify branches by type.

Branch types

Bitbucket comes with several types of branches that are frequently used in software development. This section explains what each branch type is for, and has the typical naming convention for the prefix for each branch type. The prefix can be changed for each branch type.

	Development branch Usually the integration branch for feature work and is often the default branch or a named branch. For pull request workflows, the branch where new feature branches are targeted.	varies
	Production branch Used for deploying a release. Branches from, and merges back into, the development branch. In a Gitflow-based workflow it is used to prepare for a new production release.	varies
	Feature branch Used for specific feature work or improvements. Generally branch from, and merge back into, the development branch using pull requests. See Feature branch workflow.	`feature/`
	Release branch Used for release task and long-term maintenance versions. They branch from, and merge back into, the development branch. Merging into an older release branch can be configured to automatically merge to newer release branches, as well as the development branch.	`release/`
	Bugfix branch Typically used to fix Release branches.	`bugfix/`

	Hotfix branch Used to quickly fix a Production branch without interrupting changes in the development branch. In a Gitflow-based workflow, changes are usually merged into the production and development branches.	`hotfix/`

By default, branch settings set at the project level are inherited by the repositories. Repository admins can either choose to inherit the project-level settings or override it by configuring custom settings at the repository level.

Later when you modify project settings, only settings in repositories that are set to inherit the project-level setting change to match the project branch settings.

Starting from Bitbucket 8.10, project admins can also restrict changes to repository-level settings. Note that when you restrict changes, any custom settings saved at the repository-level are deleted and the repositories inherit project settings.

Good to know:

- New repositories will have the branching model enabled by default, and use the default branch prefixes.
- Enabled branch types can't have empty prefixes, have a 30 character limit, and can't overlap (for example PROD and PRODUCT would overlap).

Configure a project's branching model

To configure a branching model for a project (requires project admin permission):

1. Go to **Project settings** > **Branches**.
2. Choose the details of branching model for repositories that inherit the project settings, then select **Save**.
3. Optional: To restrict repository-level changes, select **Don't allow changes to branch settings** from the **Restrict changes to repository settings** menu.

Configure a repository's branching model

To configure the branching model for a repository (requires repository admin permission):

1. Go to **Repository settings** > **Branches**.
2. Under **Project settings inheritance**, select **Use custom settings**.
3. Choose the details of your repository branching model, then select **Save**.

Automate the branch workflow

Bitbucket can automate some merges in the branch workflow, based on the branching model for the repository. Learn more about cascading merge

---

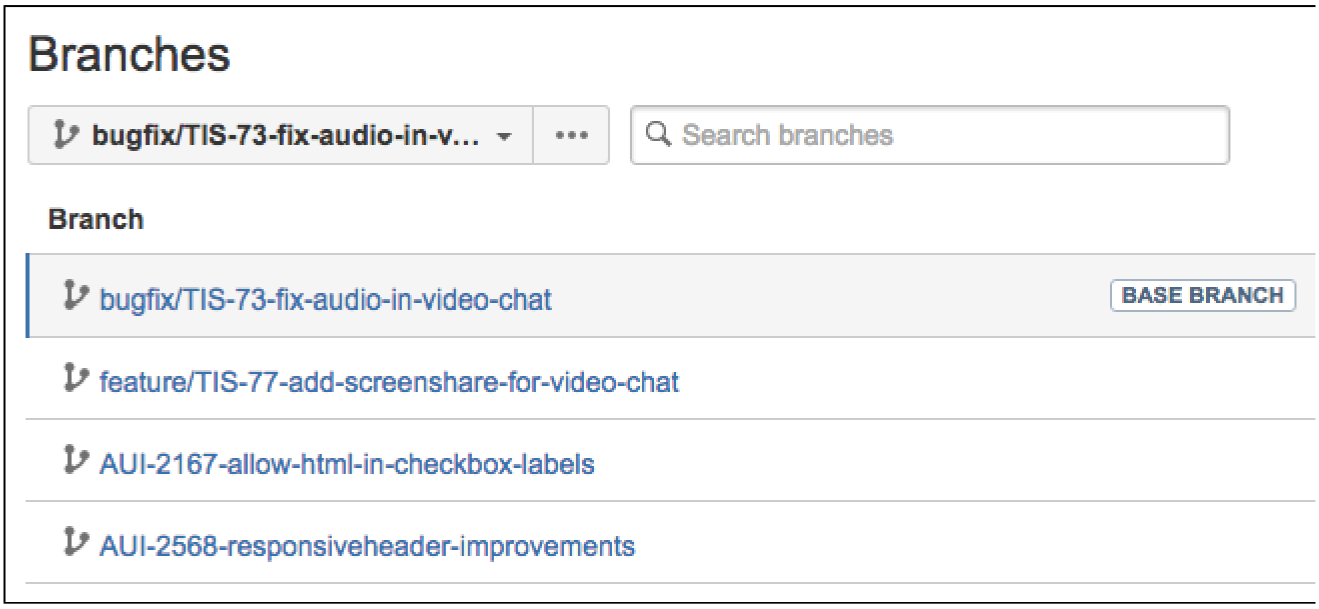
Find and manage branches

The branch listing page makes it easy to keep track of all the branches in your repository, to get there just select Branches from the side navigation bar.

The branch listing allows you to:

- See how many commits behind or ahead your branch is compared to a chosen 'base branch'.
- See the latest status for pull requests originating from branches.
- See the build status of branches at a glance.

- Track the review and merge work that still needs to be done and can help with branch cleanup.
- Identify work in progress as well as stale branches. It is calculated for each branch against the base branch.


Branches
bugfix/TIS-73-fix-audio-in-v...
Search branches
Branch
bugfix/TIS-73-fix-audio-in-video-chat
BASE BRANCH
feature/TIS-77-add-screenshare-for-video-chat
AUI-2167-allow-html-in-checkbox-labels
AUI-2568-responsiveheader-improvements

Behind /Ahead	Shows by how many commits a branch has diverged from the (default) 'base branch'. Use the branch selector to change the base branch.
Pull requests	Shows the relevant state of pull requests against each branch – click the status to see detailed pull request information. • OPEN if there is at least one open pull request. • MERGED if there are no open pull requests, and at least one pull request has been merged. • DECLINED if there are no open or merged pull requests, and at least one pull request has been declined.
*** Builds**	Shows the status of the latest build results published to Bitbucket. The overall status is 'passed' if all the different builds (for example, unit tests, functional tests, deploy to staging) succeeded and 'failed' if at least one run failed for any of those. Click an icon to see details of the builds.
Actions	Menu that includes tasks for working with branches.

***** Only if you have an integrated build server.

Search for branches

You can easily find branches by using the search at the top of the table on the Branches screen. If you're using a branching model, you can filter by branch type simply by searching for the prefix – for example, search for "feature/" to see all your feature branches.

You can find the feature and bugfix branches that haven't yet been merged into a particular release (for example, "release/2.10") by changing the 'base branch' – just use the branch selector to change the base branch, and refer to the **Behind/Ahead** and **Pull requests** columns.

Branch deletion when merging a pull request

When you merge a pull request, you can choose to delete the source branch after merging is complete. Project and repository admins can set the default behavior to either On (the branch will be deleted after merge) or Off (the branch will not be deleted after merge). Users can override this setting when they merge a pull request.

Set the default for branch deletion on merge

Branch deletion on merge is set to Off by default, therefore the option to delete the branch in the Merge pull request dialog will not be selected.

To change the default status of deleting a source branch on merge for a project (requires project admin permission):

1. Go to **Project settings** > **Branches**.
2. Under **Branch deletion on merge**, select one of the following options:
   - **Off -** When merging a pull request, the option to delete a source branch *will not* be selected.
   - **On -** When merging a pull request, the option to delete a source branch *will* be selected.

To change the default status of deleting a source branch on merge for a repository (requires repository admin permission):

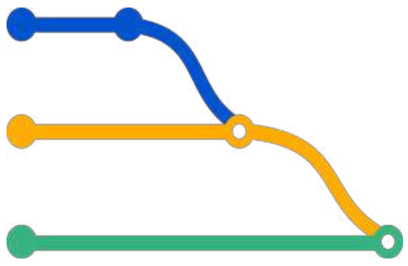
1. Go to **Repository settings** > **Branches**.
2. Under **Project settings inheritance**, select **Custom settings**.
3. Under **Branch deletion on merge**, select one of the following options:
   - **Off -** When merging a pull request, the option to delete a source branch *will not* be selected.
   - **On -** When merging a pull request, the option to delete a source branch *will* be selected.

Cascading merge

You can configure Bitbucket Data Center

to cascade changes to newer release branches, and reduce the need for manual maintenance of branches. Follow the best practices described on this page to establish a branching strategy conducive for cascading merges. You can configure cascading merge for:

- a single repository
- an entire project



On this page:

Related pages:

- Branches
- Using branch permissions
- Branch permission patterns

Conditions for cascading a merge

To cascade a merge, Bitbucket must be able to determine the ordering of branches, and rely on semantic versioning of branch names. For example, Bitbucket will order these branch names like this: 1.0.0 < 2.0.0 < 2.1.0 < 2.1.1. Learn more about the branch ordering algorithm, including some examples of branch ordering, later on this page.

Bitbucket expects that the 'development' branch, typically the default branch, is always ahead of any 'release' branches. The final merge in the cascade of merge operations will be to the 'development' branch.

The following conditions must also be met:

- A branching model must be configured.
- The 'release' branch type must be enabled or a 'production' branch must be set.
- The merge must be made using a pull request to a 'release' or 'production' branch type.
- There must be newer branches than the target branch of the pull request.

Good to know:

- Cascading merge is off by default.
- Commit messages will indicate if a merge was cascaded.
- Audit log entries are recorded for cascaded merges.
- Notifications are sent when merges succeed or fail.

What happens if a cascading merge fails?

When a cascading merge fails, Bitbucket creates a new pull request for the failed merge, and the cascade of merge operations stops. You should resolve the conflict locally before approving the new merge, which may start a new series of cascading merges. Note that a pull request that gets automatically opened when a merge fails won't trigger the continuation of the initial merge chain if resolved locally (which is the approach that we recommend).

Some reasons when a cascading merge could fail include:

- a conflict detected that prevents the merge.
- an open pull request already exists with the same source and target that the cascading merge would close.

For example, if you have multiple release branches, R1, R2, R3, and R4, they can all automatically merge into one another with automatic merging enabled. I.e., If you merge a pull request to R2, it will automatically merge R3 and R4 until you get to the development branch.

With automatic merging on, let's then say that there is a merge failure with R4. If you merge to R1, then Bitbucket merges to R2 and R3, but cannot merge to R4 because of the conflict. Bitbucket then opens a pull request from R3 to R4. The pull request is assigned to you because you attempted to perform the merge. Conflicts will need to be resolved and there are chances you may not even see that there was a pull request created.

You can choose from these two options on how pull requests from the upstream merge conflict should behave:

- Allowed to merge but only to the pull request opened for the merge conflict. This means that the next time a merge is attempted, there will be a warning stating that there is an open pull request downstream.
- Blocked from merging until the pull request that was opened for the merge conflict is resolved. This means that any merging is blocked because of the open pull request downstream.

Enable cascading merge

By default, branch settings (including cascading merge settings) from the project level are inherited by the repositories. Repository admins can either inherit the project-level branch settings or override the settings at the repository level.

Configure cascading merge for all repositories in a project

To enable cascading merge for all repositories in a project (requires project admin permission)**:**

1. Go to **Project settings** > **Branches**.
2. In the **Cascading merge** section, select **On,** and then select **Save**.

Configure cascading merge for a single repository

If the project admin hasn't restricted repository-level changes, you can customize settings for individual repositories. Learn more about how project admins can restrict changes to repository settings

To enable cascading merge for an individual repository (requires repository admin permission):

1. Go to **Repository settings** > **Branches**.
2. In the **Cascading merge** section, select **On** and then select **Save**.

Branch ordering algorithm

To cascade changes to newer release branches, Bitbucket must be able to determine the ordering of branches. Ordering is based on semantic versioning in the naming pattern for branches.

Bitbucket uses the following ordering algorithm to determine the branches in the merge chain:

- Branches are selected and ordered on the basis of the name of the branch that started the cascade (i.e. the target of the pull request for the merge).
- Branch names are split into tokens using any of these characters: underscore '_', hyphen '-', plus '+', or period '.'.
- Only branches *matching* the name of the pull request target are added into the merge path. Matching means that every token before the first numeric token must be equal to the corresponding tokens of the target branch's name.
- Branches are ordered by number, if a given token is numeric. When comparing a numeric token with an ASCII token, the numeric is ranked higher (that is, it is considered as being a newer version).
- If both tokens are non-numeric, a simple ASCII comparison is used.

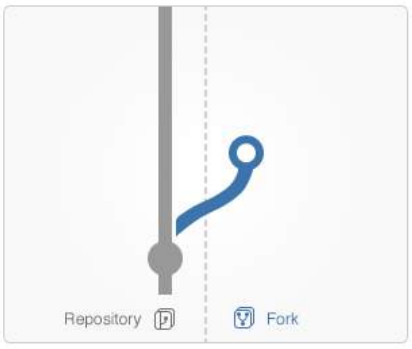
- In the unlikely case of the above algorithm resulting in equality of 2 branch names, a simple string comparison is performed on the whole branch name.
- There is a limit of 30 merges.

Branch ordering examples

The table below provides examples of branch naming patterns that Bitbucket is able, and not able, to order correctly:

GOOD	• release/1.0 • release/1.1-rc1 • release/1.1 • release/1.2 • release/2.0	Bitbucket tokenizes on the '.' and the '-' of '1.1-rc1' and is able to order these branch names correctly.
GOOD	• release/bitbucket_1.1 • release/bitbucket_1.2 • release/bitbucket_2.0	Bitbucket tokenizes on the '.' and the '_' and orders the numeric parts of these branch names correctly.
BAD	• release/1.0 • release/bitbucket_1.1	Bitbucket tokenizes on the '.' and the '_' but cannot recognize that 'bitbucket_1.1' should follow '1.0'.

Forks

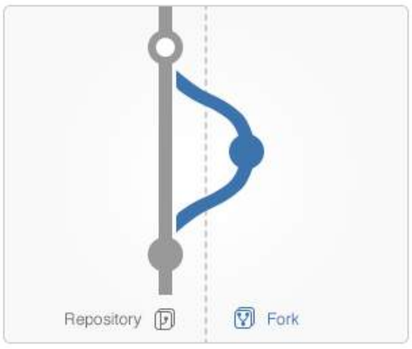


Fork

Develop features on a branch and create a pull request to get changes reviewed.

Discuss

Discuss and approve code changes related to the pull request.



Merge

Merge the branch with the click of a button.

Forks provide an alternative workflow to using branches, for where particular developers have restricted (read-only) access to a repository. See Workflow strategies for more information.

You can fork a repository into any other project in Bitbucket Data Center for which you have admin access. You can also create personal forks and give other developers access to that using repository permissions.

Create a fork

You can create a fork for any repository that you can see in Bitbucket (that is, for which you have 'read' permission).

Simply click **Fork** in the sidebar. You can choose the location for the newly forked repository. Note that when a repository is forked into another project it will get that project's permissions, which may be less restrictive.

When creating the fork you can enable fork syncing to have Bitbucket automatically keep your fork up-to-date with changes in the upstream repository.

On this page:

Related pages:

- Workflow strategies
- Controlling access to code
- Creating personal repositories

Delete forks to clear disk space

In order to clear any disk space on your Bitbucket Data Center instance, you should delete all related repositories, including any forks and upstreams. Head over to Advanced repository management to learn more about related repositories, and to find out how to delete them all at once. (Data Center only)

Issue a pull request for a fork

Pull requests for forks in Bitbucket work just the way you'd expect. See Pull requests.

When creating the pull request, you can choose the fork and the branch that contains the source to be pulled, as well as the destination fork and branch.

Merge a fork

Once a pull request has been approved by reviewers, it can be merged as usual. See Pull requests.

Synchronize with upstream

Once you fork a repository, your fork can be kept up-to-date with changes in the upstream repo either automatically by Bitbucket or you can synchronize manually. You will still need to keep your remote working repository synced with your fork in Bitbucket yourself. See Keeping forks synchronized for more details.

Disable forking

The forking of repositories is available by default. However, you can turn off forking, on a per-repository basis, if this helps you to control your development process. You can do this on the **Repository details** tab of the repository settings.

Note that disabling forking on the parent repo doesn't delete any existing forks, and doesn't prevent those existing forks from being forked. Pull requests will still work from the existing forks. Furthermore, commits in the parent are viewable via the fork if the SHA1 hash is known to the user.

Pre-receive hooks and forks

Pre-receive hooks aren't copied with the fork and so are not run when code is merged in a pull request. This means that custom hooks are unable to prevent certain changes from being merged by pull requests from forks. Instead, the hook would have to also implement a merge check.

Keeping forks synchronized

Fork syncing helps you to keep your fork in Bitbucket Data Center up-to-date with changes in the upstream repository. Bitbucket can do this automatically for all branches and tags you haven't modified in the fork.

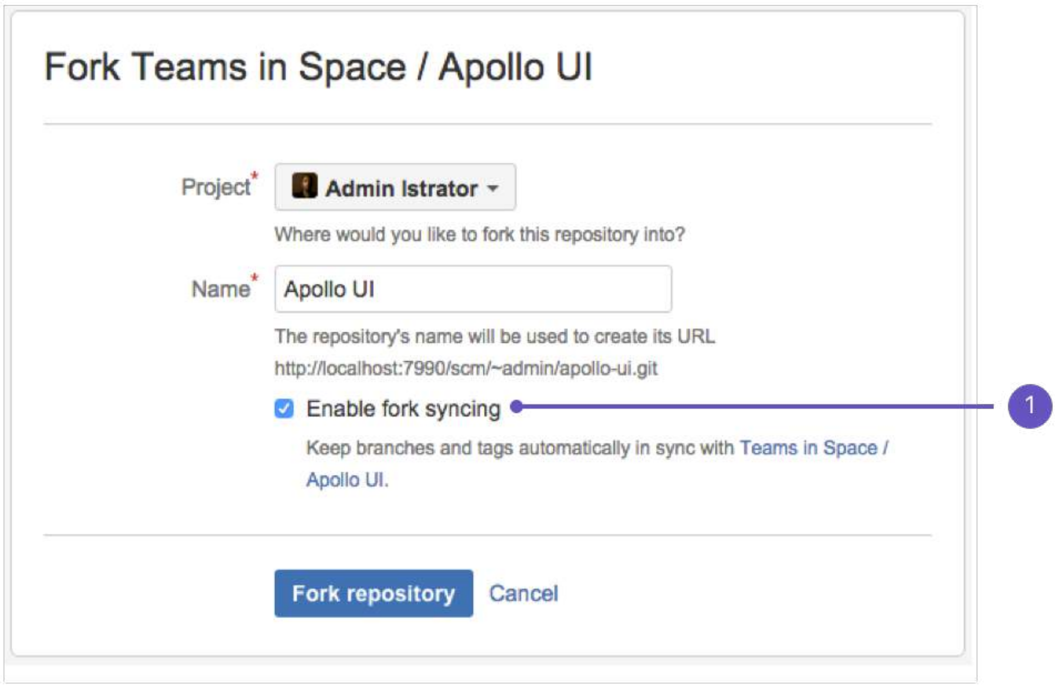
If you have modified branches or tags in the fork, Bitbucket will offer syncing strategies. Bitbucket will never update your branch or tag in your fork if this means that your changes would be lost.

Note that syncing is about pulling recent upstream changes into your fork, whereas pull requests are about pushing your changes back to the upstream repository.

On this page:

Enabling automatic fork syncing

You can enable automatic fork syncing when you first fork the repository:



Fork Teams in Space / Apollo UI

Project* Admin Istrator

Where would you like to fork this repository into?

Name* Apollo UI

The repository's name will be used to create its URL http://localhost:7990/scm/~admin/apollo-ui.git

☑ Enable fork syncing

Keep branches and tags automatically in sync with Teams in Space / Apollo UI.

1. **Enable fork syncing**

Syncing is enabled by default. You can disable or enable fork syncing at any time later by going to **Repository Settings** > **Workflow** > **Fork syncing** for the forked repository.

What gets synced?

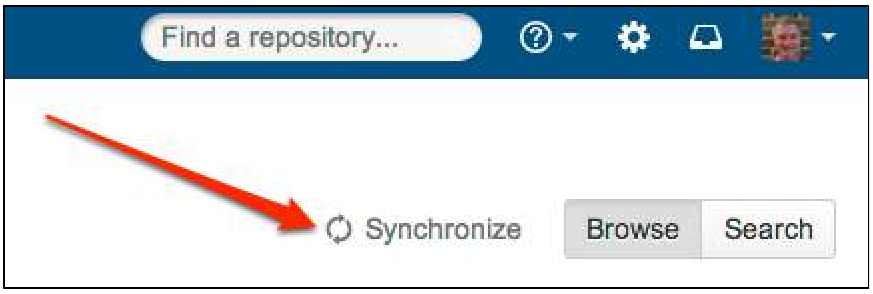
When performing automatic synchronization, Bitbucket updates the fork as follows:

- for branches - Bitbucket makes any fast-forward change, where there is no need to merge work and there is no risk of losing changes.
- for tags - Bitbucket makes updates only if the current state is the same as what upstream pointed to. So, a new tag in upstream will create a new tag in the fork, unless you have a tag of the same name, when the update will fail.

Manual syncing

If upstream and your fork have diverged, so that each has changes that are not in the other, Bitbucket will not perform a merge automatically. When you visit the branch, you have the option to manually synchronize the branch.

You can manually synchronize your branch at any time using **Synchronize** by going to the **Settings** > **Fork syncing** tab for the forked repository, or on either of the **Source** or **Commits** tabs for a repository:

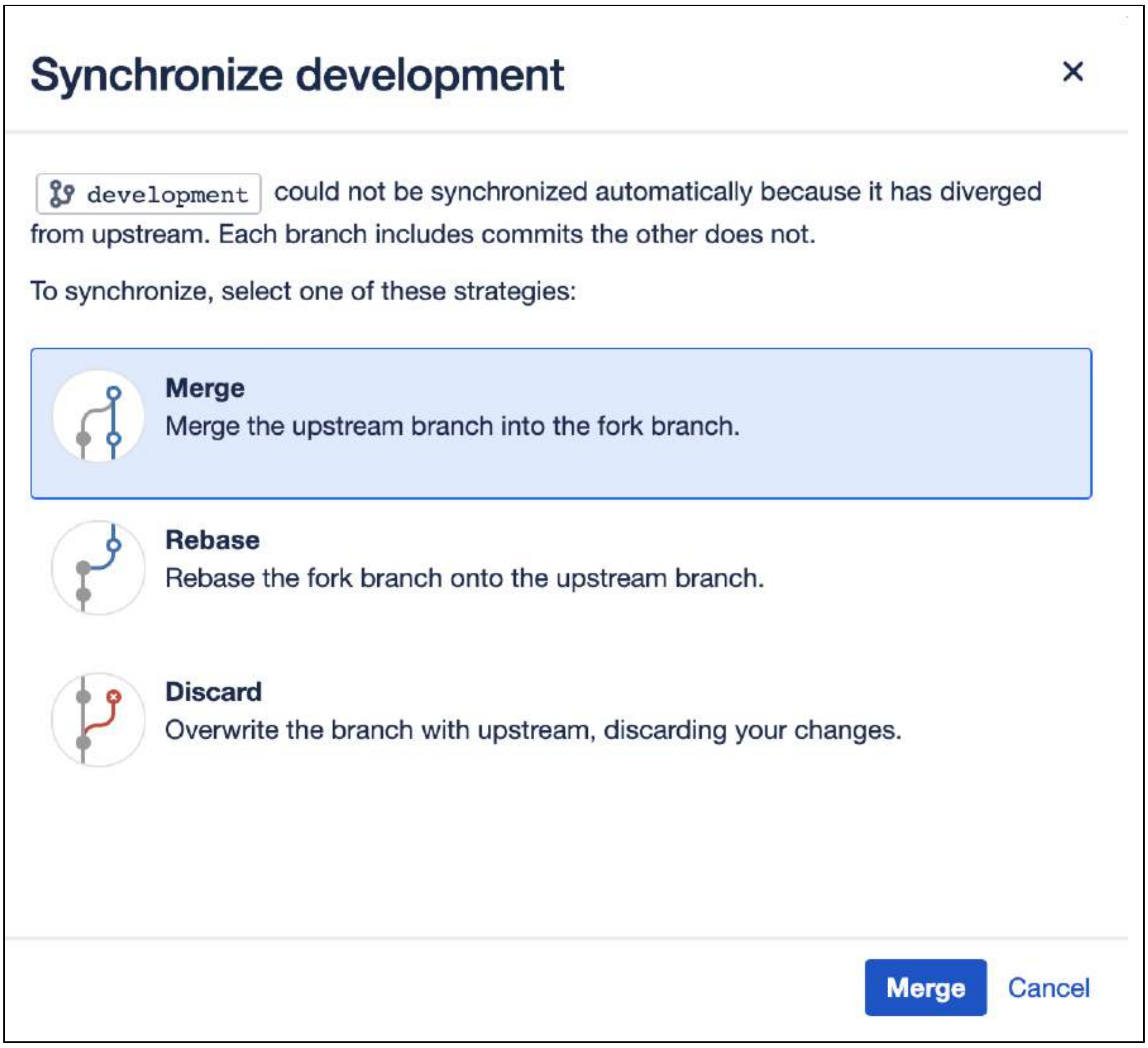


Manual synchronization strategies

When you initiate a manual synchronization, Bitbucket will ask you to choose one of the following synchronization strategies.

Merge strategy

Merge the upstream branch into the fork branch.



`development` could not be synchronized automatically because it has diverged from upstream. Each branch includes commits the other does not.

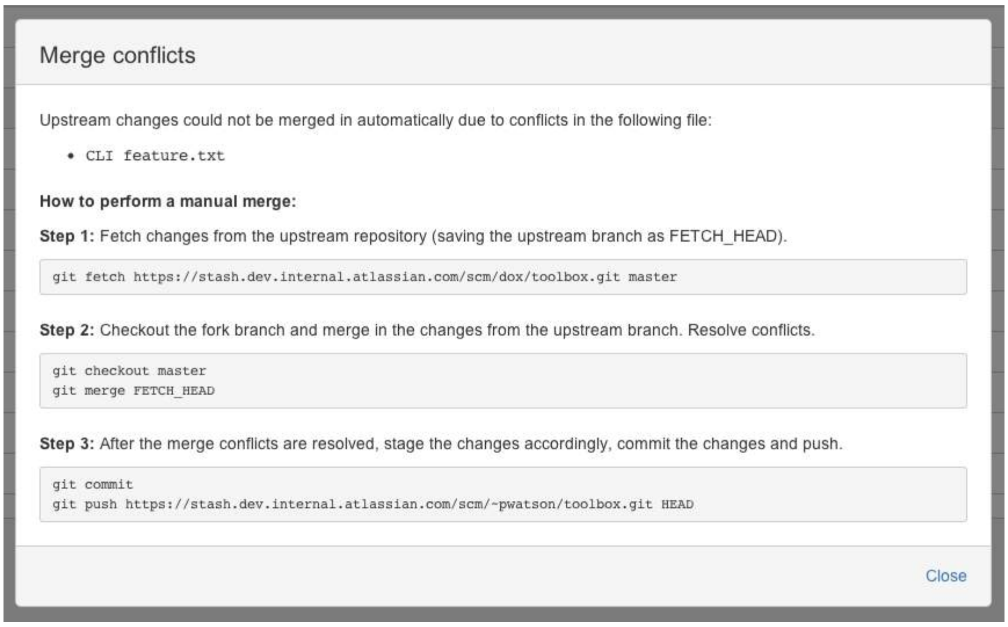
To synchronize, select one of these strategies:

Merge
Merge the upstream branch into the fork branch.

Rebase
Rebase the fork branch onto the upstream branch.

Discard
Overwrite the branch with upstream, discarding your changes.

If Bitbucket detects conflicts when trying to perform the merge it will offer hints on how to resolve those:



Upstream changes could not be merged in automatically due to conflicts in the following file:

- `CLI feature.txt`

How to perform a manual merge:

Step 1: Fetch changes from the upstream repository (saving the upstream branch as FETCH_HEAD).

```
git fetch https://stash.dev.internal.atlassian.com/scm/dox/toolbox.git master
```

Step 2: Checkout the fork branch and merge in the changes from the upstream branch. Resolve conflicts.

```
git checkout master
git merge FETCH_HEAD
```

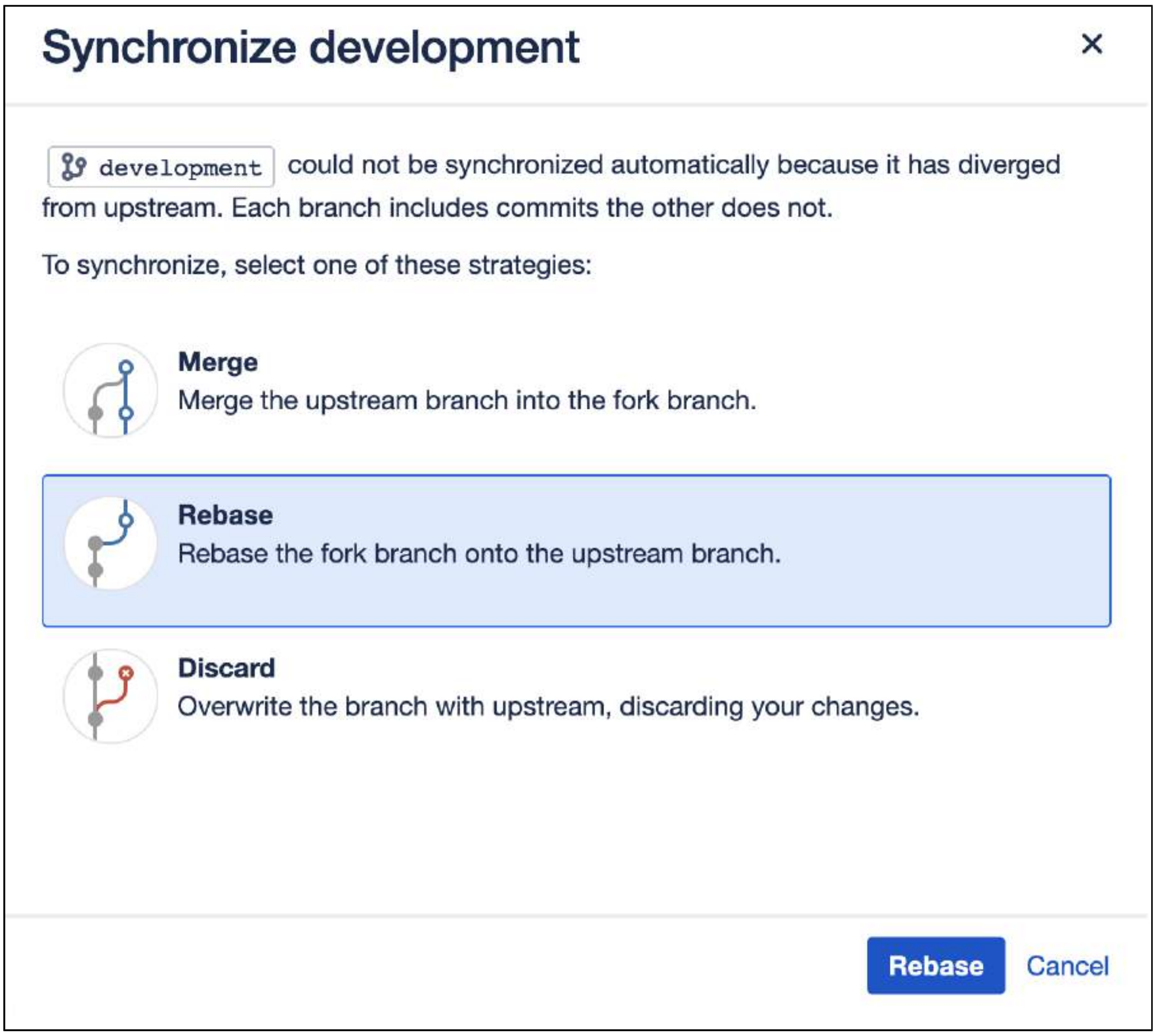
Step 3: After the merge conflicts are resolved, stage the changes accordingly, commit the changes and push.

```
git commit
git push https://stash.dev.internal.atlassian.com/scm/~pwatson/toolbox.git HEAD
```

Once the merge is complete, your branch will have incorporated all the commits on the branch in the parent repository, but your branch will still be ahead of the parent (it has your changes on it). This means automatic synchronization for this branch will not occur until your changes are pushed to the parent repository.

Rebase strategy

Rebase the fork branch onto the upstream branch. Creates a new non-merge commit for each commit on the fork.


Synchronize development

`development` could not be synchronized automatically because it has diverged from upstream. Each branch includes commits the other does not.

To synchronize, select one of these strategies:

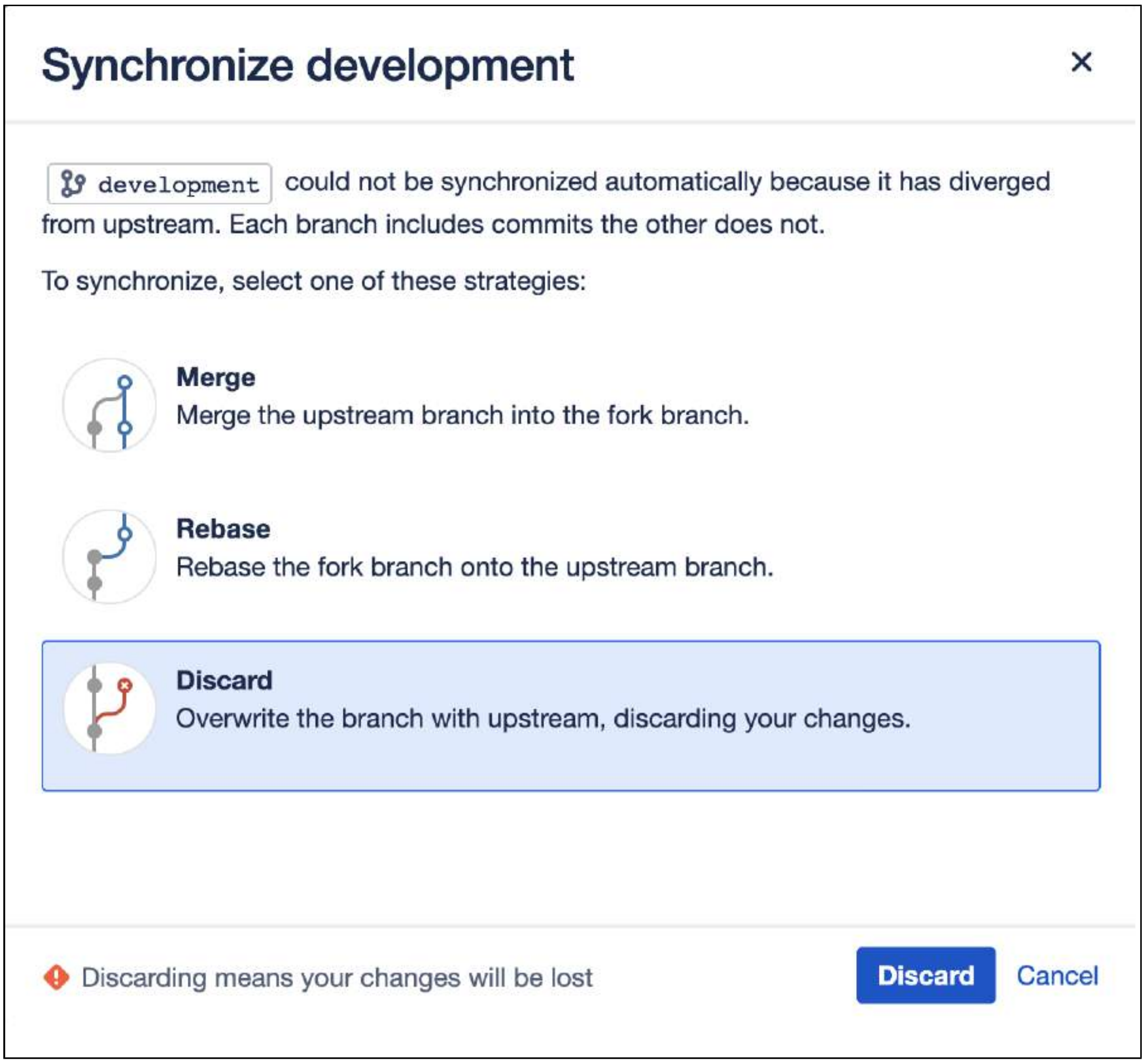
Merge
Merge the upstream branch into the fork branch.

Rebase
Rebase the fork branch onto the upstream branch.

Discard
Overwrite the branch with upstream, discarding your changes.

Discard strategy

Overwrite your changes in your fork with the upstream branch. Your changes will be lost.



Synchronize development

development could not be synchronized automatically because it has diverged from upstream. Each branch includes commits the other does not.

To synchronize, select one of these strategies:

Merge
Merge the upstream branch into the fork branch.

Rebase
Rebase the fork branch onto the upstream branch.

Discard
Overwrite the branch with upstream, discarding your changes.

Discarding means your changes will be lost

Pull requests

Pull requests in Bitbucket Data Center provide a quick and easy way for software teams to collaborate on code. A pull request is a dedicated forum for discussing a proposed feature. If there are problems with the changes, teammates can post feedback in the pull request and even tweak the feature by pushing follow-up commits. All of this activity is tracked directly inside of the pull request.

A pull request requires differences between two distinct branches. When you create a pull request you'll specify the branch to merge changes into.

Create a branch

Pull requests can be used with the Feature Branch Workflow, the Gitflow Workflow, or the Forking Workflow. You can create branches from the Bitbucket UI, from the command line using Git, or from within a connected JIRA Software instance.

Learn how to create a branch.

Create a pull request

In their simplest form, pull requests allow a developer to notify team members that they've completed a feature. Once their feature branch is ready, the developer files a pull request via their Bitbucket account. This lets everybody involved know that they need to review the code and merge it into the `master` branch.

Learn how to create a pull request.

Create a draft pull request

Starting from Bitbucket Data Center 8.18, you can create draft pull requests. A draft pull request allows you to let your team know that your code is still in progress. Since you can add reviewers to your draft, you'll receive the right feedback at the earliest stage of your work. But until you explicitly mark your draft as ready for review, it isn't eligible for merging and thus, can't impact the ongoing development.

Learn how to use draft pull requests

Review and discuss a pull request

As a reviewer of a pull request, your colleagues are counting on you to review changes to the code then provide feedback. Use reviewer status indicators to let a pull request author know you approve the changes or that changes need more work before you can approve.

To review a pull request, select either ✓ **Approve** or ⊘ **Request changes** within the header of a pull request. Click the button again or click a different one to change your status.

Approving a pull request lets the author know you reviewed their changes and that you feel the work can be merged with the target branch.

If you've requested changes, add a comment to let the author know what should change before the pull request can be merged. Once the author pushes more changes to the pull request, revisit the pull request to review the new iteration. Bitbucket remembers what you've already reviewed and only shows you the changes made since your last visit. At any time you can choose to view the entire effective diff or individual commits and make comments there also.

Learn how to review and discuss a pull request.

Merge a pull request

Learn how to merge a pull request.

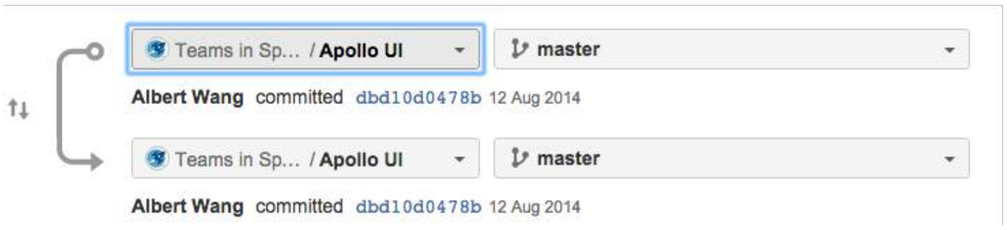
Create a pull request

When you are ready to start a discussion about your code changes in Bitbucket Data Center, it's time to create a pull request. A pull request is a dedicated forum for discussing proposed changes to a project.

If your work is still in progress and you wouldn't like to share it with the whole team, you can create a draft pull request and then, make it ready for review when you're confident about your code.

To create a regular pull request you'll need a feature branch that you've made changes to:

1. Select **Create pull request** in the sidebar.
2. Choose the source tag or branch and the destination branch. The source branch is where you made your code changes and the destination is the branch you want to merge to. The source and target branches may be located in different forks:


Teams in Sp... / Apollo UI
master
Albert Wang committed dbd10d0478b 12 Aug 2014
Teams in Sp... / Apollo UI
master
Albert Wang committed dbd10d0478b 12 Aug 2014

3. Use the Diff and Commits tabs to compare the source and destination branches before creating the pull request.
4. Select either **Create pull request** or **Continue**, and enter a title and description that will help people understand what your pull request is about. By default, the pull request title will contain the commit message or branch name. The description will populate with any existing commit history if no description template is being used in the project or repository.
   Use mentions (to notify another user), and markdown (to add formatting) in your description. If there are contributor guidelines available, have a look to make sure you're complying with the repository's owner's rules.
5. In the **Reviewers** field, mention individual team members or reviewer groups from whom you're expecting feedback on your pull request. The added reviewers will receive an email notification about the pull request.

   If default reviewers or code owners are configured for the branches you're working with, these people will be automatically added as reviewers to your pull request. If you wouldn't like to share your work with all of them, remove the corresponding user tags from the field. If you remove at least one reviewer, the **Default reviewers** or **Code owners** quick add buttons respectively will appear under the field, showing you how many reviewers you can still add from each group.

   Others who have project permissions can participate in the discussion if it interests them.

6. Select **Create**.

You will receive email notifications when your reviewers and other participants comment on the pull request or commit changes to it.

Edit a pull request

After creating a pull request, you can modify it by clicking **Edit** on the pull request's page. You can edit details such as the **Title**, **Description,** and **Reviewers**. In particular, you can change the **Destination** branch for the pull request – you'll need Read permission on the branch you want to set.

Pull request description templates

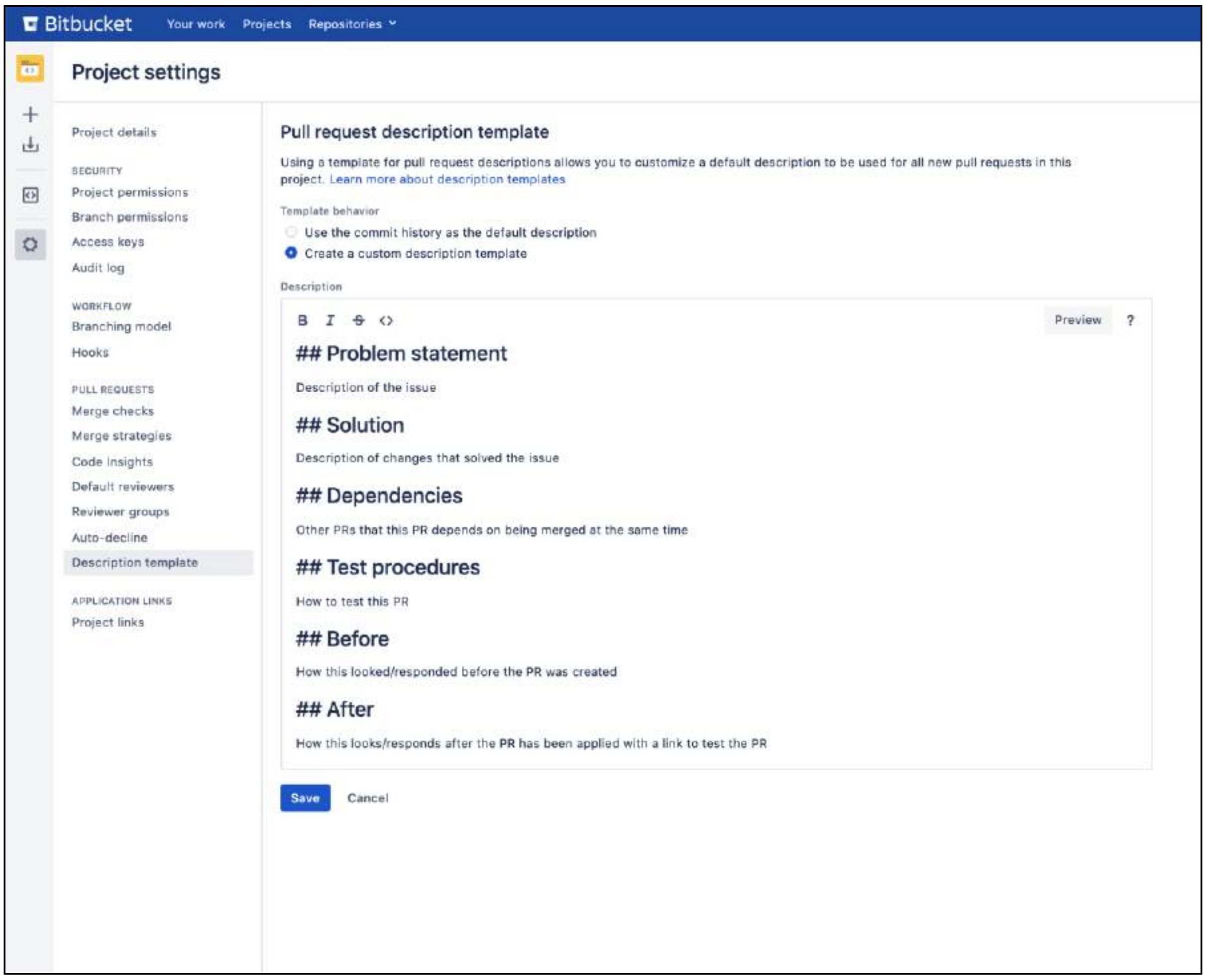
Who can do this?

Project and repository admins

Available in Bitbucket Data Center 7.13 onwards

By default, pull request descriptions automatically populate with a list of relevant commit message history. Th e **Description** field is how pull request authors can set the context for a code review by adding images, links, or provide instructions for reviewers. Having a custom template for your pull request descriptions in Bitbucket Data Center will save time and help reviewers know what to expect while doing code reviews.

Numbered list



Project settings

Pull request description template

Using a template for pull request descriptions allows you to customize a default description to be used for all new pull requests in this project. Learn more about description templates

Template behavior

- Use the commit history as the default description
- [✓ Create a custom description template]

Description

```
## Problem statement
Description of the issue
## Solution
Description of changes that solved the issue
## Dependencies
Other PRs that this PR depends on being merged at the same time
## Test procedures
How to test this PR
## Before
How this looked/responded before the PR was created
## After
How this looks/responds after the PR has been applied with a link to test the PR
```

To create a custom description template:

1. Go to **Repository or Project settings** > **Description template**.
2. (Repository only) From the **Project settings inheritance**, select **Use custom settings**.
3. From **Template behavior,** select **Create a custom description template**.
4. Fill out the **Description** field with the default information or leave it empty to set an empty description value for your template.
5. **Save** your changes.

To inherit the project level template description:

1. Go to **Repository settings** > **Description template**.
2. From **Project settings inheritance**, select **Inherit from the project settings**.
3. **Save** your changes.

The default description template will automatically be populated into the description field on the Create pull request page. If you don't want to use a template for the description, you can set the **Template behavior** toggle to **Use the commit history as the default description** on the Pull request description template page.

Code owners

As your team and products grow, expertise in areas of your code base can be fragmented between different members of the team. This can make finding the right people to notify or request reviews on changes difficult. Now, you can add code owners to your repository as a way for developers to maintain ownership over different areas of the code base. Code owners will be automatically added to pull requests in the areas of the code base they own.

When creating a new pull request, Bitbucket will automatically check if a CODEOWNERS file exists in the repository. Bitbucket checks for this file in the `.bitbucket` folder. If the file is found, every rule in that file is compared to the diff of your pull request. For each matching rule, the users associated with it are automatically added as suggested reviewers.

As code owners is a branch-based config, you can have different code owners on different branches. Bitbucket will always use the CODEOWNERS file on the target branch of your pull request.

Your browser does not support the HTML5 video element

The CODEOWNERS file

Create the CODEOWNERS file in the root directory of your repository, on your branch of choice. Compose the file using the following rules:

- Every code owner rule should be declared on a separate line.
- A code owner rule is composed of branch patterns referring to a path in the repository followed by any number of users.
- Users are specified either by email or usernames prepended with the @ character.
- Users must have the repository read permission in the target repository. Invalid identifiers or users without permission won’t be added.

- Comments can be declared on a line starting with the # character.

Here’s an example of the CODEOWNERS file:

```
# Comments in a CODEOWNERS file are prepended with the '#' character
# Empty lines are also ignored

# One code owners rule is used for each changed file in a pull request.
# Lower rules take precedence over higher rules, so this rule will only be applied
# if no other rules match a given change in the pull request. The below rule matches
# all changes in the repository, so unless a rule lower in the file matches,
# globalowner will always be suggested as a code owner
** globalowner@example.com

# Email addresses and bitbucket usernames can both be used when specifying code owners
/features/FeatureCode.java @developer-1 developer-2@example.com

# Branch patterns can match specific paths in your repository, or file types, or both!
# This pattern will match all CSS files in the repository
**.css @developer-1

# This pattern will match every file in the app/frontend directory, and all subdirectories
app/frontend/ @developer-2

# This pattern will match every CSS file in the app/frontend directory, and all subdirectories
app/frontend/**.css @developer-3

# A rule with a path and no owners is still matched, and can be used to prevent code owners
# from being added for a given file. Below, changes made in the docs directory will include
# content-designer as a code owner, unless those changes are in images, in which case no
# reviewer is added
docs/** @content-designer
docs/images/**
```

Limits

The maximum size of the CODEOWNERS file is 500 KB. If the size is larger than this, the file won’t be read. You can increase or decrease the maximum file size by changing `code.owners.maximum.filesize` in `shared/bitbucket.properties`.

No more than 100 reviewers will ever be added automatically to a pull request regardless of how many rules match. This restriction prevents hundreds of reviewers from being added to large pull requests. You can increase or decrease the reviewer limit by changing `code.owners.maximum.users` in `shared/bitbucket.properties`.

Code owners quick add for pull request review

If code owners are set for the destination branch of your draft or regular pull request, they’ll be automatically added to it as reviewers. If you want feedback only from some of the added code owners, keep them and remove the others from the **Reviewers** field.

If you remove at least one code owner, the **Code owners** quick add button will appear under the field, showing you how many reviewers you can still add from this group.

Reviewing a pull request

The review phase of a pull request in Bitbucket Data Center typically involves reviewers making comments and the author pushing additional changes and commenting in response, until the pull request is ultimately approved. The pull request author usually starts by adding colleagues as reviewers. Reviewers then leave comments – either on the entire pull request or on a specific part of the code changes, and then update their reviewer status to notify the author that they've completed their review.

Depending on the feedback provided by reviewers, the author may then update a pull request with new commits. This may be to clean up the code, resolve any outstanding tasks, or improve the quality of the code. They can also apply suggestions to quickly make code changes for minor issues like typos.

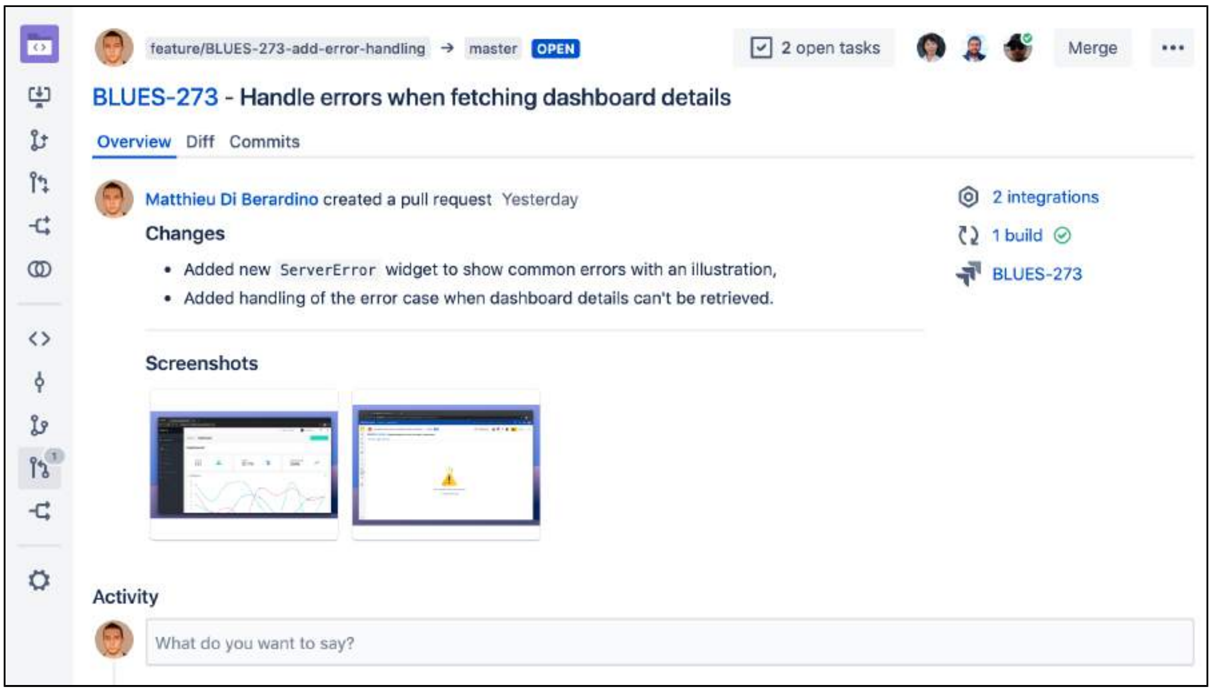
Once the cycles of reviewer feedback and new commits have reached a conclusion, a pull request can either be merged to its target branch, or declined if the changes are not to be merged.

For details on how authors and reviewers can collaborate and discuss a pull request, see Commenting on a pull request.

On this page:

Review a pull request

Bitbucket allows you to add individual reviewers and reviewer groups (Data Center only) to a single pull request who can then approve or decline the request. Pull requests give those who have access to the repository, the ability to review the quality of the code that's specified in the pull request.



Matthieu Di Berardino created a pull request Yesterday

Changes

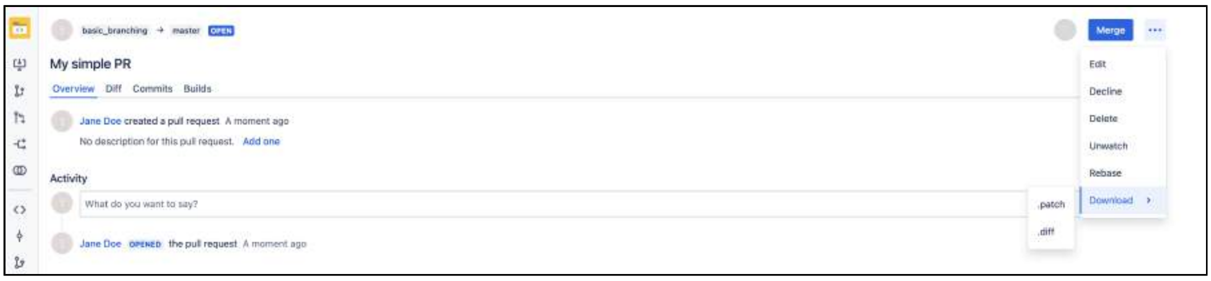
- Added new `ServerError` widget to show common errors with an illustration,
- Added handling of the error case when dashboard details can't be retrieved.

To review a pull request

1. **Access the pull request** by either following links from an email notification, selecting a notification within the pull request inbox (in the upper-right), or searching for a pull request by selecting **Pull requests** on the sidebar (read more about searching for pull requests).
2. **Review the changes** and comments left by your teammates within the pull request.
3. **Leave some feedback** about the changes, in any of the views, and use @ mentions to ask questions directly of your colleagues, who will receive a notification after you enter your comment. See Commenting on a pull request for more details about the various ways you can leave comments, including pull request tasks.
4. **Finish your review** by indicating if you feel the pull request can be merged, or if the author of the pull request needs to make additional changes before you can provide your stamp of approval. Select either of the status indicators to let your team know you've reviewed the changes and the ball is now in their court:
    - **Approve** - indicates you've reviewed the changes and the code is ready to be merged.
    - **Request changes** - indicates you've reviewed the changes, but the code is not quite ready to be merged.

If needed, you can also get a .patch or .diff file of the pull request you're reviewing. Share the files with your team to maintain flexibility in your work and align with different developer workflows.

To download a .patch or .diff file, in the pull request action menu, select **Download** and select the format of the file you want to download.



Jane Doe created a pull request A moment ago

No description for this pull request. Add one

Activity

What do you want to say?

Jane Doe OPENED the pull request A moment ago

Add a reviewer group to your pull request

You can add reviewer groups to your pull request by typing the name of an existing group into the **Reviewers** field. Each user that is a part of that group will then be added and display as individual users if they have project permissions. See Reviewer groups for pull requests for more information on creating and editing reviewer groups.

Create a Jira issue from a pull request

Bitbucket allows you to create a Jira issue directly from a pull request comment or task instead of being forced to leave Bitbucket and return with a created issue.

To create an issue from a pull request comment or task:

1. Create a new issue by clicking **...** > **Create Jira issue**.
2. Select the **Project** and **Issue type**.
3. Add a summary, description, and any other fields as needed.
4. Click **Create issue**.

If a created issue is deleted inside Jira, it will continue to be counted as an issue in Bitbucket, but will no longer be visible on the pull request.

There are three main ways to view changes:

1. The **Overview tab -** lists all of the activity for a pull request since the pull request was created.
2. The **Diff view tab -** highlights which lines of code have been added, deleted, or modified.
3. The **Commits tab -** lists all the commits that will get merged. You can click to view a single commit.

Overview

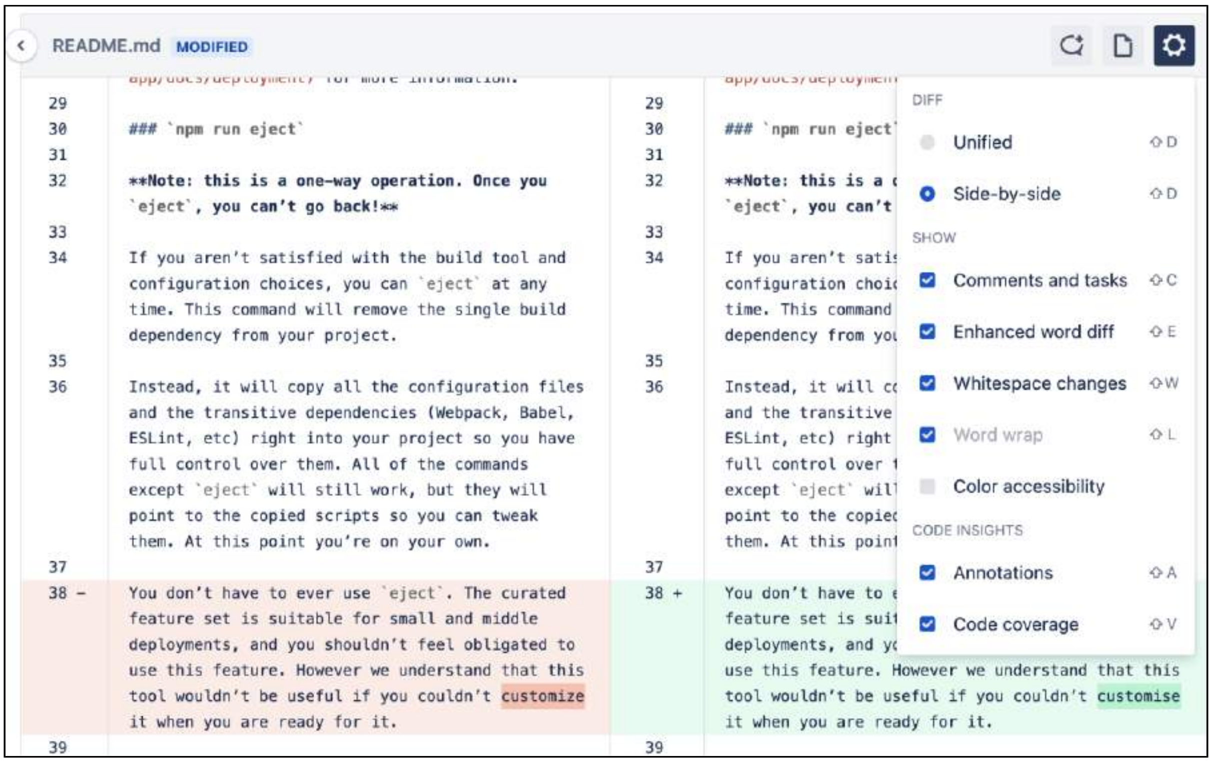
The overview tab captures all of the team's activity on the pull request in one place, right from the initial creation, through to when it is finally merged (or declined), with all the comments, replies, and commits that happen along the way.

Diff view

The diff view highlights the changes between the source and target branch. You can choose whether you want to highlight word level changes in the diff, disable word wrap, or display details like comments and whitespace changes from the **Diff view settings** ⚙ icon.

The **Unified diff** option shows the changes in one continuous column.

The **Side-by-side diff** lets you easily compare the changes by showing the original file on one side, highlighting removed and modified lines, and then changed files on the other side, highlighting added and modified lines.



```
### `npm run eject`

**Note: this is a one-way operation. Once you
`eject`, you can't go back!**

If you aren't satisfied with the build tool and
configuration choices, you can `eject` at any
time. This command will remove the single build
dependency from your project.

Instead, it will copy all the configuration files
and the transitive dependencies (Webpack, Babel,
ESLint, etc) right into your project so you have
full control over them. All of the commands
except `eject` will still work, but they will
point to the copied scripts so you can tweak
them. At this point you're on your own.

38 - You don't have to ever use `eject`. The curated
     feature set is suitable for small and middle
     deployments, and you shouldn't feel obligated to
     use this feature. However we understand that this
     tool wouldn't be useful if you couldn't customize
     it when you are ready for it.

38 + use this feature. However we understand that this
     tool wouldn't be useful if you couldn't customise
     it when you are ready for it.
```

DIFF
- ○ Unified ⇧D
- ● Side-by-side ⇧D

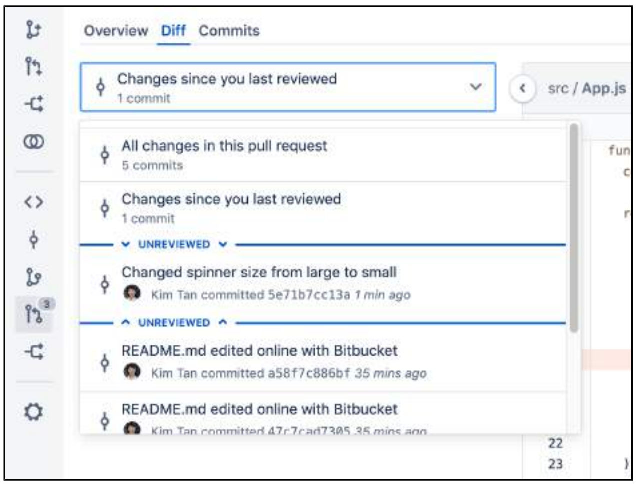
SHOW
- ✓ Comments and tasks ⇧C
- ✓ Enhanced word diff ⇧E
- ✓ Whitespace changes ⇧W
- ✓ Word wrap ⇧L
- ☐ Color accessibility

CODE INSIGHTS
- ✓ Annotations ⇧A
- ✓ Code coverage ⇧V

ⓘ For browser performance reasons, lines are still wrapped in the side-by-side diff view and cannot be disabled.

Iterative reviews

Within the diff view, using the **Change Scope selector**, you can select a specific commit to review, or choose to view all changes within a pull request. If you return to a pull request that you previously reviewed, you'll only see the new commits added since you last reviewed the pull request.



Changes since you last reviewed
1 commit

All changes in this pull request
5 commits

Changes since you last reviewed
1 commit

UNREVIEWED

Changed spinner size from large to small
Kim Tan committed 5e71b7cc13a *1 min ago*

UNREVIEWED

README.md edited online with Bitbucket
Kim Tan committed a58f7c886bf *35 mins ago*

README.md edited online with Bitbucket
Kim Tan committed 47c7cad7305 *35 mins ago*

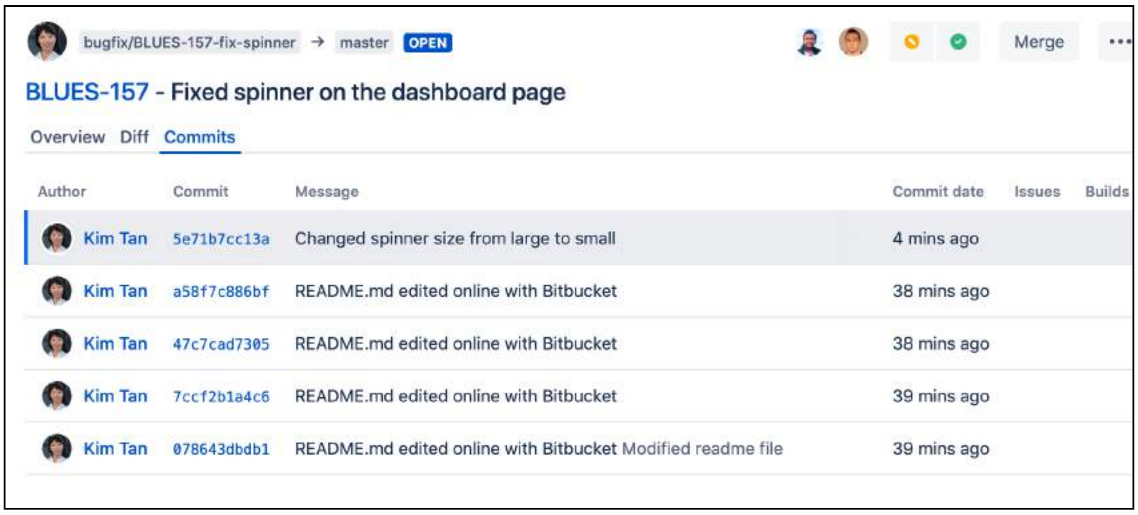
Commits

The **Commits** tab lists all the commits that will get merged (those that are greyed out have already been merged). Clicking through to a commit leaves you inside the pull request context and the commit can be reviewed as part of the pull request.

When viewing a commit, you can comment on the whole file, or a particular line of code, for any file in the commit.

Participants can commit new changes to the branch. Bitbucket auto-updates the **Commits** tab of the pull request, so you can see exactly which commits will be merged. Bitbucket is smart about comments, moving them along when lines are added or removed. If a line with a comment gets removed, you can still view the comment in the activity, but Bitbucket marks the diff as *outdated* to let you know that this piece of code has been changed in recent commits. These hidden comments can also be viewed by selecting **other comments**.

View a single commit within a pull request

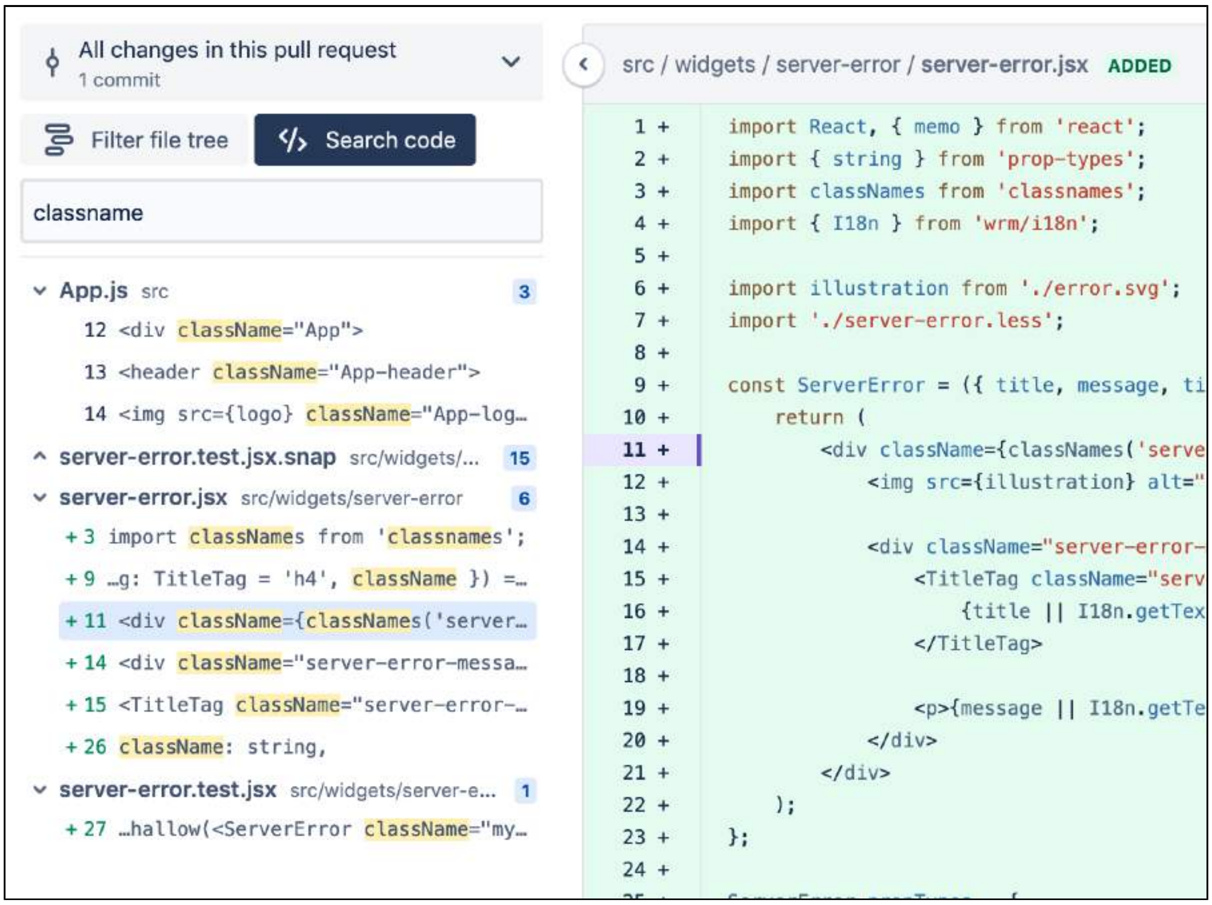

bugfix/BLUES-157-fix-spinner → master OPEN
Merge
BLUES-157 - Fixed spinner on the dashboard page
Overview Diff Commits

Author	Commit	Message	Commit date	Issues	Builds
Kim Tan	5e71b7cc13a	Changed spinner size from large to small	4 mins ago		
Kim Tan	a58f7c886bf	README.md edited online with Bitbucket	38 mins ago		
Kim Tan	47c7cad7305	README.md edited online with Bitbucket	38 mins ago		
Kim Tan	7ccf2b1a4c6	README.md edited online with Bitbucket	39 mins ago		
Kim Tan	078643dbdb1	README.md edited online with Bitbucket Modified readme file	39 mins ago		

Find matching code in a pull request

When you want to locate code in a pull request, you can search for it within changed files in the diff view.

To locate code within changed files, click **Search code** and enter your text into the search field. Only the files containing the match are then displayed expanded in the file tree with the number of occurrences highlighted per file. Easily navigate between occurrences by clicking through each line.



classname

App.js src 3
12 <div className="App">
13 <header className="App-header">
14 <img src={logo} className="App-log…
server-error.test.jsx.snap src/widgets/... 15
server-error.jsx src/widgets/server-error 6
+3 import classNames from 'classnames';
+9 …g: TitleTag = 'h4', className }) =…
+11 <div className={classNames('server…
+14 <div className="server-error-messa…
+15 <TitleTag className="server-error-…
+26 className: string,
server-error.test.jsx src/widgets/server-e... 1
+27 …hallow(<ServerError className="my…

src / widgets / server-error / server-error.jsx ADDED

```
+ import React, { memo } from 'react';
+ import { string } from 'prop-types';
+ import classNames from 'classnames';
+ import { I18n } from 'wrm/i18n';
+
+ import illustration from './error.svg';
+ import './server-error.less';
+
+ const ServerError = ({ title, message, ti
+     return (
+         <div className={classNames('serve
+             <img src={illustration} alt="
+
+             <div className="server-error-
+                 <TitleTag className="serv
+                     {title || I18n.getTex
+                 </TitleTag>
+
+                 <p>{message || I18n.getTe
+             </div>
+         </div>
+     );
+ };
+
```

Find files in a pull request

To filter through changed files, click **Filter file tree** and enter the file name into the field. You can search through files in folders using wildcards.

Some common wildcards supported are `*`, `?`, and `**`. For example; filtering on `**/test/**/*mock*`, reveals all files or folders within a directory called `test` that uses `mock` in their name. Note that matching is case-insensitive, so the filter will match both `text/one/my-mock-test.js` and `Test/two/MyMockTest.java`.

Watching and notifications

You automatically get added as a watcher of a pull request when you are added to the pull request as a reviewer, or when you perform an action related to the pull request (such as adding a comment):

Action	You're now a watcher
You are added as a reviewer	✓
You add yourself as a reviewer	✓
You comment on a pull request	✓
You reply to a comment	✓
You push to the source branch	✓
You request auto-merge for a pull request	✓
You cancel auto-merge for a pull request	✓

You can manually add yourself as a watcher by selecting **Watch** from the selection menu drop-down on the pull request screen.

You can stop watching a pull request by clicking the link in the email notification, or **...** > **Unwatch** on the pull request screen. If you stop watching a pull request, you will not automatically be added as a watcher again if you subsequently perform an action that would otherwise have added you.

Bitbucket sends email notifications to watchers when certain pull request events occur. Email notifications are batched by default, but you can change your personal account settings (on the **Notification settings** tab) so that you get notifications immediately. The following notifications however, are always sent immediately to:

- the reviewers when a pull request is created
- all watchers when a pull request is deleted
- a user when they are added as a reviewer to a pull request
- a user when they are removed as a reviewer from a pull request
- a user when they are mentioned in the description of a pull request

See Notifications for details.

Add default reviewers to pull requests

Default reviewers allow you to automatically add one or more users as reviewers to pull requests in Bitbucket Data Center. In addition, you can optionally specify how many of the specified default reviewers must approve a pull request prior to merging to ensure that a minimum level of review occurs.

Related pages:

- Reviewing a pull request
- Pull requests

You may have different roles in your team that should be automatically added to pull requests depending on the nature of the pull request. This can be achieved by assigning default reviewers for a specific repository, a specific branch, using a branch pattern, or with a branch type from the branching model. For example, you might specify a release manager be assigned to all pull requests targeting release branches in Bitbucket.

Once assigned in the repository settings, default reviewers will be pre-filled during pull request creation. At that time the set of reviewers can then be adjusted for each pull request.

Adding default pull request reviewers for all repositories in a project

To add default reviewers for pull requests (requires project admin permissions):

1. Go to **Project settings** > **Default reviewers**.
2. Click **Add default reviewers**.
3. For the **Source branch** and **Target branch** fields, select either **Branch name**, **Branch pattern**, **Branching model,** or **Any branch.**
    a. Branch name - enter the name of an existing branch.
    b. Branch pattern - use a branch permission pattern to match multiple branches.
    c. Branching model - select the branch type to restrict access to. Read more about branching models.
    d. Any branch - add default reviewers for pull request coming from every branch (for Source branch) to any branch (for Target branch).
4. Enter the name(s) of who should be assigned as a reviewer in the **Default reviewers** field.
5. *Optional*: In the **Approvals required** field, select how many reviewers must approve pull requests that match this criteria before merging.
6. Click **Create**.

Adding default pull request reviewers for a single repository

To add default pull request reviewers for a single repository (requires repo admin permissions):

1. Go to **Repository settings** > **Default reviewers**.
2. Click **Add default reviewers**.
3. For the **Source branch** and **Target branch** fields, select either **Branch name**, **Branch pattern**, **Branching model,** or **Any branch.**
    a. Branch name - select an existing branch by name.
    b. Branch pattern - use a branch permission pattern to match multiple branches.
    c. Branching model - select the branch type to restrict access to. Read more about branching models.
    d. Any branch - add default reviewers for pull request coming from every branch (for Source branch) to any branch (for Target branch).
4. Enter the name(s) of who should be assigned as a reviewer in the **Default reviewers** field.
5. *Optional*: In the **Approvals required** field, select how many reviewers must approve pull requests that match this criteria before merging.
6. Click **Create**.

Default reviewers quick add for pull request review

If default reviewers are set for the destination branch of your draft or regular pull request, they'll be automatically added to it as reviewers. If you want feedback only from some of the added default reviewers, keep them and remove the others from the **Reviewers** field.

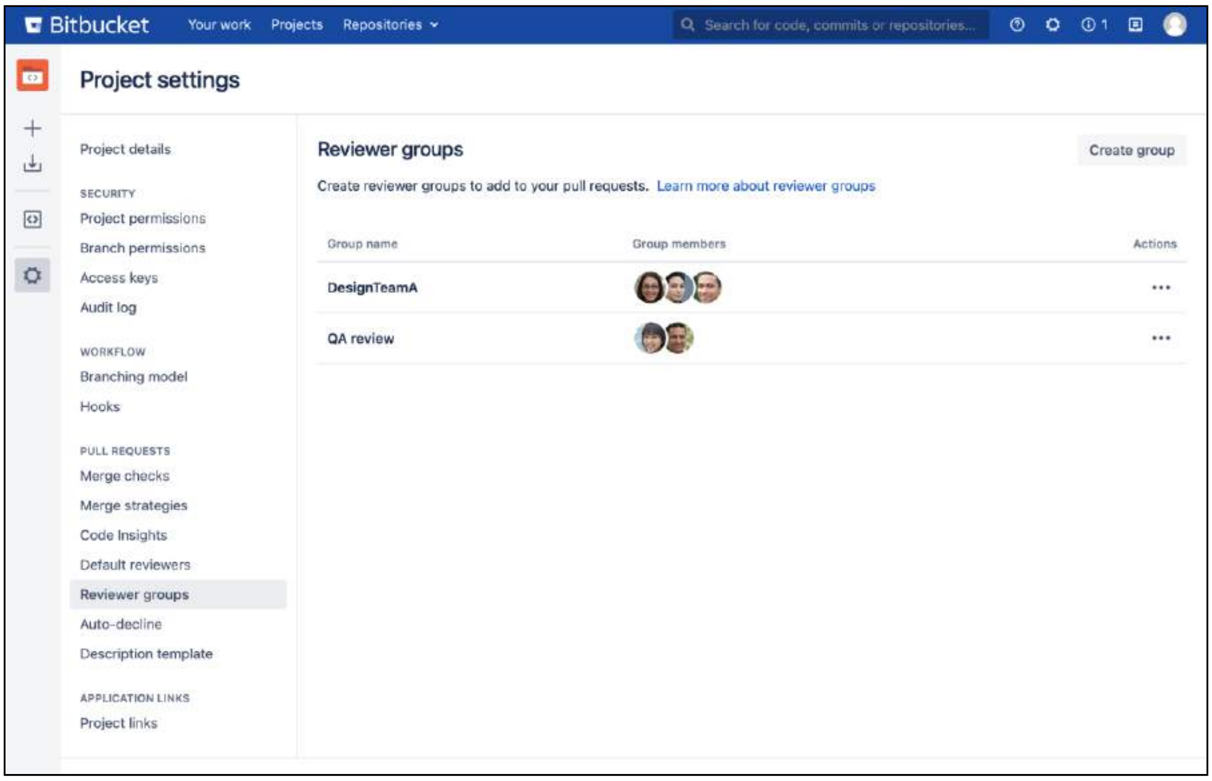
If you remove at least one default reviewer, the **Default reviewers** quick add button will appear under the field, showing you how many reviewers you can still add from this group.

Reviewer groups for pull requests

Reviewer groups in Bitbucket Data Center, allow you to quickly add pre-defined groups of reviewers to pull requests. Project and repository admins can create and manage reviewer groups.

Related pages:

- Reviewing a pull request
- Create a pull request



Create reviewer groups to add to your pull requests. Learn more about reviewer groups

Group name	Group members	Actions
DesignTeamA		•••
QA review		•••

Who can use this procedure?

Project and repository admins

Available in Bitbucket Data Center 7.13 onwards

To create a reviewer group for a project or repository:

1. Select **Project settings** or **Repository settings** > **Reviewer groups** (under pull requests).
2. Select **Create group**.
3. Provide a name for your new reviewer group.
4. Search for users to add to the reviewer group.
5. Select **Create**.

To add a reviewer group to your pull request, start by typing in the name of the group into the **Reviewers** field. When you select a group, group members are added to the field as individual users.

Your browser does not support the HTML5 video element

Reviewer groups and permissions

You can’t add a user to the reviewer group if they don’t have access to the project or repository.

And reviewer groups won’t impact user permissions. When a group member’s permission is removed (for example, **Read** access to a repository), they will still display as a member of the reviewer group, but will no longer have access to the associated code.

When a repository with reviewer groups is moved to a new project, the reviewer group and all members that have access to the project are moved along with the repository. If no group members have access to the project, the reviewer group will still move across to the new project and will display in a search, but group members will not be added to the pull request.

Commenting on a pull request

The most important aspect of a pull request is the discussion it generates. You can comment on the entire pull request, a particular file, or on specific lines of code in a file to generate discussion relevant to your code review. You can also create a task or convert any comment to a task, so actions identified during the review can be easily tracked and resolved. Another efficient way to collaborate is to start a review, allowing you to leave multiple comments or tasks without sending them off to the author until you are ready to publish them.

For more on what you can do in a pull request and an overview to the code review workflow itself, see Revie wing a pull request.

Comments

Places in Bitbucket Data Center where you can make comments:

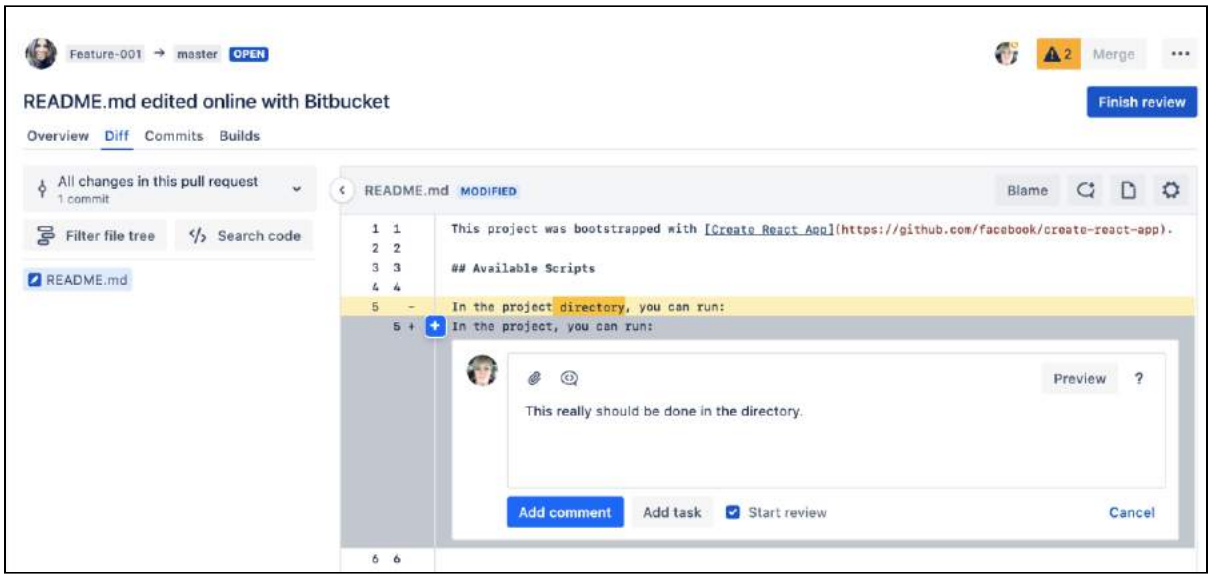
- **Overview tab** - you can add a comment on the Overview tab (just under 'Activity'), or reply to a previous comment. Use mentions to alert another Bitbucket user to your comment, and use Markdown to add formatting, for example, headings or lists.
- **Diff view tab** - display and create comments for a file directly on lines of code for commits and pull requests.

Draft multiple comments during a review process

When you are reviewing a pull request and you want to make multiple comments or tasks across various line s of code or files before the pull request is merged, you can manage your workflow more effectively by starting a review rather than adding your comments and submitting them one at a time.

To start a review:

1. From the pull request you are reviewing, begin by selecting the **Start review** button in the top, right side of the page. You can also start a review from the comment form by selecting the **Start review** checkbox.
2. Type your comment and then select **Add comment**.
3. Add any other additional comments or tasks to your review.



Feature-001 → master OPEN
Merge
Finish review
Overview Diff Commits Builds
All changes in this pull request
1 commit
Filter file tree
Search code
README.md
README.md MODIFIED
Blame
Preview ?
Add comment Add task Start review Cancel

README.md edited online with Bitbucket

```
This project was bootstrapped with [Create React App](https://github.com/facebook/create-react-app).

## Available Scripts

- In the project directory, you can run:
+ In the project, you can run:
```

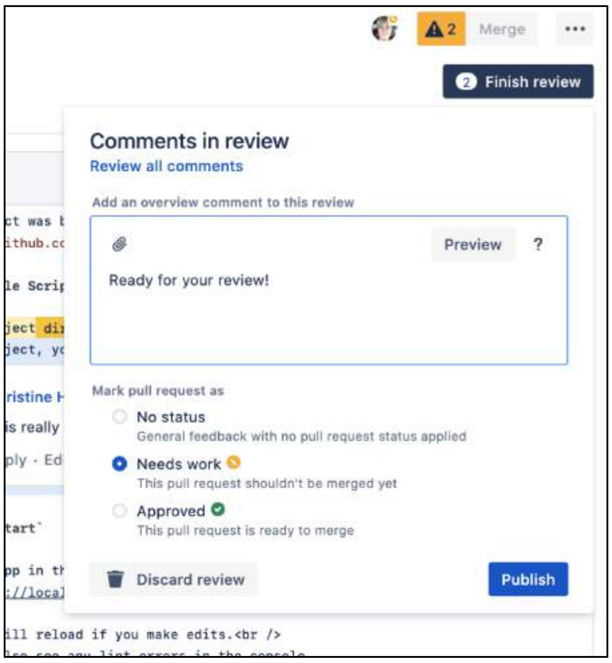
This really should be done in the directory.

While in a review:

- comments are pending and only visible to you
- all comments added will be part of the review
- the author will be notified only when you publish the review

To publish a review:

1. Select **Finish review** to open the **Comments in review** dialog.
2. From here, you can review all of your feedback and add an overview comment.
3. When you are ready, select **Publish** to send the review to the author.


Merge
Finish review
Comments in review
Review all comments
Add an overview comment to this review
Preview
Ready for your review!
Mark pull request as
No status
General feedback with no pull request status applied
Needs work
This pull request shouldn't be merged yet
Approved
This pull request is ready to merge
Discard review
Publish

If you want to delete all of the pending comments and tasks without publishing, use **Discard review**.

Tasks

You can create an ad-hoc task on the entire pull request, a particular file, or on specific lines of code in a file to track required work identified during a code review. Convert a task into a comment, or a comment into a task. Anyone with repository read permission can convert any other user's comments and tasks (and vice versa). A repository administrator can delete other user's comments or tasks and can also enable a merge check that requires all tasks to be resolved before the pull request can be merged. See Checks for merging pull requests.

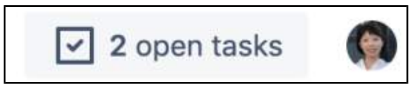
For consistent tasks, admins can define default tasks at the project or repository level that are created when the pull request is opened. Learn more about default tasks

To create a pull request task:

1. Select **Add a comment** or the icon on a line of code
2. Add your text.
3. Select **Create task.**

When writing a task, you can use markdown to add formatting, images, and attachments to your tasks.

To see all the open and resolved tasks for a pull request:



1. Use **Shift+T** on the pull request page, or click the **Open tasks list** button.
2. Select the **'View on'** linked text in the **Tasks** window to see a task in the context of where it was created.

To resolve tasks for a pull request, **select the checkbox** next to the open task.

Suggestions

As a reviewer of a pull request in Bitbucket, you can suggest a small change to the code by leaving a suggestion right inside the comment or task itself. If you have write access to the source repository, you can commit the suggested change directly in the pull request without further action.

To create a pull request suggestion on a single line of code:

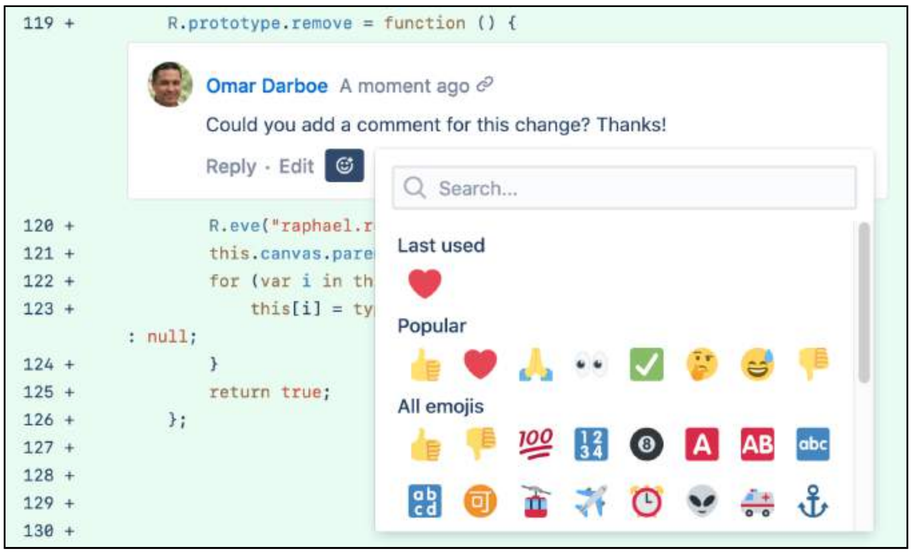
1. In the comment dialog, click .
2. Type your suggestion in the code block. You can also add any feedback outside of that code block.

To apply a pull request suggestion:

1. Select **Apply suggestion**.
2. Edit the commit message if required and then select **Commit changes** to add a new commit to the pull request.

If a comment contains a code block that you'd like to copy, you can simply select the **Copy** button that appears every time you hover over this code block. The code will be copied and you can paste it wherever needed.

React to comments



```
+         R.prototype.remove = function () {
```

Omar Darboe A moment ago

Could you add a comment for this change? Thanks!

```
+             R.eve("raphael.r
+             this.canvas.pare
+             for (var i in th
+                 this[i] = ty
: null;
+             }
+             return true;
+         };
+
+
+
+
```

Sometimes there's nothing more to say, and a or is all you need when replying to a comment.

To react to a comment with an emoji, select the **Add reaction** button , then select an emoji.

To remove an emoji from a comment, select it and it will disappear.

Resolve or collapse comments

After the author of a pull request has addressed or responded to comments, they can resolve comments by selecting **Resolve**. When a comment is resolved, it is marked as **RESOLVED** and collapsed by default. This helps both the reviewers and the author scroll past resolved comment threads and focus on the open comments.

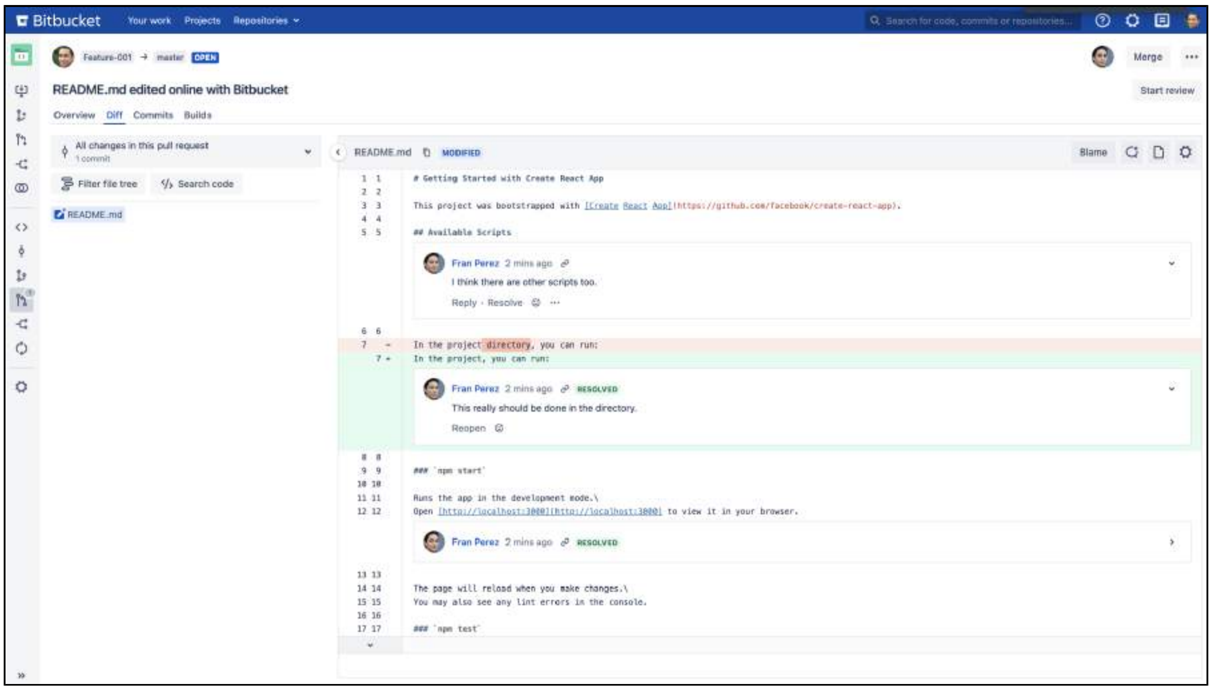
Note that:

- open tasks are not completed when you resolve a comment thread
- you can only react to resolved comment threads but you can't edit or reply

You can always expand the resolved comments to view the entire discussion. If a comment or comment thread has been resolved accidentally or requires further changes or discussion, you can reopen it at any time.

If many comments on the pull request are still open and you want to focus on the code diff, you can quickly hide them to declutter your view.

Any user with **Read** acccess to the repository can resolve and reopen comments.



```
# Getting Started with Create React App

This project was bootstrapped with [Create React App](https://github.com/facebook/create-react-app).

## Available Scripts
```

Fran Perez 2 mins ago

I think there are other scripts too.

Reply · Resolve

```
-  In the project directory, you can run:
+  In the project, you can run:
```

Fran Perez 2 mins ago RESOLVED

This really should be done in the directory.

Reopen

```

### `npm start`

Runs the app in the development mode.\
Open [http://localhost:3000](http://localhost:3000) to view it in your browser.
```

Fran Perez 2 mins ago RESOLVED

```

The page will reload when you make changes.\
You may also see any lint errors in the console.

### `npm test`
```

Viewing other comments in Bitbucket

When updating a pull request, comments that are in older diffs or that have become outdated due to a pull request update will become hidden. To view them, click the **other comments** counter button at the top of the page to open a dialog box with more context as to why code has changed throughout a pull request. You'll be able to:

- see a file's activity stream showing comments that are outdated or appear on another diff
- distinguish which comments are actually outdated
- reply to, like, delete, or react to outdated comments the same way you can from the overview tab

Merge a pull request

You can merge a pull request or set a pull request to auto-merge even if you aren't the author of this pull request. To do this, you need the write or admin permission for the repository that the pull request targets.

This flexibility allows different teams to have different approaches to using Bitbucket. If your team requires stricter control, consider using branch permissions to restrict who can merge a pull request to particular users or groups. You might also want to consider using a plugin to enforce a particular workflow, for example to ensure that only approvals from members of your review team allow merging, see the page Checks for merging pull requests.

On this page:

Related pages:

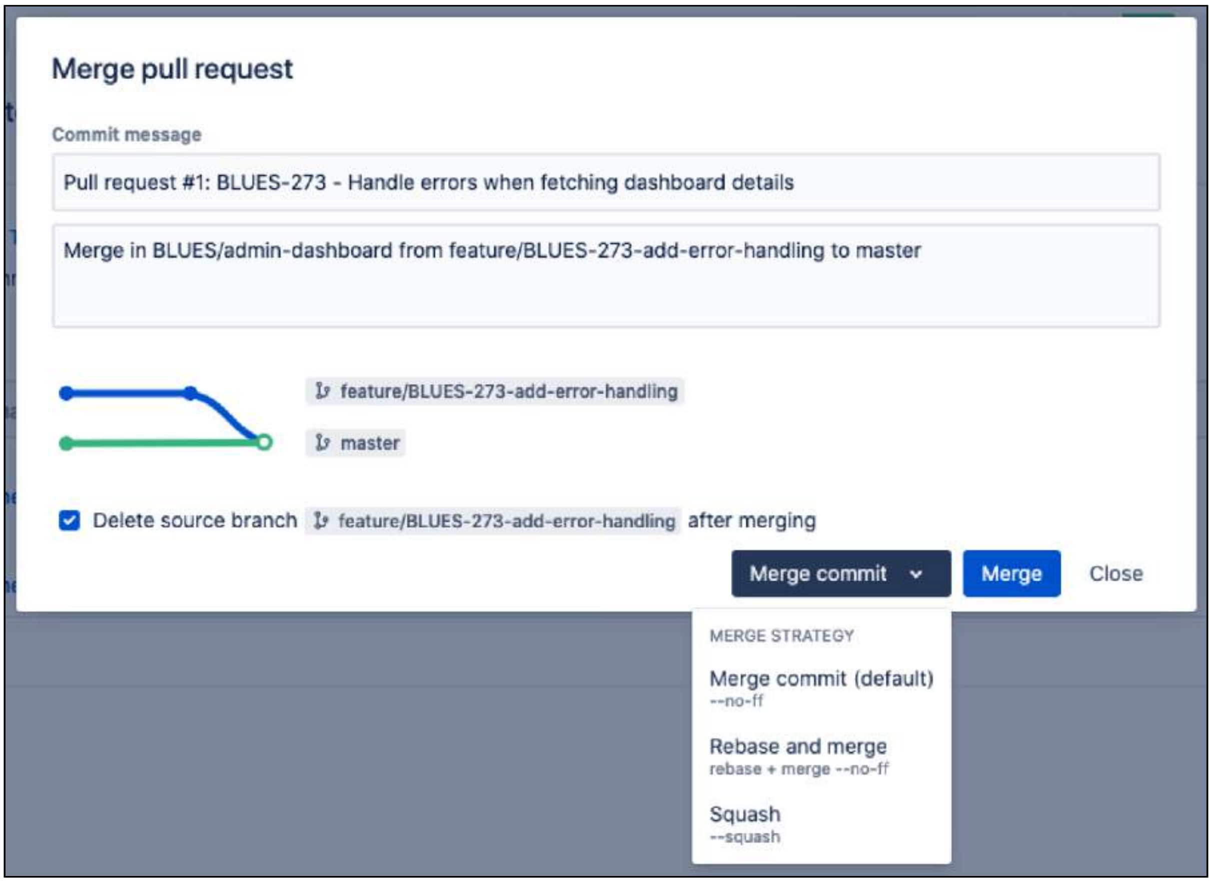
- Pull request merge strategies
- Cascading merge
- Branches

If a pull request is a draft, it can't be merged. Make sure all draft pull requests have been reviewed and approved before the merge.

Merge a pull request

To merge a pull request:

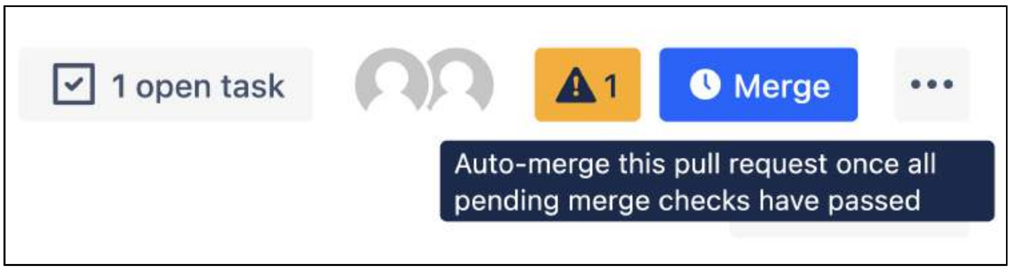
1. In the top-right corner of the pull request view, select **Merge**.
2. In the Merge pull request dialog, you can add information about the pull request in a comment. The text you add appears between the subject line and the log lines that Bitbucket and Git generate, and adds the text to the commit message for the merge.
3. Select a merge strategy from the menu and then, select **Merge**.
   Git merge strategies affect the way the Git history appears after a merge has occurred. Administrators can configure which merge strategies are available and which merge strategy will be the default. Learn more about pull request merge strategies


Merge pull request
Commit message
Pull request #1: BLUES-273 - Handle errors when fetching dashboard details
Merge in BLUES/admin-dashboard from feature/BLUES-273-add-error-handling to master
feature/BLUES-273-add-error-handling
master
Delete source branch feature/BLUES-273-add-error-handling after merging
Merge commit
Merge
Close
MERGE STRATEGY
Merge commit (default)
--no-ff
Rebase and merge
rebase + merge --no-ff
Squash
--squash

Auto-merge a pull request

In Bitbucket 8.15 and later, you can have your pull requests merged automatically by the system. For this, you need to select the same **Merge** button in the top-right corner of the pull request view. The clock icon on the button will let you know that auto-merge is available for a target repository.

The Merge button with the clock icon will be enabled as soon as the pull request is created unless there are merge conflicts.


1 open task
1
Merge
Auto-merge this pull request once all pending merge checks have passed

When all merge checks have passed, Bitbucket will automatically merge the pull request on behalf of the user who submitted the pull request for auto-merge.

Enable auto-merge for pull requests

To enable auto-merge for pull requests in a project or repository:

1. Go to **Project settings** or **Repository settings**, respectively.
2. In the left menu, select **Auto-merge**.
3. Select **Enable auto-merge**.
   a. If you're enabling auto-merge for a repository in a project where auto-merge isn't enabled, first select **Use custom settings**. Then, select **Enable auto-merge**.

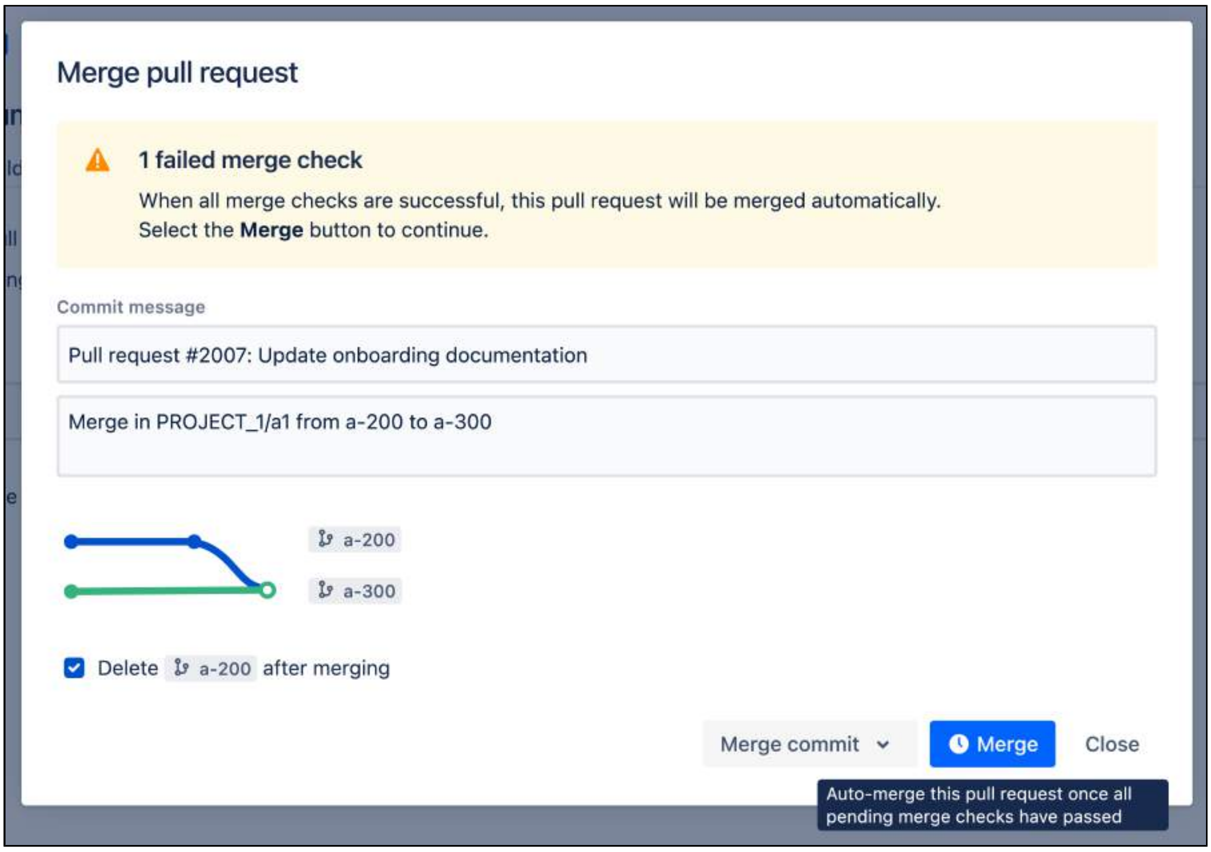
Set a pull request to auto-merge

A pull request can be auto-merged when it has no merge conflicts and it isn't ready to merge.

To auto-merge a pull request:

1. In the top-right corner of the pull request view, select **Merge**. The clock icon on the button will let you know that auto-merge is available for a target repository.
2. In the **Merge pull request** dialog, you have the same options that are available during manual merge, such as updating the commit message, deleting a source branch, or selecting a merge strategy.
3. Select **Merge**.

You can opt for auto-merge only if a pull request has some failed checks. If all checks of the pull request are successful, the usual manual merge operation will immediately take place.



Merge pull request

1 failed merge check

When all merge checks are successful, this pull request will be merged automatically.
Select the **Merge** button to continue.

Commit message

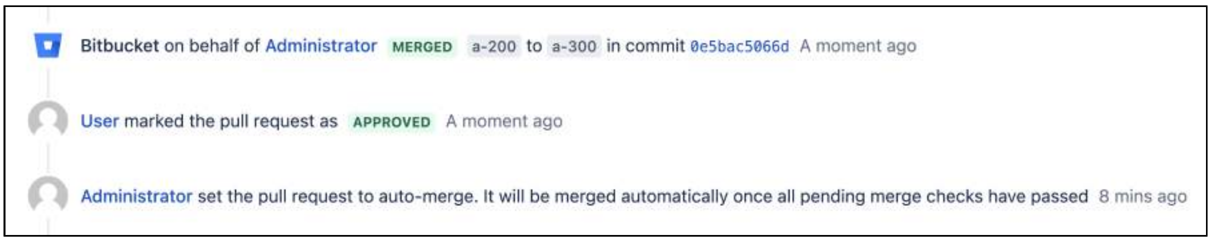
Pull request #2007: Update onboarding documentation

Merge in PROJECT_1/a1 from a-200 to a-300

✓ Delete a-200 after merging

Auto-merge this pull request once all pending merge checks have passed

When all merge checks have passed, Bitbucket will automatically merge the pull request on behalf of the user who submitted the pull request for auto-merge.



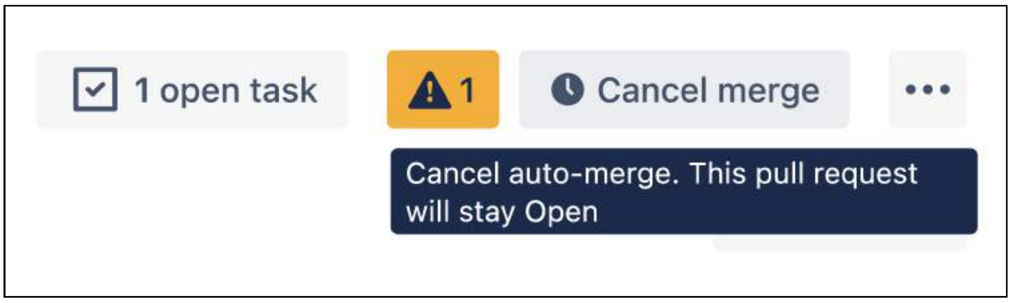
Bitbucket on behalf of Administrator MERGED a-200 to a-300 in commit 0e5bac5066d A moment ago

User marked the pull request as APPROVED A moment ago

Administrator set the pull request to auto-merge. It will be merged automatically once all pending merge checks have passed 8 mins ago

Cancel auto-merge for a pull request

You can cancel auto-merge if, for example, you decide to merge a pull request manually. To cancel auto-merge, select the **Cancel merge** button in the top-right corner of the pull request view.

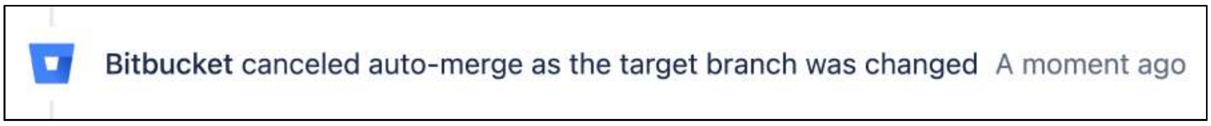


What if a pull request can’t be auto-merged?

After you set your pull request to auto-merge, Bitbucket may not be able to auto-merge it and will cancel the operation. This can happen for one of the following reasons:

- The pull request has merge conflicts.
- The pull request has new code changes.
- The target branch of the pull request was changed.
- Merge checks on the pull request timed out.
- The pull request couldn’t be merged for two weeks. (This is the default period but an administrator can set it to a different value.)
- The pull request can't be merged with the selected merge strategy.
- The user who set auto-merge is no longer active or doesn’t have permission to merge.

If Bitbucket cancels auto-merge due to any reason or another user cancels auto-merge manually, you’ll receive an email notification about this, similarly to other pull request activities. On the pull request overview page, the record about the cancelation and its reason will appear. For example, the record about the cancelation due to the pull request changing target branches.

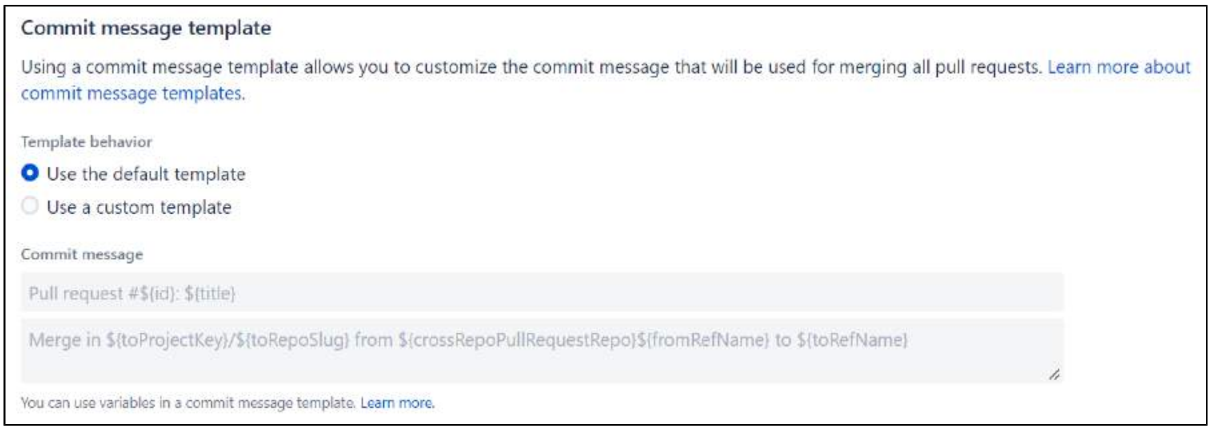


Bitbucket canceled auto-merge as the target branch was changed A moment ago

Customize a commit message for your pull requests

A commit message appears in the **Merge pull request** dialog. In your project or repository, you can use the default template or create a custom template for commit messages. You can configure this behavior in the **C ommit message template** section on the **Merge strategies** page. Under **Template behavior**, select one of the options:

- **Use the default template**: you won’t be able to edit the commit message template in the merge strategies but you’ll be able to change your commit messages when merging pull requests.
- **Use a custom template**: you’ll be able to edit the commit message template immediately, as well as change your commit messages when merging pull requests.



Commit message template

Using a commit message template allows you to customize the commit message that will be used for merging all pull requests. Learn more about commit message templates.

Template behavior

[✓ Use the default template]

Use a custom template

Commit message

Pull request #${id}: ${title}

Merge in ${toProjectKey}/${toRepoSlug} from ${crossRepoPullRequestRepo}${fromRefName} to ${toRefName}

You can use variables in a commit message template. Learn more.

Learn more about pull request merge strategies

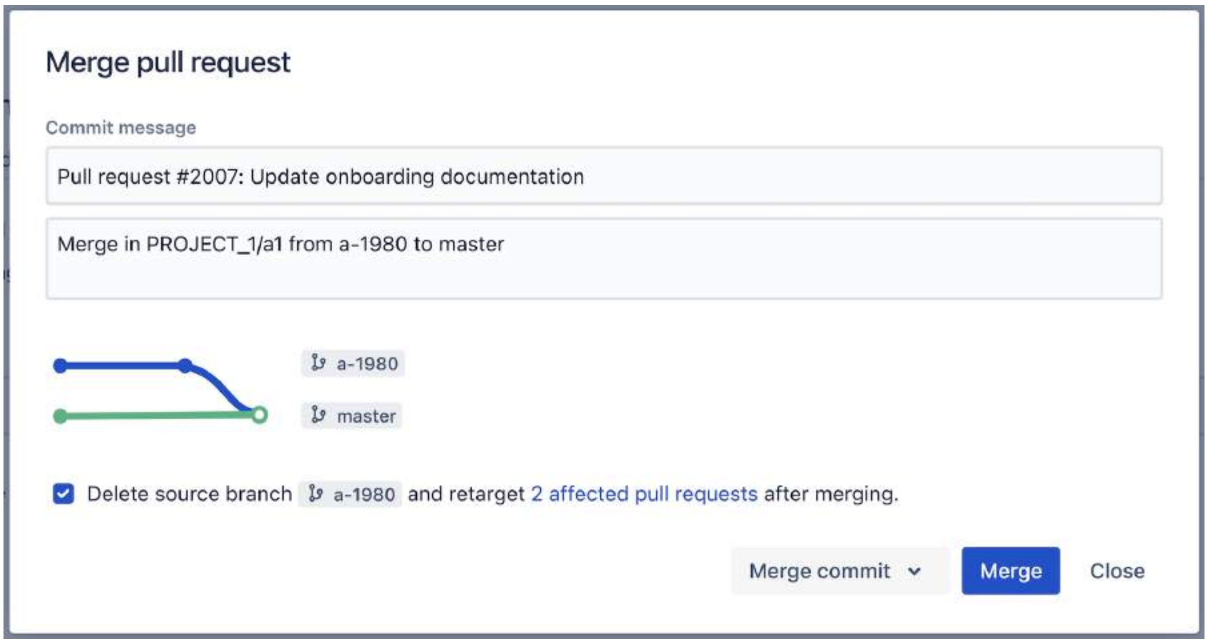
Delete source branch after merging

When merging a pull request, you can choose to **Delete source branch after merging** to keep your branch list clean.

If you choose to delete the source branch, any open pull requests targeting the source branch will be retargeted to the target branch. Select the **affected pull requests** link within the dialog to view the pull requests that will be modified.

Before deleting your source branch, Bitbucket will do some checks. The branch being merged will not be deleted if:

- The branch is the default repository branch.
- The user does not have permission to delete the branch.



Merge pull request

Commit message

Pull request #2007: Update onboarding documentation

Merge in PROJECT_1/a1 from a-1980 to master

✓ Delete source branch a-1980 and retarget 2 affected pull requests after merging.

Once accepted, the pull request is marked as merged on the *Pull requests* tab. If Bitbucket detects a conflict that prevents the merge, notifications are displayed on the *Overview* and *Diff* tabs of the pull request. Click **M ore information** to see instructions for how to resolve the conflict in your local repository.

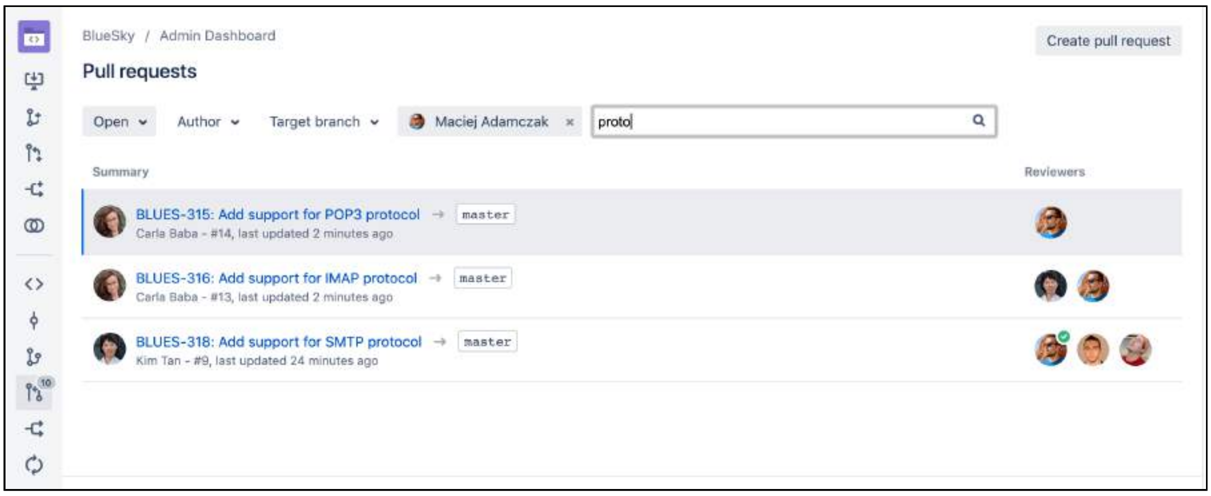
Search for pull requests

In Bitbucket Data Center, you can easily find pull requests within a repository by using the search bar and the following filters available on the pull request page:

- status
- author (the person who created the pull request)
- branch
- reviewer (the person who reviewed the pull request)
- text that is in the title or description

To find pull requests relating to your search criteria:

1. In the repository, click on the sidebar to go to the Pull requests page.
2. Choose your criteria or enter the pull request title or description in the search bar.



BLUES-315: Add support for POP3 protocol → master
Carla Baba - #14, last updated 2 minutes ago

BLUES-316: Add support for IMAP protocol → master
Carla Baba - #13, last updated 2 minutes ago

BLUES-318: Add support for SMTP protocol → master
Kim Tan - #9, last updated 24 minutes ago

Checks for merging pull requests

Pull requests provide a way to do peer code reviews and merges as part of a branch-based development workflow. As your team grows, you may need to set restrictions about when pull requests can be merged to protect your production code and keep code quality high. Merge checks can help you do this.

On this page:

Merge checks

Merge checks stop pull requests from being merged until they meet requirements that you’ve set. Your requirements can be based a range of things, including the number of reviewers who have approved the pull request, or the result of a Code Insights report. This ensures that pull requests are fully vetted before they’re merged. It also helps to avoid the problem of code review blockages and the need to completely lock down a repository.

Default merge checks

Bitbucket Data Center comes with some default merge checks.

By default, merge check settings from the project level are inherited by the repositories. Repository admins can either set a merge check to inherit the project-level setting or override it (by enabling or disabling the merge check at the repository-level).

Later when you modify a project-level merge check (enable or disable it), only merge checks in repositories that are set to inherit the project-level setting change to match the project-level merge check. Merge checks that've been set to override project-level settings will not change.

Starting from Bitbucket 8.10, project admins can also restrict repository-level customization of a merge check. Note that when you restrict changes, any custom settings saved at the repository-level for that merge check are deleted and the merge check inherits project settings.

The default merge checks that come with Bitbucket are:

- **All reviewers approve** - requires all reviewers to approve a pull request before merging.
- **Minimum approvals** - requires at least the specified number of approvals before merging.
- **Minimum successful builds** - requires at least the specified number of successful builds before merging.
- **No 'changes requested' status** - blocks the merge if any reviewers have marked the pull request as 'changes requested'.
- **No incomplete tasks** - requires all tasks to be complete before merging.

In addition to **minimum approvals** for a pull request, you can also set **default reviewers**. If both of these checks have been configured, they both need to be met in order to merge. In other words, meeting the minimum number of approvals won't be enough to merge if the default reviewers have not approved the pull request.

Configure merge checks for all repositories in a project

Enabling (or disabling) merge checks at the project level changes merge checks for repositories set to inherit project settings. If you previously changed merge checks for an individual repository, that repository's configuration will not change when configuring merge checks at the project level.

To enable (or disable) merge checks for repositories in a project (requires project admin permissions):

1. Go to **Project settings** > **Merge checks**.
2. Select **More actions ...** > **Enable** or **Disable**.
3. Optional: To disable repository-level customization, select **More actions ...** > **Don't allow**.

Configure merge checks for an individual repository

Enabling (or disabling) merge checks at the repository level enables a merge check for all pull requests created in that repository.

If your project admin hasn't restricted repository-level customization for a merge check, you can configure it to override the project-level setting (enabled or disabled) or set it to inherit the project-level setting.

To enable (or disable) merge checks for a single repository (requires repository admin permissions):

1. Go to **Repository settings** > **Merge checks**.
2. Select **More actions ...** >
   a. **Inherit from project**, to use the project-level setting
   b. **Enable** or **Disable** to override the project-level setting

Add a new merge check

Additional merge checks can be installed by system administrators and can also be enabled for all repositories in a project, or for individual repositories.

To add merge checks from the Atlassian Marketplace (requires system admin permission):

1. Go to **Project settings** > **Merge checks**.
2. Click **Add merge check**.
3. Search for a merge check to add, and click **Install**.

Once you add a new merge check, you can enable (or disable) it in the same way as the default merge checks.

Create a merge check

You can also write your own merge request check plugin.

Code Insights merge checks

You can block pull requests from being merged until their Code Insights reports meet your requirements. You can set these merge checks for all the repositories in a project, or a single repository, and your requirements can be based on whether:

- a specific report is present
- the report passes or fails
- the report adds annotations of a certain severity to the diff

⚠ Annotations only block merging if they are on the diff. If they’re somewhere else on a changed file, or on a file that hasn’t changed they won’t block the merge.

To add a Code Insights merge check for all the repositories in a project (requires project admin permissions):

1. Go to **Project settings** > **Code Insights**.
2. Enter the report key of your required report. You can find this on the report in the bottom right.
3. Enter its required status and its annotation requirements.
4. Click **add**.

To add a Code Insights merge check for a repository (requires repository admin permissions):

1. Go to **Repository settings** > **Code Insights**.
2. Enter the report key of your required report. You can find this on the report in the bottom right.
3. Enter its required status and its annotation requirements.
4. Click **add**.

Required builds merge check

ⓘ This feature is available with a Bitbucket Data Center license.

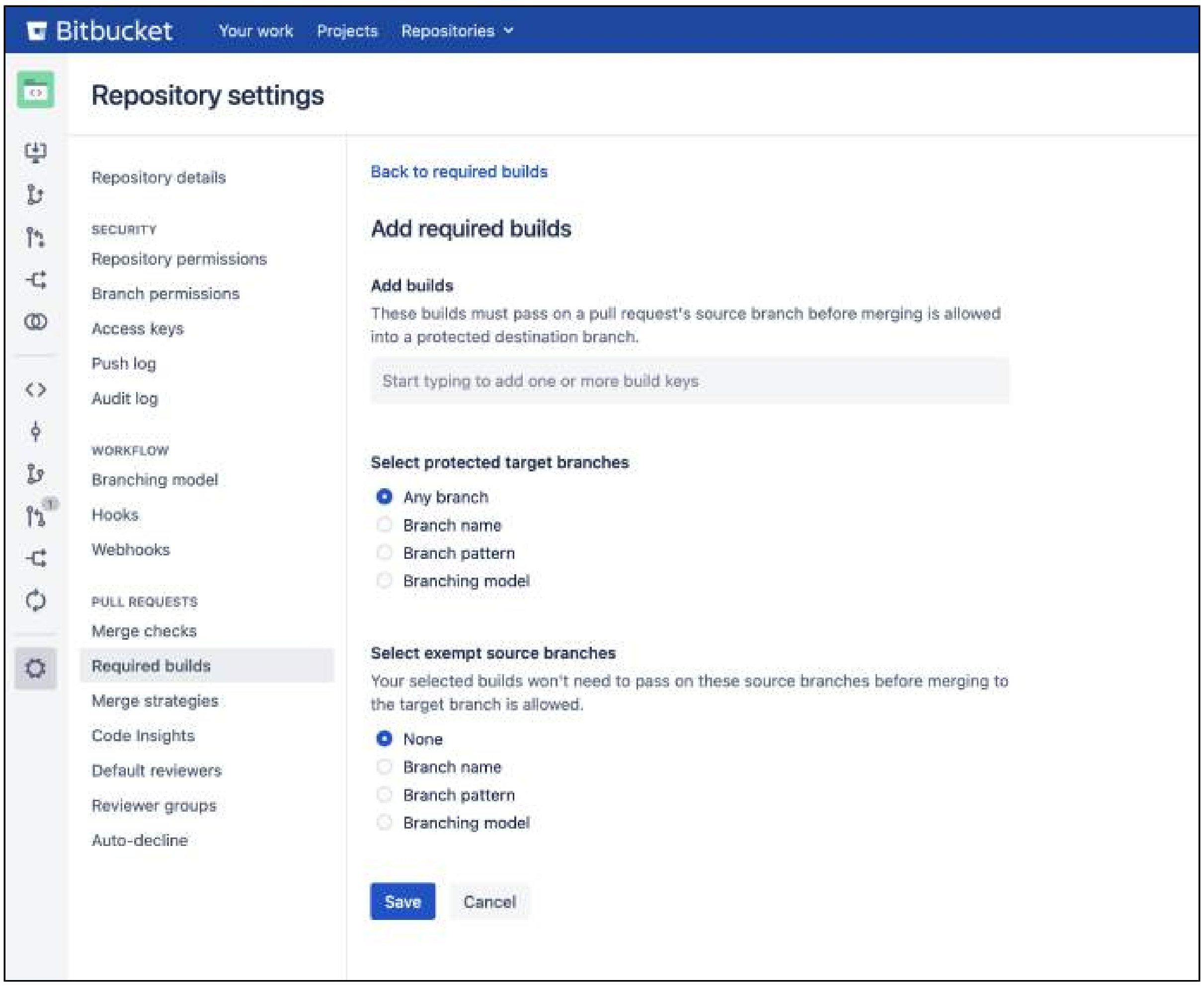
While the **minimum successful builds** merge check lets you require at least the specified number of successful builds, you can use the **required builds** merge check for requiring specific builds to successfully pass before a pull request can be merged into specified target branches.

Using required builds provides a simple but powerful interface to ensure code quality by protecting critical branches in your repository.

ⓘ To use required builds, you must have Bamboo 7.1+ or the Bitbucket Integration Plugin version 2.0.0 +. See Link your CI server for more details on integration guides.

To add a required build merge check for pull requests in a repository (requires repository admin permissions):

1. Go to **Repository settings** > **Required builds**.
2. Select **Add required builds**.
3. From the **Add required builds** page, input the details as described in the table below.
4. Select **Save**.



Add required builds

Add builds

These builds must pass on a pull request's source branch before merging is allowed into a protected destination branch.

Start typing to add one or more build keys

Select protected target branches

[✓ Any branch]
Branch name
Branch pattern
Branching model

Select exempt source branches

Your selected builds won't need to pass on these source branches before merging to the target branch is allowed.

[✓ None]
Branch name
Branch pattern
Branching model

Field	Description

Add builds	Add any build keys here that will need to successfully pass before merging a pull request. The build key will depend on the CI tool used to generate the build. For example; • In **Bamboo**, you may have a *project key* called PROJ, and a *plan key* called COREBUILDS, so then the build key in this field would be PROJ-COREBUILDS. • The build key of a **Jenkins** job is the name of each item in the path to the build, separated by a forward slash. For example; a folder called PROJ that contains a multibranch pipeline job called COREBUILDS, then the build key would be PROJ /COREBUILDS.
Select protected target branches	Choose from a list of branches. Any pull request with a target branch that matches this setting will need to have successful builds on the latest commit before it can be merged. You can set this merge check to apply to **Any branch** in the repository, or you can be more specific by choosing: • **Branch name** - a specific branch by name • **Branch pattern** - a pattern syntax for matching branch names • **Branching model** - any branch types that you have enabled will display here
Select exempt source branches	In some cases, you may want to add specific source branches that won’t need to pass in the selected required build(s). For example; you could allow urgent fixes to skip build checks by adding the **Branch pattern** `hotfix-*`, which would allow any branch starting with `hotfix-` to be merged without a successful build. Leave this option set to **None** if you don’t want to add an exemption, otherwise choose from the following: • **Branch name** - a specific branch by name • **Branch pattern** - a pattern syntax for matching branch names • **Branching model** - any branch types that you have enabled will display here

Pull request merge strategies

Conflicts can happen with any of these merge strategies. When a conflict occurs,Bitbucket Data Center will leave the repository as it was before attempting to apply the merge. To resolve such conflicts, check out the target branch locally and attempt to apply the rebase. The Git client can then facilitate resolution of these conflicts, finalize the local rebase and be pushed to the server. At that point you may wish to manually fast-forward the target branch, or simply attempt the pull request merge again using the web interface.

Git merge strategies affect the way the Git history appears after merging a pull request. With Bitbucket, you can choose which merge strategies to allow, and enable one or more merge strategies for all repositories in a project or for an individual repository. You can also allow users to choose a merge strategy from the merge dialog when they create a pull request.This page describes how to configure which merge strategies are available to your users, and briefly describes the merge strategies available.

On this page:

Merge strategies

By default, merge strategy settings from the project level are inherited by the repositories. Repository admins can either choose to inherit the project-level settings or override it by configuring custom settings at the repository level.

Later when you modify project settings, only settings in repositories that are set to inherit the project-level setting change to match the project merge strategy settings.

Starting from Bitbucket 8.10, project admins can also restrict changes to repository-level settings. Note that when you restrict changes, any custom settings saved at the repository-level are deleted and the repositories inherit project settings.

The merge strategies available in Bitbucket are:

- **Merge commit** (`--no-ff`) DEFAULT: Always create a new merge commit and update the target branch to it, even if the source branch is already up to date with the target branch.
- **Fast-forward** (`--ff`): If the source branch is out of date with the target branch, create a merge commit. Otherwise, update the target branch to the latest commit on the source branch.
- **Fast-forward only** (`--ff-only`): If the source branch is out of date with the target branch, reject the merge request. Otherwise, update the target branch to the latest commit on the source branch.
- **Rebase, merge** (`rebase + merge --no-ff`): Commits from the source branch onto the target branch, creating a new non-merge commit for each incoming commit. Creates a merge commit to update the target branch. The PR branch is **not** modified by this operation.
- **Rebase, fast-forward** (`rebase + merge --ff-only`): Commits from the source branch onto the target branch, creating a new non-merge commit for each incoming commit. Fast-forwards the target branch with the resulting commits. The PR branch is **not** modified by this operation.
- **Squash** (`--squash`): Combine all commits into one new non-merge commit on the target branch.
- **Squash, fast-forward only** (`--squash --ff-only`): If the source branch is out of date with the target branch, reject the merge request. Otherwise, combine all commits into one new non-merge commit on the target branch.

Commit message templates

Instead of using the default commit message in your pull requests, you can create a custom template for commit messages and apply this template at a project or repository level.

When you merge a pull request, the value set in the template will be used to populate the title and body fields of the commit message in the merge modal. Commit message templates also support variables, allowing your commit messages to include details such as the source and target branch or the approvers of the pull request.

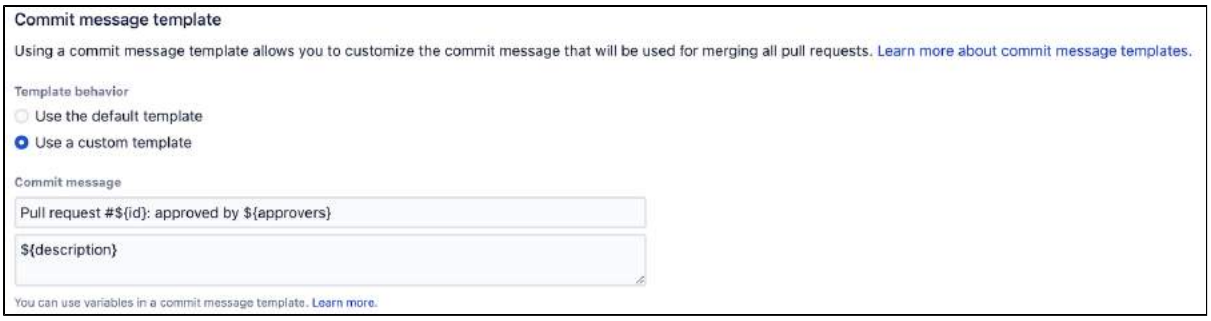
To configure a custom template for commit messages:

1. Navigate to **Project** or **Repository** settings > **Merge strategies**.
2. Under **Commit message template**, set **Template behavior** to **Use a custom template**.
3. Enter the desired title and body in the **Commit message** fields. You can use the supported variables.

   The title is mandatory.

   The following variables are supported:
   a. `title` – the pull request title
   b. `id` – the pull request ID
   c. `description` – the pull request description
   d. `toProjectKey` – the project key of the target project
   e. `fromProjectKey` – the project key of the source project
   f. `toRepoSlug` – the slug of the target repository
   g. `fromRepoSlug` – the slug of the source repository
   h. `crossRepoPullRequestRepo` – the project and repository of the source ref when the pull request is a cross-repo pull request; or an empty string in the case where the source and target repositories are the same
   i. `toRefName` – the display name of the target ref
   j. `fromRefName` – the display name of the source ref
   k. `approvers` – a comma-separated list of users that have approved the pull request at the time the merge modal is opened; or an empty string in the case where there are no such approvals

4. Select **Save**.


Commit message template

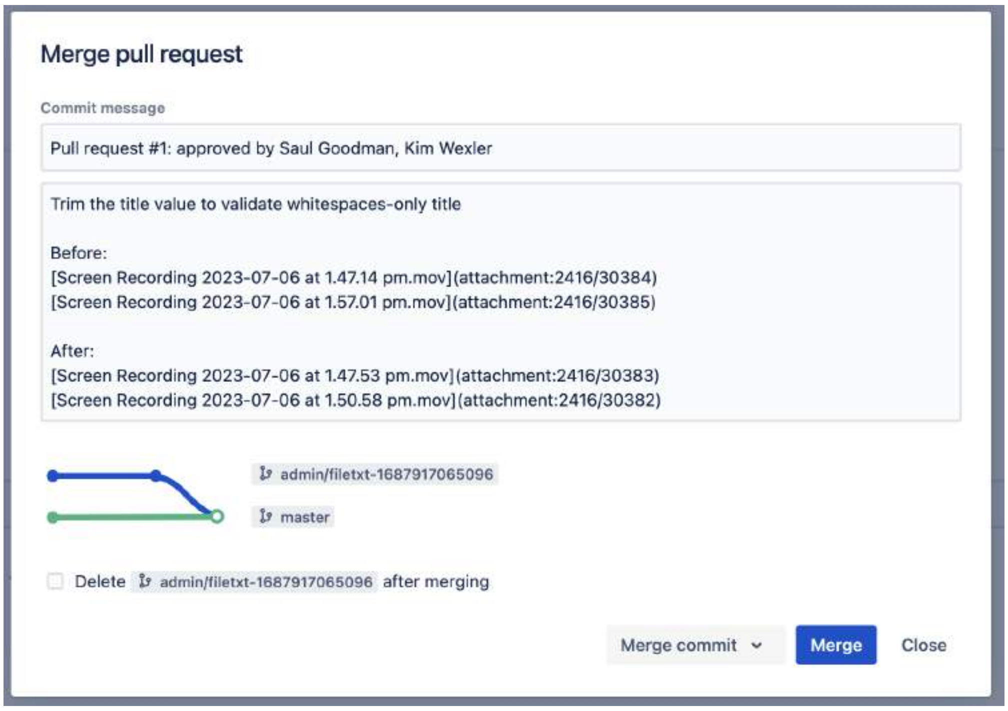
Using a commit message template allows you to customize the commit message that will be used for merging all pull requests. Learn more about commit message templates.

Template behavior
Use the default template
[✓ Use a custom template]

Commit message
Pull request #${id}: approved by ${approvers}
${description}

You can use variables in a commit message template. Learn more.

The template is applied when merging a pull request:


Merge pull request

Commit message

Pull request #1: approved by Saul Goodman, Kim Wexler

Trim the title value to validate whitespaces-only title

Before:
[Screen Recording 2023-07-06 at 1.47.14 pm.mov](attachment:2416/30384)
[Screen Recording 2023-07-06 at 1.57.01 pm.mov](attachment:2416/30385)

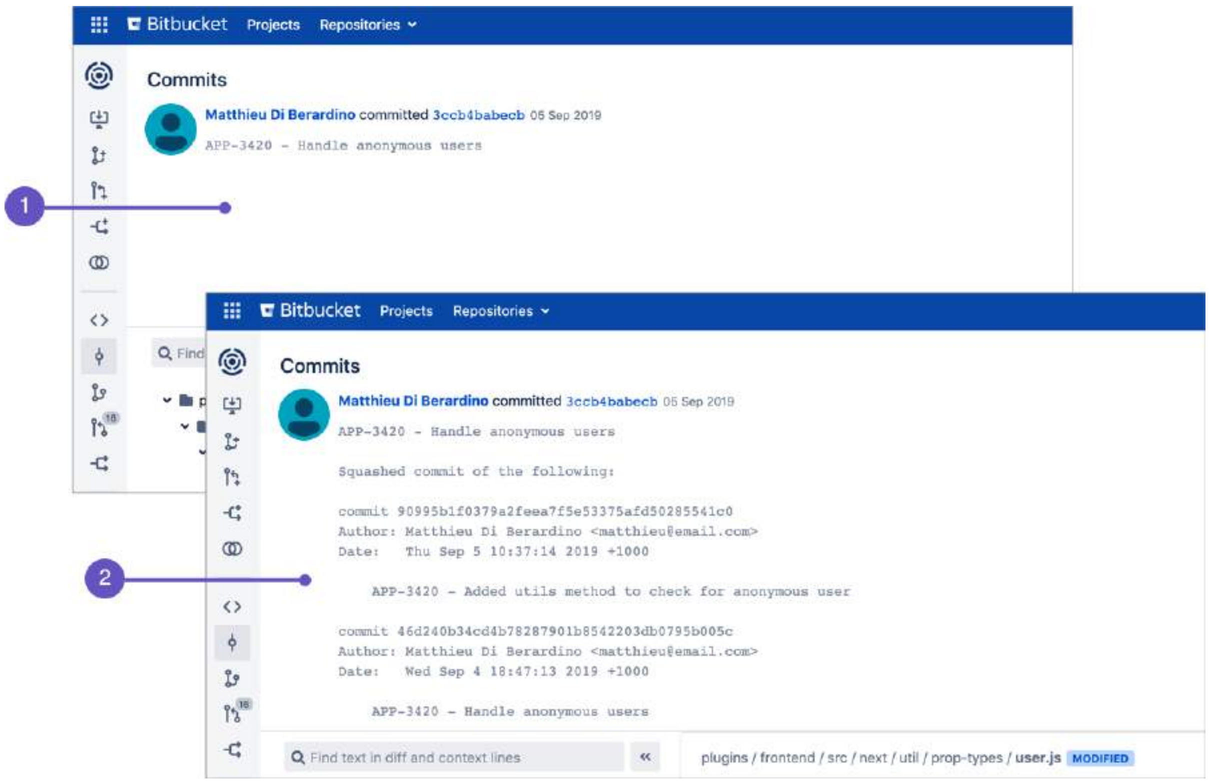
After:
[Screen Recording 2023-07-06 at 1.47.53 pm.mov](attachment:2416/30383)
[Screen Recording 2023-07-06 at 1.50.58 pm.mov](attachment:2416/30382)

admin/filetxt-1687917065096
master
Delete admin/filetxt-1687917065096 after merging
Merge commit
Merge
Close

Custom commit messages remain editable, so you can always make changes to yours before merging a pull request.

Commit summaries

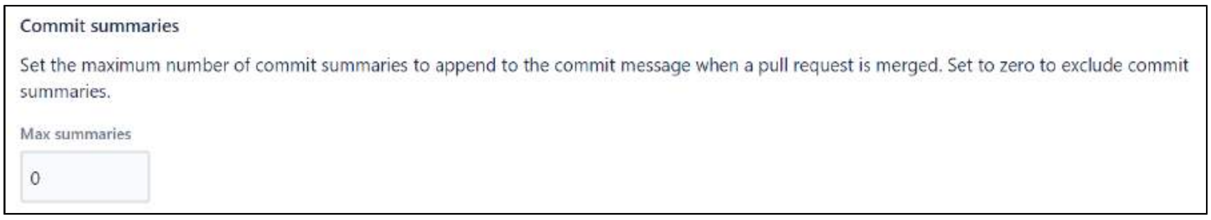
When you merge a pull request, you can control the number of commit summaries included in commit messages with the **Commit summaries** option. This setting is helpful if you don't want to see as many commit details in the commit message when merging or squashing a pull request. You can do this for all repositories in a project or a single repository (if your project admin hasn't restricted repository-level changes).


Bitbucket
Projects
Repositories
Commits
Matthieu Di Berardino committed 3ccb4babecb 05 Sep 2019
1
2
Find text in diff and context lines
plugins / frontend / src / next / util / prop-types / user.js MODIFIED

```
APP-3420 - Handle anonymous users
```

```
APP-3420 - Handle anonymous users

Squashed commit of the following:

commit 90995b1f0379a2feea7f5e53375afd50285541c0
Author: Matthieu Di Berardino <matthieu@email.com>
Date:   Thu Sep 5 10:37:14 2019 +1000

    APP-3420 - Added utils method to check for anonymous user

commit 46d240b34cd4b78287901b8542203db0795b005c
Author: Matthieu Di Berardino <matthieu@email.com>
Date:   Wed Sep 4 18:47:13 2019 +1000

    APP-3420 - Handle anonymous users
```

1. Commit with no summaries.
2. Commit with two summaries.


Commit summaries

Set the maximum number of commit summaries to append to the commit message when a pull request is merged. Set to zero to exclude commit summaries.

Max summaries

0

To set the maximum number of commit summaries for a single repository (requires repository admin permissions):

1. Go to **Repository settings** > **Merge strategies**.
2. Enter the maximum number of commit summaries to include. Specify zero to display no summaries.

To set the maximum number of commit summaries for a project (requires project admin permissions):

1. Go to **Project settings** > **Merge strategies**
2. Enter the maximum number of commit summaries to include. Specify zero to display no summaries.

Using rebase in Bitbucket

Rebasing allows you to replay feature branch commits onto the tip of your target branch, creating a linear history.
By rebasing your commits to the tip of the target branch, you retain existing commits, and simply add yours on top.

Potential issues

When using a rebase workflow, it's possible to encounter unexpected side effects if branches aren't carefully managed and tracked. For example:

- If you have a branch that uses a previously merged branch (using rebase) as a common ancestor, further merging (using rebase) can cause duplicate commits with empty content to be applied to a target branch.
- When running a `git pull` locally after a pull request's source branch has been rebased using the UI, it can result in unexpected merges between the original commits (still present on the local branch), and their rebased replacements, (fetched from the server). When pulling, if the tracking branch has been updated on the remote, by default Git will merge the incoming changes with the local commit.

Conflicts

Conflicts can happen with any merge strategy. When a conflict occurs, Bitbucket will leave the repository as it was before attempting to apply the merge.

To resolve such conflicts, check out the target branch locally, and attempt to apply the rebase. The Git client can then facilitate resolution of these conflicts, finalize the local rebase, and be pushed to the server.

At that point you may wish to manually fast-forward the target branch, or simply attempt the pull request merge again using the web interface.

Transactional failures

A transactional failure occurs when a two-step process (ie rebase, then merge) is taking place and other changes are made at the same time that prevent the second step from applying as expected. The impact for you means on occasion, if you try to rebase, it will fail, and won't apply the merge. You will receive a transactional failure notification if this happens.

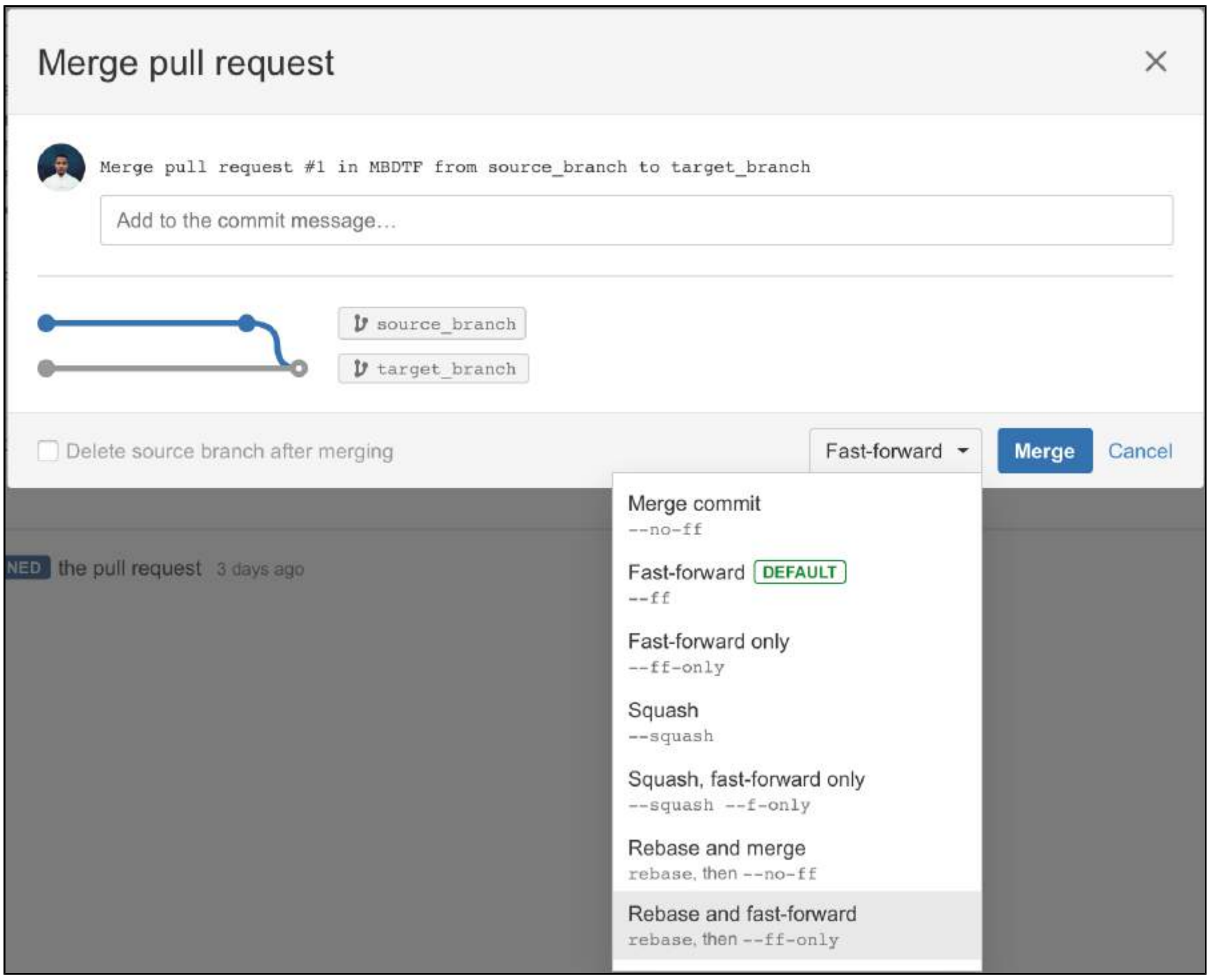
In the event there is a transactional failure, we recommend waiting a short time, refreshing the browser to load the latest pull request state, and trying again.

An **asynchronous** process updates pull requests when the source and target branches change, so multiple retries (or a longer wait) may be required before the system is in a consistent state to attempt the merge.

Need more context? Try our merging versus rebasing tutorial.

Change the merge strategy for a single pull request

Which merge strategies can be used is determined by the merge strategies enabled by your project or repository admins.


Merge pull request

Merge pull request #1 in MBDTF from source_branch to target_branch

Add to the commit message...

To change the merge strategy for a specific pull request:

1. When merging a pull request, click the default merge strategy in use, then select a new one.
2. Add a comment (if applicable), the click **Merge**.

Configure merge strategies for all repositories in a project

Enabling a merge strategy at the project level allows users to choose that merge strategy when merging pull requests for all repositories in a project.

To enable (or disable) merge strategies for all repositories in a project (requires project admin permissions):

1. Go to **Project settings** > **Merge strategies**.
2. Select the toggle next to a merge strategy to enable (or disable) it.
3. Click **Save**.
4. Optional: To restrict repository-level changes, select **Don't allow changes to merge strategies** from the **Restrict changes to repository settings** menu.

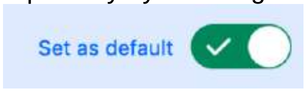
Users can now choose any of the merge strategies you enabled when they merge pull requests from the repositories in the project.

Configure merge strategies for an individual repository

If the project admin hasn't restricted repository-level changes, you can customize settings for individual repositories.

Enabling (or disabling) a merge strategy at the repository level allows users to choose that merge strategy when merging pull requests created in that repository. Configuring merge strategies at the repository level requires you to override merge strategies configured at the project level. If you have not configured merge strategies for an individual repository it will inherit the merge strategies enabled at the project level.

To enable (or disable) merge strategies for a single repository (requires repository admin permissions):

1. Go to **Repository settings** > **Merge strategies**.
2. In the *Project settings inheritance* section, select **Use custom settings**.
3. Click the toggle by a merge strategy to enable (or disable) it.
4. (Optional) Once a merge strategy is enabled you can set it as the default merge strategy for that repository by hovering next to the toggle and clicking **Set as default**.


5. Click **Save**.

Once set, any changes made to merge strategies at the project level will be ignored for this repository because it was changed independent of the project configuration.

Code Insights

Code Insights is a feature added in Bitbucket Server 5.15.

It surfaces information relevant to a pull request, so the author and reviewers are able to make better informed decisions. Information supplied could include:

- static analysis reports
- security scan results
- artifact links
- unit tests
- build status

It includes an API, and a UI so apps created by a third-party can supply data to be surfaced on the pull requests.

The information comprises two parts; **annotations** and **reports**.

Integrations

Integrations can be built to send data to pull requests. Integrations that have been built by third-parties can be found in the Atlassian marketplace.

Building an integration: Resources

If you're looking to build your own integration, we have some tutorials available on Atlassian's developer documentation site.

If you are interested in **adding Code Insights as part of your CI pipeline**, here is a very helpful resource.

If you're wanting a more comprehensive overview of the feature and how it works, try the how to add code insights to pull requests tutorial.

Quality reports and annotations

Quality reports

The generated reports show summary information sent by any integration to Bitbucket Data Center for your branch. They can also be run against your branch without sending a report.

Reports can contain:

- a description
- a link back to the reporter’s URL
- up to 6 fields for displaying data
- the annotations attached to the report (if there are any).

Annotations

Annotations show specific information on a given line in the pull request, and must be attached to a report.

Annotations are shown on the **unified diff view**, and on **reports**. They are not shown on side-by-side diff, commit diffs, or iterative diff.

You can see annotations on:

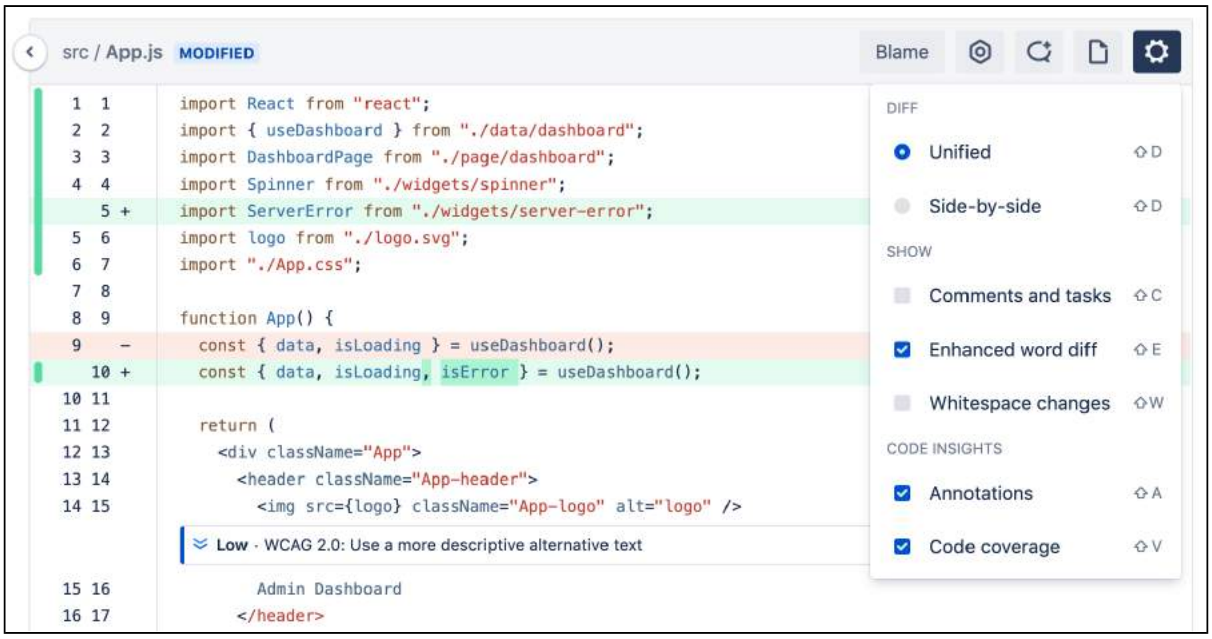
- changed lines, or
- lines added in the pull request.

This ensures that there is not too much noise from annotations that are not relevant to you.

Hiding annotations from the diff view

If you need to work without annotations enabled, you can hide them by using keyboard shortcut **Shift + A** or:

1. Click **Diff view settings** ⚙.
2. Clear the **Annotations** check box option in the menu.

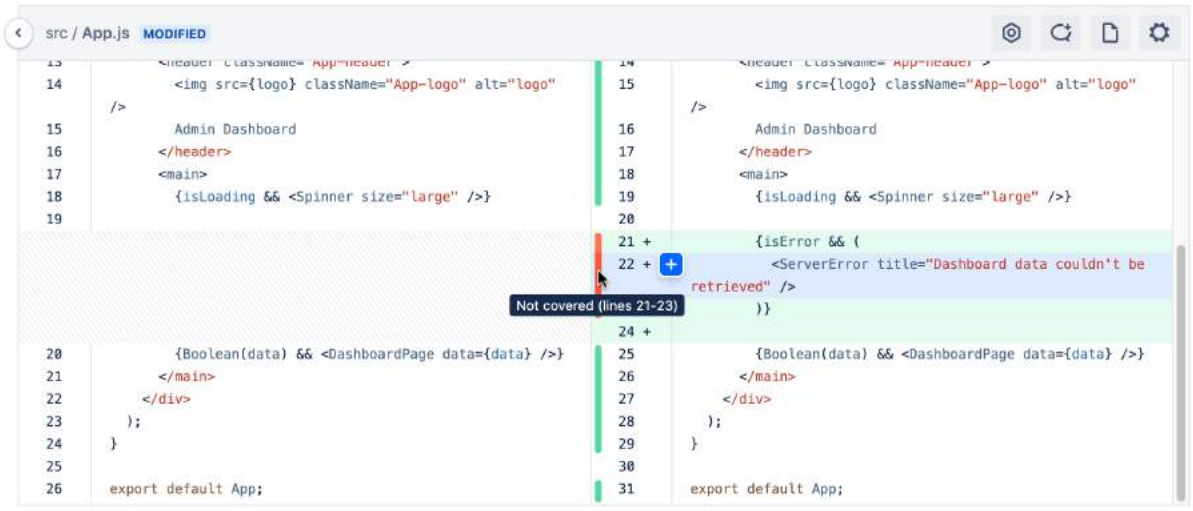


```
    import React from "react";
    import { useDashboard } from "./data/dashboard";
    import DashboardPage from "./page/dashboard";
    import Spinner from "./widgets/spinner";
  + import ServerError from "./widgets/server-error";
    import logo from "./logo.svg";
    import "./App.css";

    function App() {
  -   const { data, isLoading } = useDashboard();
  +   const { data, isLoading, isError } = useDashboard();

      return (
        <div className="App">
          <header className="App-header">
            <img src={logo} className="App-logo" alt="logo" />
  Low · WCAG 2.0: Use a more descriptive alternative text
            Admin Dashboard
          </header>
```

Code coverage

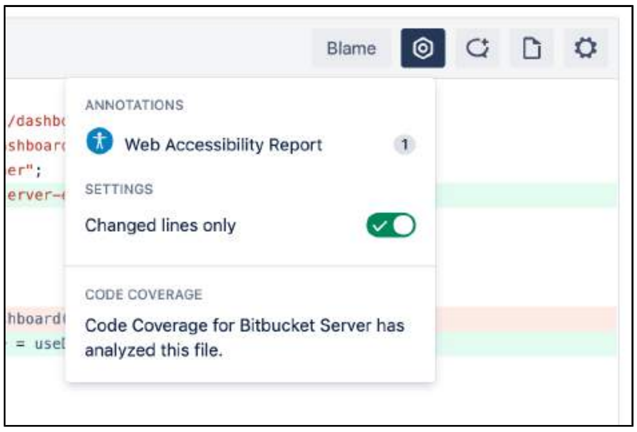
To ensure code that you are reviewing meets the quality requirements it takes to move on to the next stage of development, review code covered directly inside of a pull request without leaving Bitbucket by integrating your code coverage tool.

As part of your continuous integration (CI) workflow, code coverage finds aspects of the code which may not have been covered adequately by tests. The results are compiled and displayed in the diff view by color-coded blocks presenting which lines of code are covered **Fully**, **Partially**, or **Not covered**.



```
          <img src={logo} className="App-logo" alt="logo"
/>
          Admin Dashboard
        </header>
        <main>
          {isLoading && <Spinner size="large" />}

+         {isError && (
+           <ServerError title="Dashboard data couldn't be
retrieved" />
          )}
+
          {Boolean(data) && <DashboardPage data={data} />}
        </main>
      </div>
    );
  }

  export default App;
```

You can then also dig into a coverage report if it's provided, to see those actual lines that may not have been covered and use that to identify critical parts of your application that still need to be tested.



Code Coverage for Bitbucket Server has analyzed this file.

Hiding code coverage from the diff view

If you need to work without code coverage displayed, you can hide it by using keyboard shortcut **Shift + V** or:

Click **Diff view settings** ⚙.

Clear the **Code coverage** check box option in the menu.

Head to Atlassian Marketplace for Apps that support Code Insights. Here is the link to API if you want to integrate it with your own code coverage app.

Enhancements to your code review workflow

Since version 7.0 of Bitbucket Data Center, we've been making big improvements to our pull request experience. This page collects them all in one spot for you.

Update	Released version
Draft pull requests	8.18
Add reviewers to pull requests with quick adds	8.18
Paste links right into the text of your comments in pull requests	8.18
Add tables to comments in pull requests	8.18
Signed system commits	8.17
Download .patch and .diff files from a pull request	8.17
Copy code blocks with one click	8.17
Pull request auto-merge	8.15
Define code owners for pull request reviews and shared codebase expertise	8.14
Preview and watch videos from pull requests with a web video player	8.13
Discover unsigned commits and inspect committers' identities	8.13
Custom template for commit messages	8.12
Resolve and collapse comments	8.9
Diff view updates	8.0
Update	**Release version**
Reviewer groups for pull requests	7.13
Pull request description templates	7.13
Update pull requests to the latest version	7.10
New code review workflow	7.7
React to comments	7.7
Accessible colors for the diff view	7.7

On this page:

View hidden comments	7.4
Locate pull requests by searching for text and selecting a reviewer	7.2
Pull requests get a makeover	7.0
Task improvements in a pull request	7.0
We've got your code covered	7.0

Keep your work in progress with draft pull requests

Are you working on a piece of code that you'd like to get some early feedback on but that still isn't ready for the final review? You no longer have to bother about how to let the team know that your work is still in progress. Instead, you can simply create a draft!

You can work on a draft pull request as long as you need and add only wanted reviewers to it manually. Until you make the pull request ready for review, it can't be merged. At the same time, with the help of webhooks, you can update your integrations with CI tools and other platforms to track draft pull requests, thus maintaining total control over your workflows.

Add reviewers to pull requests with quick adds

You can now use the quick add buttons to share your code with all the preconfigured default reviewers or code owners.

When you remove any of the automatically added reviewers from your pull request when creating or editing it, you can quickly add them back with the **Default reviewers** and **Code owners** buttons. The buttons will appear under the **Reviewers** field if any default reviewers or code owners, respectively, have been configured for the branches you're working with. When hovering over the buttons, you can also check how many more reviewers from each group you can add.

Paste links right into the text of your comments in pull requests

The text editor in pull request comments now also allows you to paste a copied link right into the text you highlighted by hitting CTRL+V or Command+V on your keyboard. No need to play around with brackets.

Add tables to comments in pull requests

Adding tables to pull request comments is now faster and more convenient! When commenting on a pull request, you can now add a table to your message by simply selecting the table icon in the text editor and creating a scaffolding of a table with the Markdown syntax.

Signed system commits

All commits created by Bitbucket Data Center can now be automatically signed with a public system GPG key. System-signed commits ensure that all code commits in Bitbucket have verifiable signatures, helping you comply with the strictest security and compliance standards.

Learn more about signed system commits

Download .patch and .diff files from a pull request

You can now download `.diff` and `.patch` files directly from pull requests. Conducting a thorough code review in the comfort of your IDE and easily share the files with your team, streamlining collaboration and maintaining flexibility in your project work to stay aligned with diverse developer workflows and preferences.

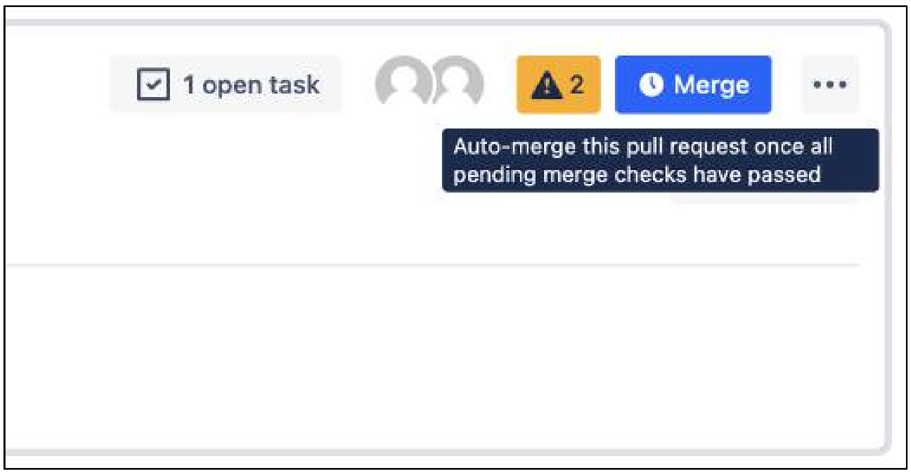
Copy code blocks with one click

No more tedious manual selection of code snippets! To copy a code block, select the **Copy** button that will appear when you hover over any code block in comments.

Auto-merge your pull requests

How often are you pulled away from your work to check if a pull request is ready for merge? With auto-merge for pull requests, this tedious monitoring will no longer take your precious time!

Auto-merge allows users to select whether they want Bitbucket to merge a pull request on their behalf when it’s ready to be merged. If auto-merge is available, the clock icon will appear on the Merge button.


1 open task
2
Merge
Auto-merge this pull request once all pending merge checks have passed

When all merge checks have passed, Bitbucket will automatically merge this pull request on behalf of the user who submitted the pull request for auto-merge.

Learn more about auto-merging pull requests

Define code owners for pull request reviews and shared codebase expertise (releases 8.14)

SERVER DATA CENTER

You can now define owners with expertise for specific areas of the codebase by creating a CODEOWNERS file in your repository. A code owner will be automatically notified about any pull request that introduces changes to the code they’re responsible for. Code owners will also be automatically added to pull requests as reviewers.

Learn more about how to define code owners

Preview and watch videos from pull requests with a web video player (released 8.13)

DATA CENTER

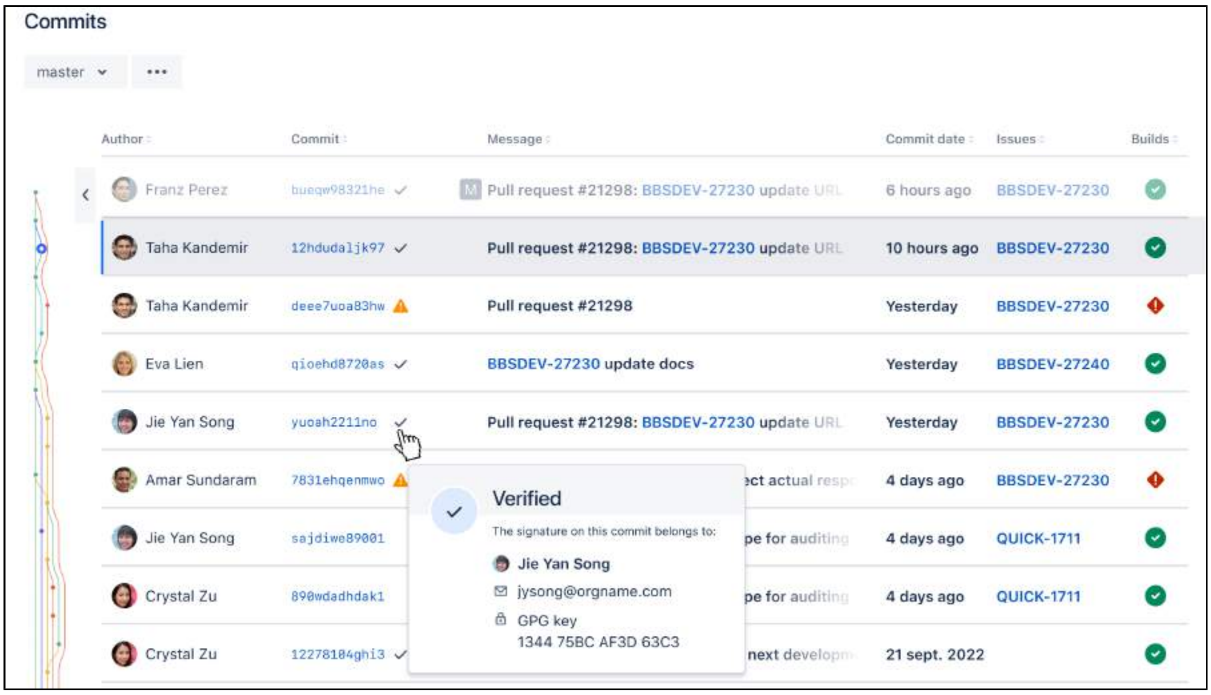
With a built-in video player, you can now preview and watch videos from descriptions and comments in pull requests. If you’re attaching a video file from your own storage to a pull request, make sure that the video meets the following requirements:

- The supported formats are `mp4`, `mov`, and `webm`.
- The maximum file size is 10 Mb.

Discover unsigned commits and inspect committers' identities (released 8.13)

SERVER DATA CENTER

While signing commits with GPG keys has already been available in Bitbucket, you can now check if a commit has a verified signature or not on the **Commits** page. A quick glance at the page will help you find signed and unsigned commits and identify their authors. So you can always monitor the security of changes to your code and timely react to any suspicious issues.


Commits

master

Author	Commit	Message	Commit date	Issues	Builds
Franz Perez	buoqw98321he ✓	Pull request #21298: BBSDEV-27230 update URL	6 hours ago	BBSDEV-27230	✓
Taha Kandemir	12hdudaljk97 ✓	Pull request #21298: BBSDEV-27230 update URL	10 hours ago	BBSDEV-27230	✓
Taha Kandemir	deee7uoa83hw ⚠	Pull request #21298	Yesterday	BBSDEV-27230	⚠
Eva Lien	qioehd8720as ✓	BBSDEV-27230 update docs	Yesterday	BBSDEV-27240	✓
Jie Yan Song	yuoah2211no ✓	Pull request #21298: BBSDEV-27230 update URL	Yesterday	BBSDEV-27230	✓
Amar Sundaram	7831ehqenmwo ⚠	ect actual resp	4 days ago	BBSDEV-27230	⚠
Jie Yan Song	sajdiwe89001	pe for auditing	4 days ago	QUICK-1711	✓
Crystal Zu	890wdadhdak1	pe for auditing	4 days ago	QUICK-1711	✓
Crystal Zu	12278184ghi3 ✓	next developm	21 sept. 2022		✓

Verified

The signature on this commit belongs to:

Jie Yan Song

jysong@orgname.com

GPG key
1344 75BC AF3D 63C3

Custom template for commit messages (released 8.12)

SERVER DATA CENTER

After release 8.12, you can configure a custom template for a commit message. When you merge a pull request, the value set in the template will be used to populate the title and body fields of the commit message in the merge modal. Commit message templates also support variables, allowing your commit messages to include details such as the source and target branch or the approvers of the pull request.

If the custom template isn't set, Bitbucket will generate a commit message suggestion for you in the same way it does in previous versions.

This feature helps you establish a standard practice for your pull requests. Your team will add consistent, informative commit messages and create a useful Git commit history without wasting time copying and pasting the required details.

Learn how to configure commit message templates

Resolve and collapse comments (released 8.9)

SERVER DATA CENTER

When a pull request has lots of comments it becomes hard to navigate and focus on really important discussions. You can now resolve comment threads to communicate to the rest of the pull request participants that the issue has been addressed, the decision has been made, and no further discussion is needed.

If many comments on the pull request are still open and you want to focus on the code diff, you can quickly declutter your view by collapsing comment threads.

Learn how to resolve comments

Diff view updates (released 8.0)

In 7.0, we redesigned pull requests and gave them a makeover. We've now moved all the diff views (including commit diffs, branch compares, and the Create Pull Request page) to the new format – enjoy a faster and consistent code collaboration experience!

If your app or integration uses frontend plugin points on these pages, refer to the API changes in the original pull request update.

Reviewer groups for pull requests (released 7.13)

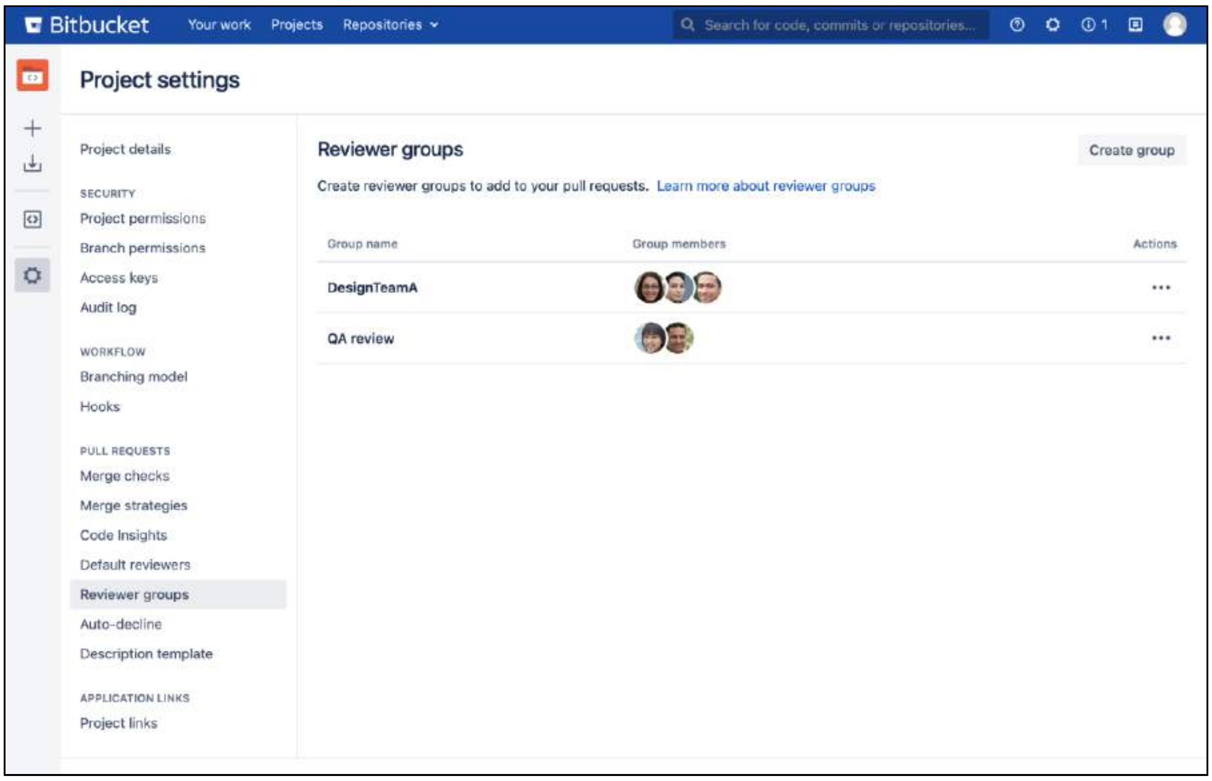
DATA CENTER

Spending more time than you should be, adding the same reviewers to your pull request, one user at a time? Reviewer groups are here to help you quickly add the right reviewers that need to be involved with your code review.

While creating a pull request, start by simply typing a group name into the Reviewers field, and then select a reviewer group to add.

Your browser does not support the HTML5 video element

Project and repository admins create and manage reviewer groups. This makes it easier for development teams to self-manage these groups. Select group members from existing Bitbucket users that have access to the project or repository.



Reviewer groups

Create reviewer groups to add to your pull requests. Learn more about reviewer groups

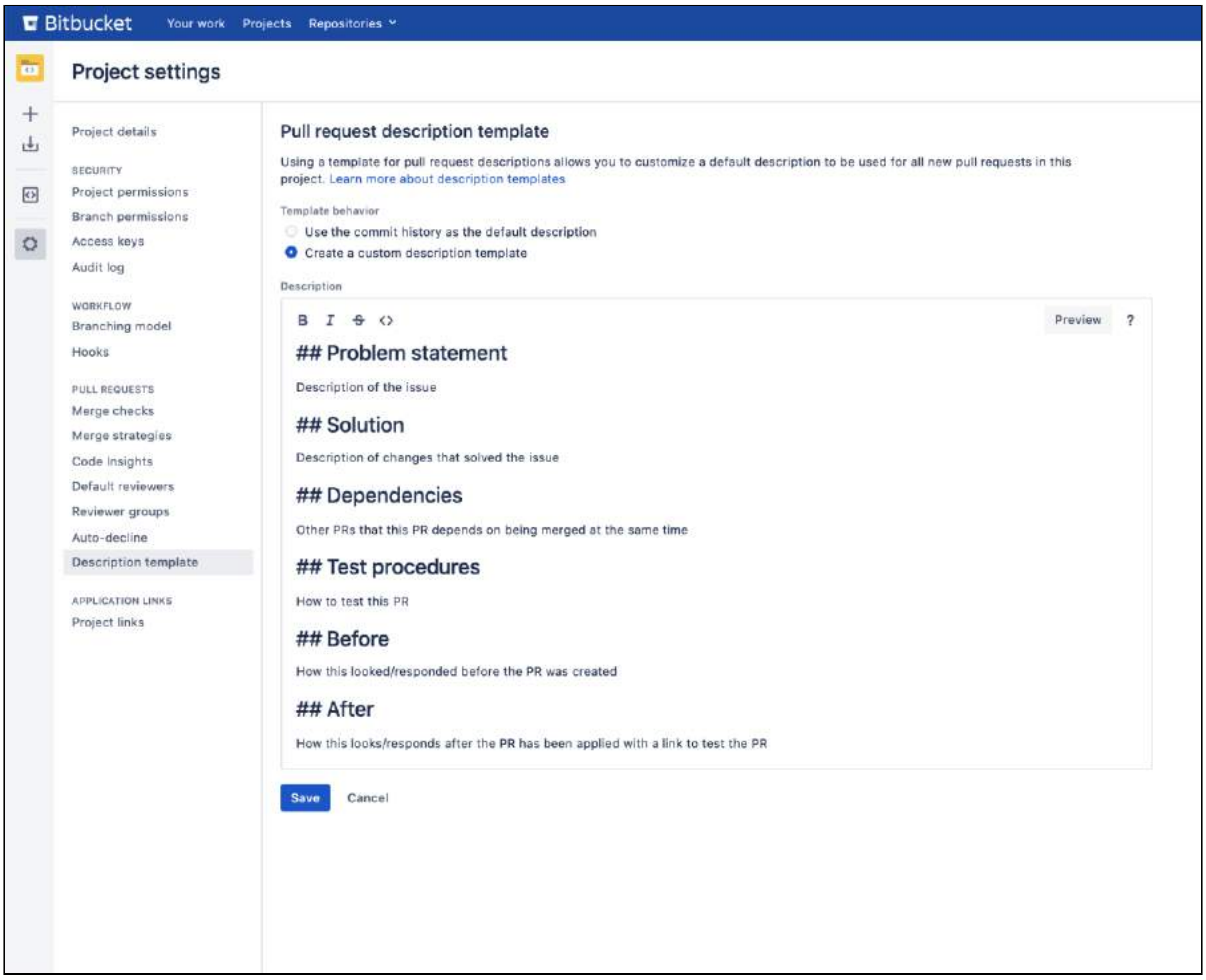
Group name	Group members	Actions
DesignTeamA		•••
QA review		•••

Get more information on how reviewer groups can help speed up your code review workflow.

Pull request description templates (released 7.13)

DATA CENTER

Having a template for your pull request descriptions will save time and help reviewers know what to expect while doing code reviews. Communicate review guidelines, or even remind authors about common tasks that should be done. When a new pull request is created, contents of the default description template are used and automatically applied.



Pull request description template

Using a template for pull request descriptions allows you to customize a default description to be used for all new pull requests in this project. Learn more about description templates

Template behavior

○ Use the commit history as the default description
● Create a custom description template

Description

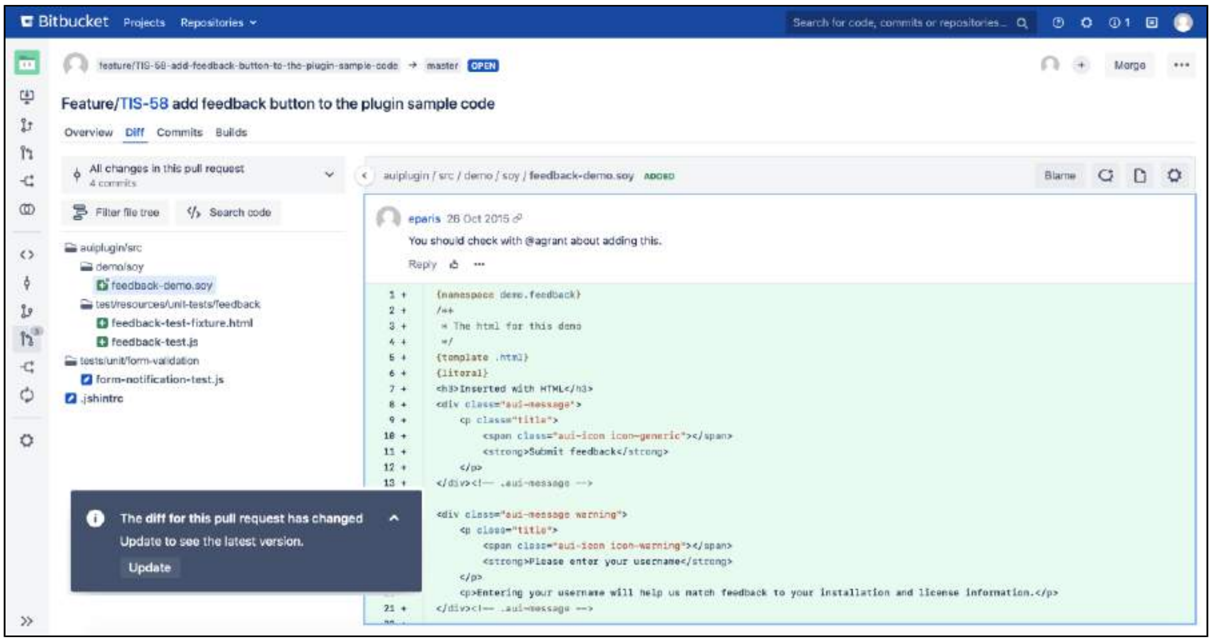
Problem statement
Description of the issue
Solution
Description of changes that solved the issue
Dependencies
Other PRs that this PR depends on being merged at the same time
Test procedures
How to test this PR
Before
How this looked/responded before the PR was created
After
How this looks/responds after the PR has been applied with a link to test the PR

You can find the new description template for pull requests on the **Project settings** page.

Update pull requests to the latest version (released 7.10)

SERVER DATA CENTER

Now, when you're in the middle of reviewing code and a pull request is modified, Bitbucket will notify you so that you can update it to see the latest changes.


Bitbucket
Projects
Repositories
Search for code, commits or repositories...
feature/TIS-58-add-feedback-button-to-the-plugin-sample-code
master
OPEN
Merge
Overview
Diff
Commits
Builds
All changes in this pull request
4 commits
Filter file tree
Search code
auiplugin/src
demo/soy
feedback-demo.soy
test/resources/unit-tests/feedback
feedback-test-fixture.html
feedback-test.js
tests/unit/form-validation
form-notification-test.js
.jshintrc
auiplugin / src / demo / soy / feedback-demo.soy
ADDED
Blame
Reply
Update

Feature/TIS-58 add feedback button to the plugin sample code

eparis 26 Oct 2015

You should check with @agrant about adding this.

```
{namespace demo.feedback}
/**
 * The html for this demo
 */
{template .html}
{literal}
<h3>Inserted with HTML</h3>
<div class="aui-message">
    <p class="title">
        <span class="aui-icon icon-generic"></span>
        <strong>Submit feedback</strong>
    </p>
</div><!-- .aui-message -->

<div class="aui-message warning">
    <p class="title">
        <span class="aui-icon icon-warning"></span>
        <strong>Please enter your username</strong>
    </p>
    <p>Entering your username will help us match feedback to your installation and license information.</p>
</div><!-- .aui-message -->
```

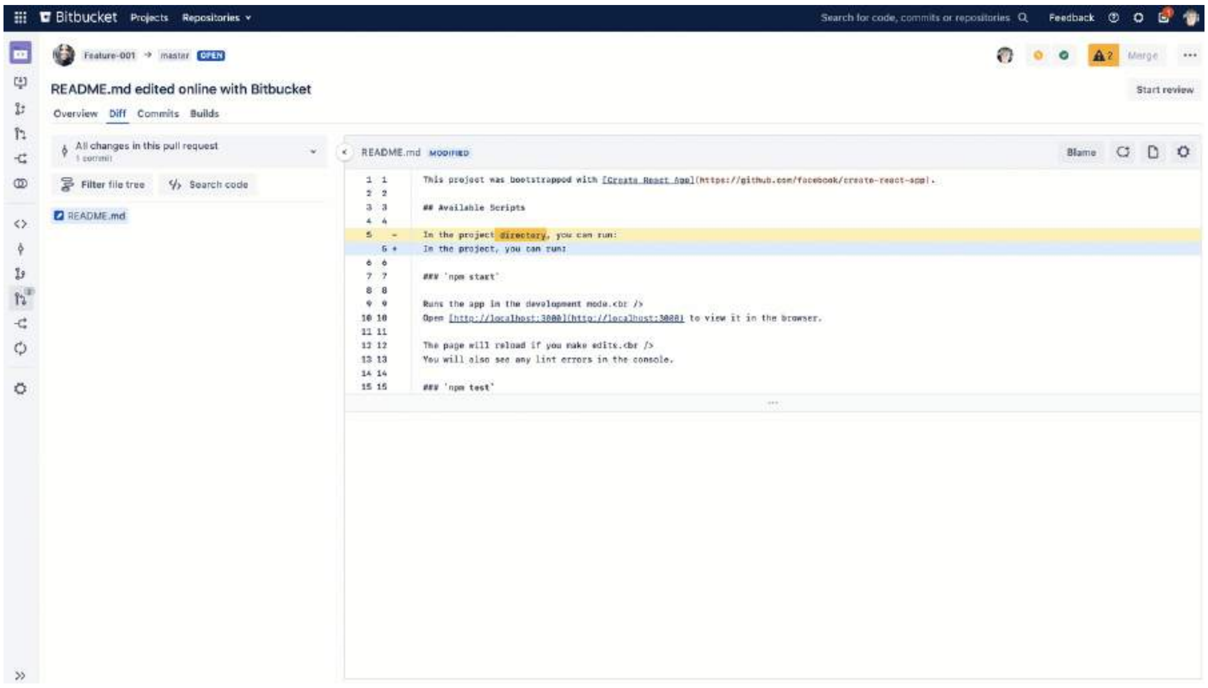
The diff for this pull request has changed

Update to see the latest version.

New code review workflow (released 7.7)

SERVER DATA CENTER

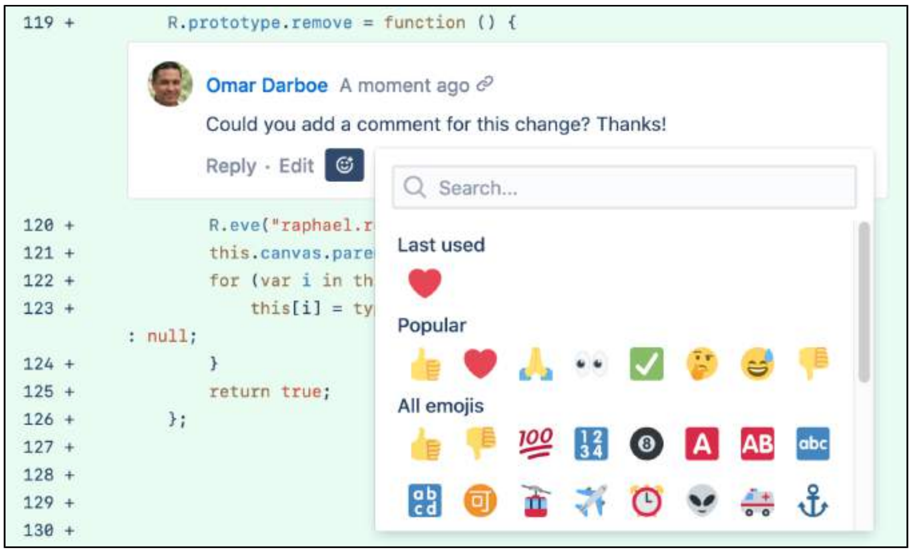
As a pull request reviewer, you can now draft multiple comments on files and code during a review process. Then when you are ready, send them all off at once, rather than just one at a time. This new code review workflow will save you time and unnecessary back and forth exchanges with the pull request author.



README.md edited online with Bitbucket

```
This project was bootstrapped with [Create React App](https://github.com/facebook/create-react-app).

## Available Scripts

- In the project directory, you can run:
+ In the project, you can run:

### 'npm start'

Runs the app in the development mode.<br />
Open [http://localhost:3000](http://localhost:3000) to view it in the browser.

The page will reload if you make edits.<br />
You will also see any lint errors in the console.

### 'npm test'
```

React to comments (released 7.7)



```
+        R.prototype.remove = function () {
```

Omar Darboe A moment ago

Could you add a comment for this change? Thanks!

```
+            R.eve("raphael.r
+            this.canvas.pare
+            for (var i in th
+                this[i] = ty
      : null;
+            }
+            return true;
+        };
+
+
+
+
+
```

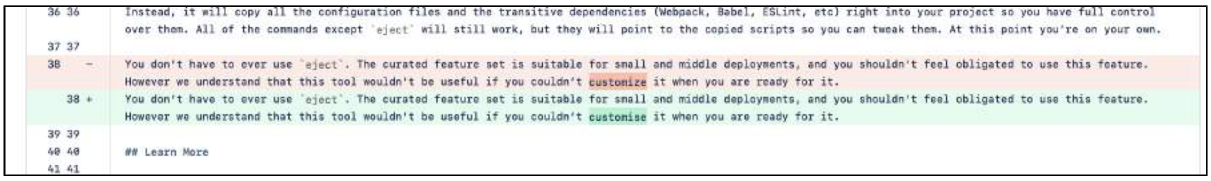
Responding to comments just got easier! With comment reactions you can now add emojis to any comment. So whether you want to give a quick , mark something as , or add a little
, the right emoji is just a couple of clicks away.

Select the **Add reaction** button to try it out, and see Commenting on a pull request for more information.

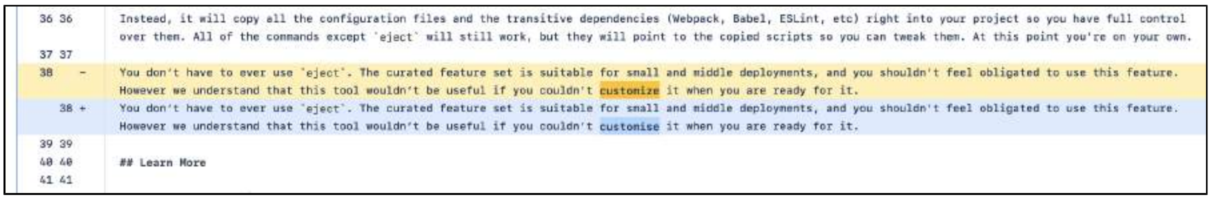
Accessible colors for the diff view (released 7.7)

SERVER DATA CENTER

We've been hard at work to make some important accessibility changes. This release includes a new setting for the diff view that lets you switch to an accessible color option that uses blue and yellow for added and removed lines respectively. Once enabled, the colors will change immediately in the diff view.



```
    Instead, it will copy all the configuration files and the transitive dependencies (Webpack, Babel, ESLint, etc) right into your project so you have full control
    over them. All of the commands except `eject` will still work, but they will point to the copied scripts so you can tweak them. At this point you're on your own.

-   You don't have to ever use `eject`. The curated feature set is suitable for small and middle deployments, and you shouldn't feel obligated to use this feature.
    However we understand that this tool wouldn't be useful if you couldn't customize it when you are ready for it.
+   You don't have to ever use `eject`. The curated feature set is suitable for small and middle deployments, and you shouldn't feel obligated to use this feature.
    However we understand that this tool wouldn't be useful if you couldn't customise it when you are ready for it.

    ## Learn More
```



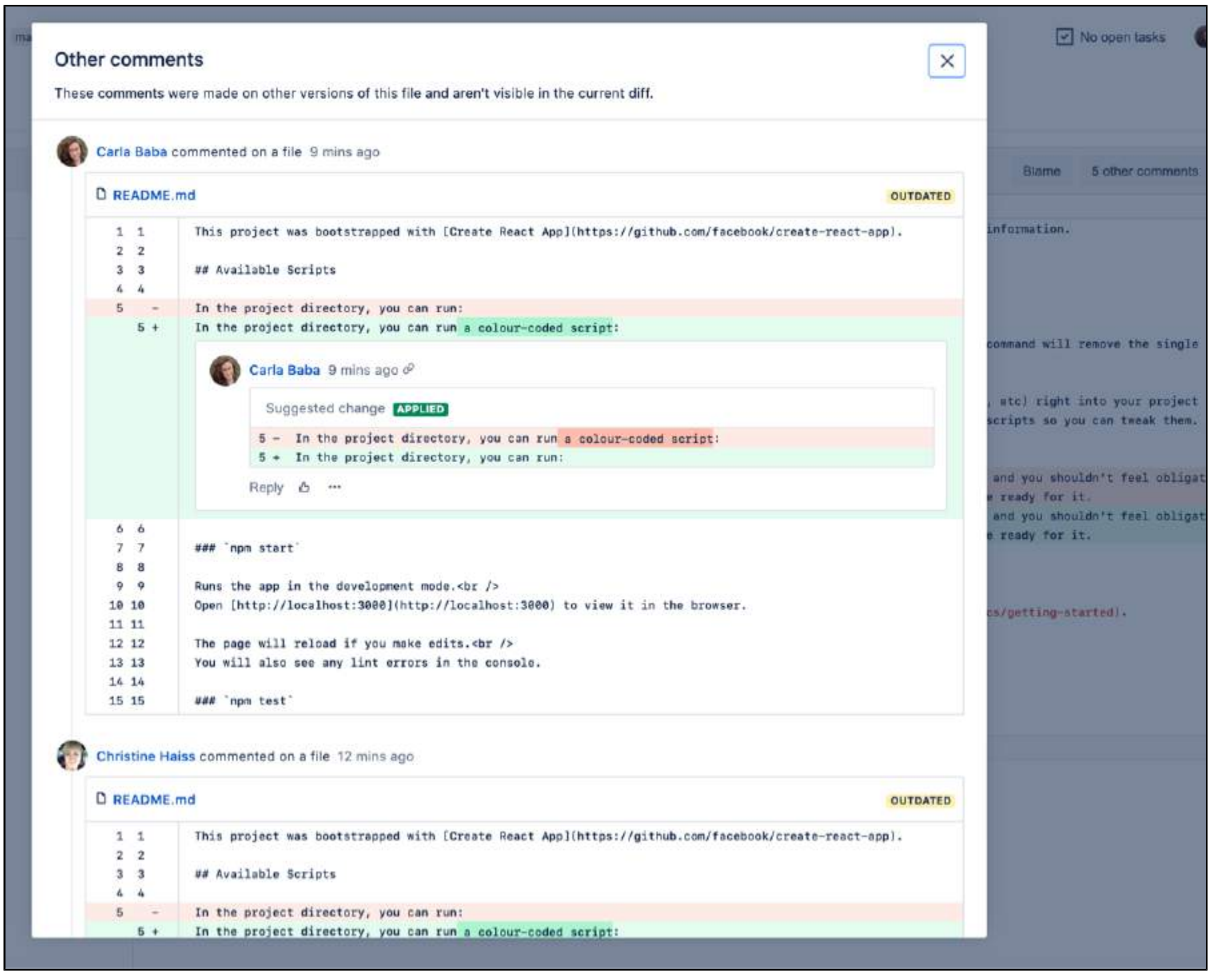
```
    Instead, it will copy all the configuration files and the transitive dependencies (Webpack, Babel, ESLint, etc) right into your project so you have full control
    over them. All of the commands except `eject` will still work, but they will point to the copied scripts so you can tweak them. At this point you're on your own.

-   You don't have to ever use `eject`. The curated feature set is suitable for small and middle deployments, and you shouldn't feel obligated to use this feature.
    However we understand that this tool wouldn't be useful if you couldn't customize it when you are ready for it.
+   You don't have to ever use `eject`. The curated feature set is suitable for small and middle deployments, and you shouldn't feel obligated to use this feature.
    However we understand that this tool wouldn't be useful if you couldn't customise it when you are ready for it.

    ## Learn More
```

View hidden comments (released 7.4)

SERVER DATA CENTER

No more disappearing act for comments that are in older diffs or that have become outdated due to a pull request update. By selecting the other comment counter when it appears on your pull request, you'll have more context on why code has changed throughout a pull request by being able to:

- See a file's activity stream showing comments that are outdated or appear on another diff.
- Distinguish which comments are actually outdated.
- Reply to, like, delete, or react to outdated comments the same way you can from the overview tab.



Other comments

These comments were made on other versions of this file and aren't visible in the current diff.

Carla Baba commented on a file 9 mins ago

README.md OUTDATED

```
   This project was bootstrapped with [Create React App](https://github.com/facebook/create-react-app).

   ## Available Scripts

-  In the project directory, you can run:
+  In the project directory, you can run a colour-coded script:
```

Carla Baba 9 mins ago

Suggested change APPLIED

```
5 -  In the project directory, you can run a colour-coded script:
5 +  In the project directory, you can run:
```

Reply

```
   ### `npm start`

   Runs the app in the development mode.<br />
   Open [http://localhost:3000](http://localhost:3000) to view it in the browser.

   The page will reload if you make edits.<br />
   You will also see any lint errors in the console.

   ### `npm test`
```

Christine Haiss commented on a file 12 mins ago

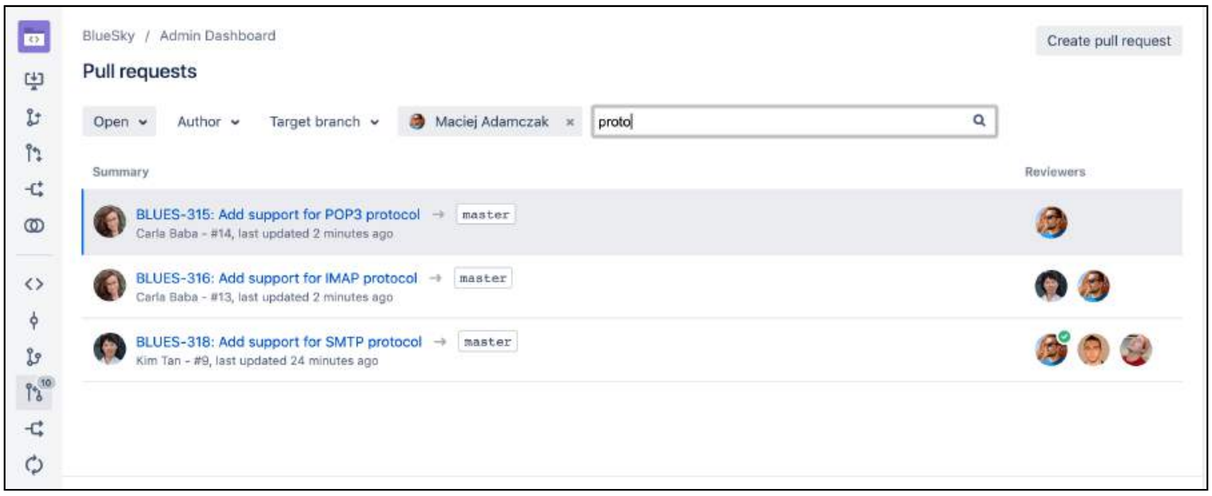
README.md OUTDATED

```
   This project was bootstrapped with [Create React App](https://github.com/facebook/create-react-app).

   ## Available Scripts

-  In the project directory, you can run:
+  In the project directory, you can run a colour-coded script:
```

Locate pull requests by searching for text and selecting a reviewer (released 7.2)

SERVER DATA CENTER

It's not productive to have to sift through a large list of pull requests in order to locate a comment you've left or to see why a change was made, so we've made it easier to find a pull request by refining your search. Quickly filter on matches to pull request titles and their descriptions by entering some text into the new search field. We've also added the option to filter by any reviewer so that you can further narrow down the list of pull requests that you've reviewed.



BLUES-315: Add support for POP3 protocol → master
Carla Baba - #14, last updated 2 minutes ago

BLUES-316: Add support for IMAP protocol → master
Carla Baba - #13, last updated 2 minutes ago

BLUES-318: Add support for SMTP protocol → master
Kim Tan - #9, last updated 24 minutes ago

For information on other pull request filtering options, see Search for pull requests.

Pull requests get a makeover (released 7.0)

SERVER DATA CENTER

The pull request page has been redesigned and packed full of improvements to make your code review experience smoother, more enjoyable, and less of a tedious task.

Faster navigation in pull requests

With twice-as-fast content loading while switching between diffs, improved file navigation performance, and smooth scrolling in a side-by-side diff, you just might find yourself having fun speeding through your code reviews.

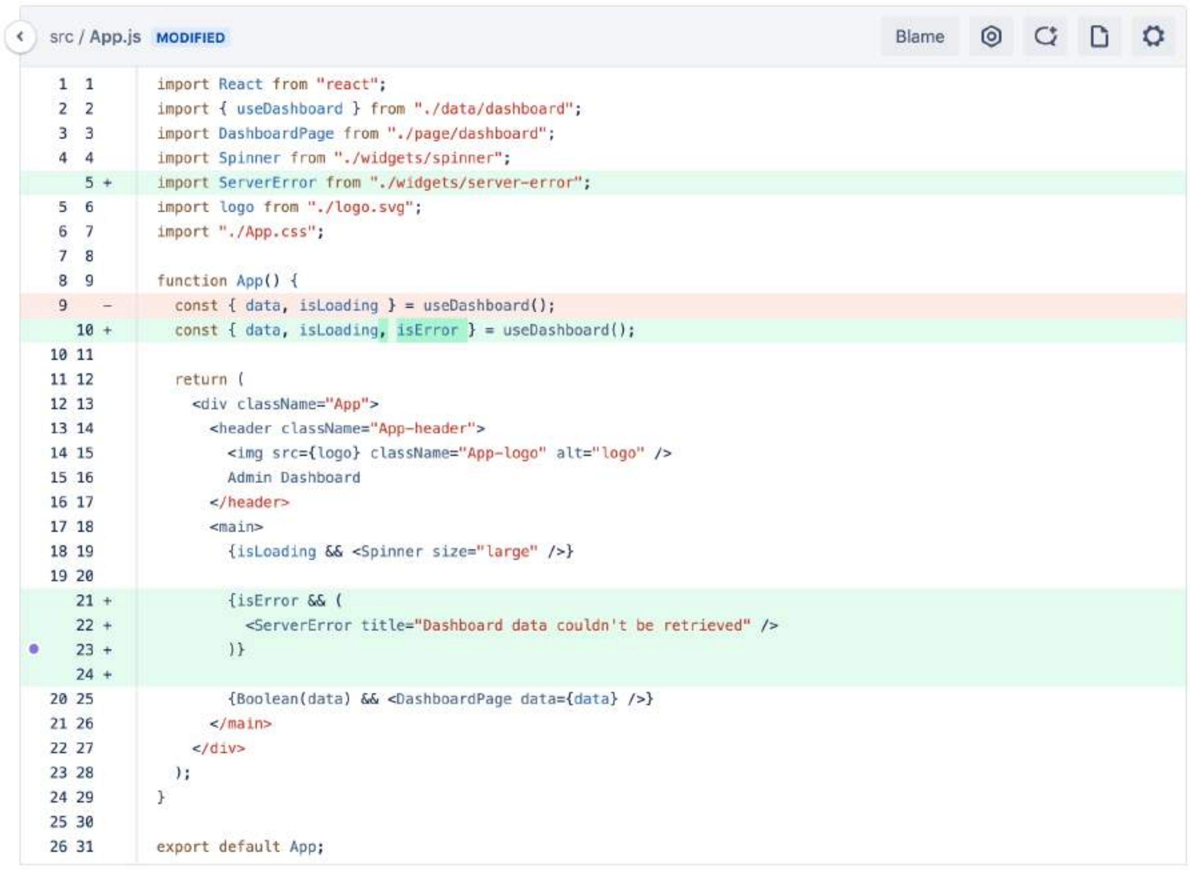
Your browser does not support the HTML5 video element

A more intuitive design

We've improved the pull request workflow, giving you a more effective and efficient experience.

Better collaboration in the diff view

- Commenting
    - Comment anywhere in the diff, including on expanded lines of code that weren't changed as a part of the pull request.
    - Comment on files stored via Git LFS.
- Syntax highlighting: Until now, syntax highlighting was only available on the side-by-side diff, but now it’s available in the unified diff too.



```
  import React from "react";
  import { useDashboard } from "./data/dashboard";
  import DashboardPage from "./page/dashboard";
  import Spinner from "./widgets/spinner";
+ import ServerError from "./widgets/server-error";
  import logo from "./logo.svg";
  import "./App.css";

  function App() {
-   const { data, isLoading } = useDashboard();
+   const { data, isLoading, isError } = useDashboard();

    return (
      <div className="App">
        <header className="App-header">
          <img src={logo} className="App-logo" alt="logo" />
          Admin Dashboard
        </header>
        <main>
          {isLoading && <Spinner size="large" />}

+         {isError && (
+           <ServerError title="Dashboard data couldn't be retrieved" />
+         )}
+
          {Boolean(data) && <DashboardPage data={data} />}
        </main>
      </div>
    );
  }

  export default App;
```

- Word wrap: No more horizontal scrolling to read lines of code in the diff.
- Expanding: Click Show more to expand all lines in the diff now, rather than just 10 at a time.

- Searching: You can now use your browser's native Ctrl+F action to search for code in the file you're viewing.
- Image thumbnails: Drag or attach an image into a comment and you'll see a thumbnail-sized preview of it rather than having the full-sized image rendered.

Do more with less clicking

- Copying: You can now copy code from just one side of the side-by-side diff view without also copying code from the other one. Also, select and copy branch names in one click.
- Pasting: When you paste code from a pull request into a comment, we'll automatically format it as a `code block` with the correct syntax highlighting.
- Editor: When you type into a comment or description editor in a PR, you'll see Markdown hints as you type, no need to preview until you're ready to see the final view.

Your browser does not support the HTML5 video element

File-tree improvements

- Filtering: Easily locate changed files in a pull request using the new **Filter file tree** button. Use wildcards to find what you need faster on pull requests that have a great deal of files to look through. You can find it just above the file-tree, along with the **Search code** button. To see an example, check out Reviewing a pull request.

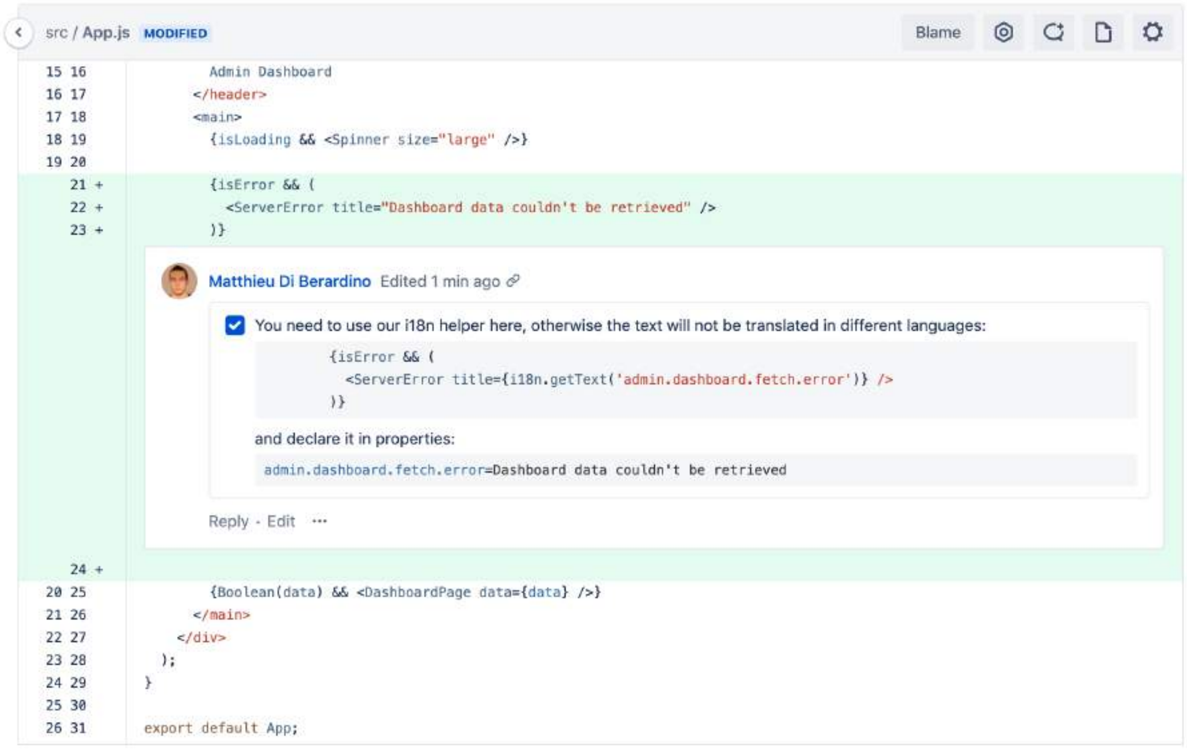
  Your browser does not support the HTML5 video element

- Redesigned icons: Icons in the file tree view now have a more distinctive design with contrasting colors so that you can better recognize the relationship between them, and whether your file has been edited, added, removed, or modified.

Task improvements in a pull request (released 7.0)

SERVER DATA CENTER

Create tasks in your pull requests without having to write a comment first. In fact, you can even convert comments into tasks. They also now support Markdown and rich content, like code snippets. Check the Reviewing a pull request page for more details.


src / App.js MODIFIED

```
        Admin Dashboard
      </header>
      <main>
        {isLoading && <Spinner size="large" />}

        {isError && (
          <ServerError title="Dashboard data couldn't be retrieved" />
        )}
```

Matthieu Di Berardino Edited 1 min ago

✓ You need to use our i18n helper here, otherwise the text will not be translated in different languages:

```
{isError && (
  <ServerError title={i18n.getText('admin.dashboard.fetch.error')} />
)}
```

and declare it in properties:

```
admin.dashboard.fetch.error=Dashboard data couldn't be retrieved
```

Reply · Edit ···

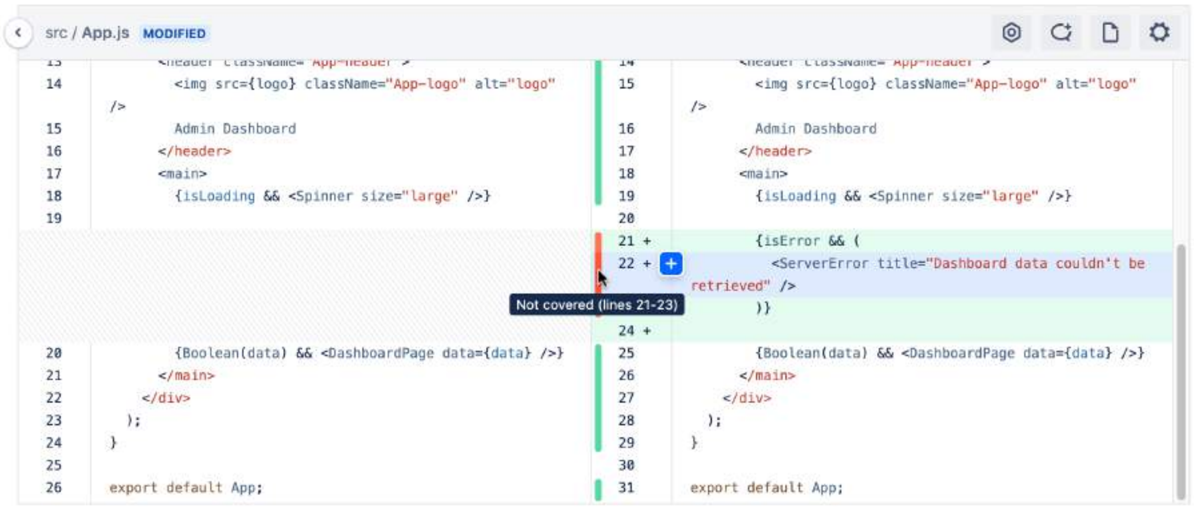
```

        {Boolean(data) && <DashboardPage data={data} />}
      </main>
    </div>
  );
}

export default App;
```

We've got your code covered (released 7.0)

SERVER DATA CENTER

Code Insights for Bitbucket offers a better way for your team to improve code quality by allowing continuous integration (CI) and other analysis tools to surface insights about code quality in pull requests. This is so issues that are related to code quality can be viewed and acted upon during a normal code review process. Now, you can access your code coverage results as a part of Code Insights.

Code coverage finds aspects of the code which may not have been covered adequately by tests. The results are compiled and displayed in the diff view using color-coded blocks which represent lines of code that are covered fully, partially, or not at all by tests. You can then also dig into a coverage report, if it’s provided, to see the actual lines that may not be covered and use that to identify critical parts of your application that still need to be tested.


src / App.js MODIFIED

```
        <img src={logo} className="App-logo" alt="logo"
/>
        Admin Dashboard
      </header>
      <main>
        {isLoading && <Spinner size="large" />}

        {Boolean(data) && <DashboardPage data={data} />}
      </main>
    </div>
  );
}

export default App;
```

```
        <img src={logo} className="App-logo" alt="logo"
/>
        Admin Dashboard
      </header>
      <main>
        {isLoading && <Spinner size="large" />}

        {isError && (
          <ServerError title="Dashboard data couldn't be
retrieved" />
        )}

        {Boolean(data) && <DashboardPage data={data} />}
      </main>
    </div>
  );
}

export default App;
```

Draft pull requests

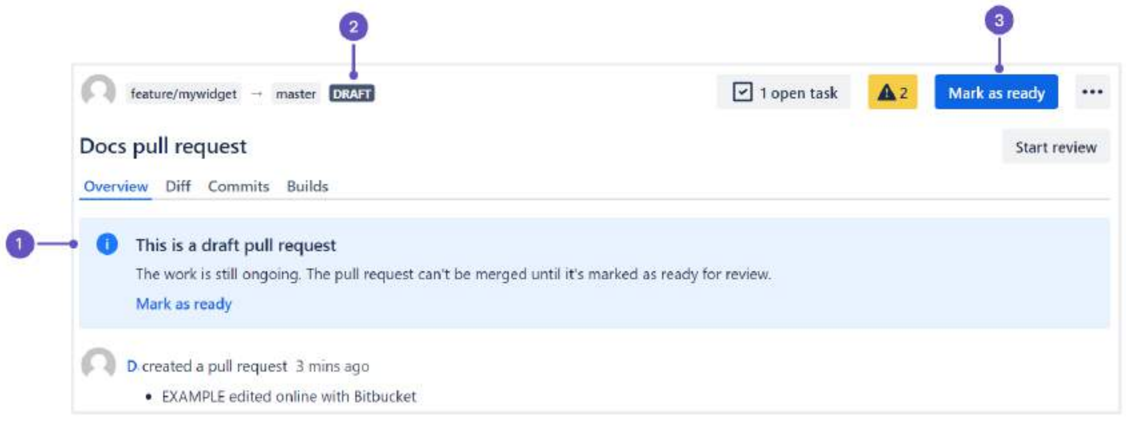
It might sometimes take you more time than planned to put a pull request together so you'd like to avoid unnecessary feedback or accidental merging until it is ready.

By creating a draft pull request, you can clearly signal to your team that the work is still in progress. You can still use all of Bitbucket's collaborative features to get early feedback while your pull request is a draft, but merging is prevented and the look and feel of the draft tells your teammates where things are at.

At the same time, with the help of webhooks, you can update your integrations with CI tools and other platforms to track draft pull requests, thus maintaining total control over your workflows.

On this page:

Once your pull request is ready for review and merging, it's easy to mark it as such. Check out the following screenshot.



This is a draft pull request

The work is still ongoing. The pull request can't be merged until it's marked as ready for review.

Mark as ready

D created a pull request 3 mins ago

- EXAMPLE edited online with Bitbucket

1. The information note lets you and the reviewers know that you're viewing a draft. The **Mark as ready** button in the note allows you to submit your draft for further review and merge.
2. The **Draft** lozenge (DRAFT) will be displayed on a draft pull request across the whole user interface until you mark the pull request as ready for review.
3. The **Mark as ready** button allows you to submit your draft for further review and merge.

Create a draft pull request

You start creating a draft pull request in the same way as you create a regular pull request. When you're ready to save the draft pull request, select **Create as draft**.

Check out the more detailed guidelines:

1. Select **Create pull request** in the sidebar or on the **Pull requests** page.
2. Before you proceed, check the **Diff** and **Commits** tabs at the bottom of the page to compare the source and destination branches.
3. Select the source tag or branch and the destination branch. Then, select **Continue**.
4. Enter the title and description of your draft pull request.

5. In the **Reviewers** field, mention individual team members or reviewer groups from whom you're expecting feedback on your draft pull request. The added reviewers will receive an email notification about the draft pull request.

   If default reviewers or code owners are configured for the branches you're working with, these people will be automatically added as reviewers to your pull request. If you don't wish to share your work with all of them, remove the corresponding user tags from the field. If you remove at least one reviewer, the **Default reviewers** or **Code owners** quick add buttons respectively will appear under the field, showing you how many reviewers you can still add from each group.

   > Feel free to skip adding reviewers when you're only creating a draft pull request. You can add them later. For example, when editing the draft to make it ready for review.

6. Select **Create as draft**.

Your draft pull request has been created and you can continue your work.

Make a draft pull request ready for review

When you're ready to share your code for further review and merge, you can mark your draft pull request as ready for review. To do this, select the **Mark as ready** button.

At this stage, you can also add reviewers to your pull request manually or, if applicable, manage the automatically added default reviewers or code owners with the corresponding quick add buttons under the **Re viewers** field.

Your draft will immediately become ready for review and merge, just as your regular pull requests. In the activity history, the pull request will be marked as **Ready for review** (READY FOR REVIEW). The reviewers you've added will receive an email notification about the pull request made ready for review.

Convert a regular pull request to a draft

If you want to convert your pull request back to draft to continue working on it, go to the pull request action menu (•••) and select **Mark as draft**. In the activity history, the pull request will be marked as **Draft** (DRAFT).

Review a draft pull request

You review draft pull requests in the same way as you review regular pull requests: you can approve drafts or request changes to them. These reviewer statuses will remain after the draft pull request is marked as ready for review.

Note that until a draft is marked as ready for review, it isn't eligible for merging, either manually or automatically.

View draft pull requests

By default, draft pull requests are hidden from the list of pull requests in your Bitbucket instance. To view draft pull requests:

1. Go to the **Pull requests** page.
2. Select the **Show drafts** checkbox.

Drafts will be displayed on the list with other pull requests in the order based on the time of their last update.

Webhooks for draft pull requests

Draft pull requests not only ensure a seamless internal process but can also play well with other applications, giving you total control over your workflows.

To signal the draft nature of pull requests to your Bitbucket integrations with CI tools or communication platforms like Slack, use updated webhooks.

Audit log events

The Bitbucket audit log allows you to have a full history of changes to draft pull requests: when they were created, made ready for review, or converted back to drafts.

Check the audit log events for draft pull requests

Default tasks

Default tasks allow project and repository admins to configure a list of tasks which are automatically created when a pull request is opened. These tasks allow admins to set consistent processes for developers to follow when working on pull requests.

The **No incomplete tasks** merge check can be used to prevent pull requests with incomplete default tasks from being merged. And when you change the target branch on a pull request, the default tasks on the pull request are also updated.

You can define default tasks from the project or repository settings page. When admins create default tasks at the project level, all repositories in the project will inherit the default tasks in their repository settings. Repository admins can't overwrite or remove inherited tasks. Admins can add additional tasks that are specific to the repository in the repository settings.

On this page

Create a default task

You must be an admin with project or repository permissions to create default tasks for projects or repositories.

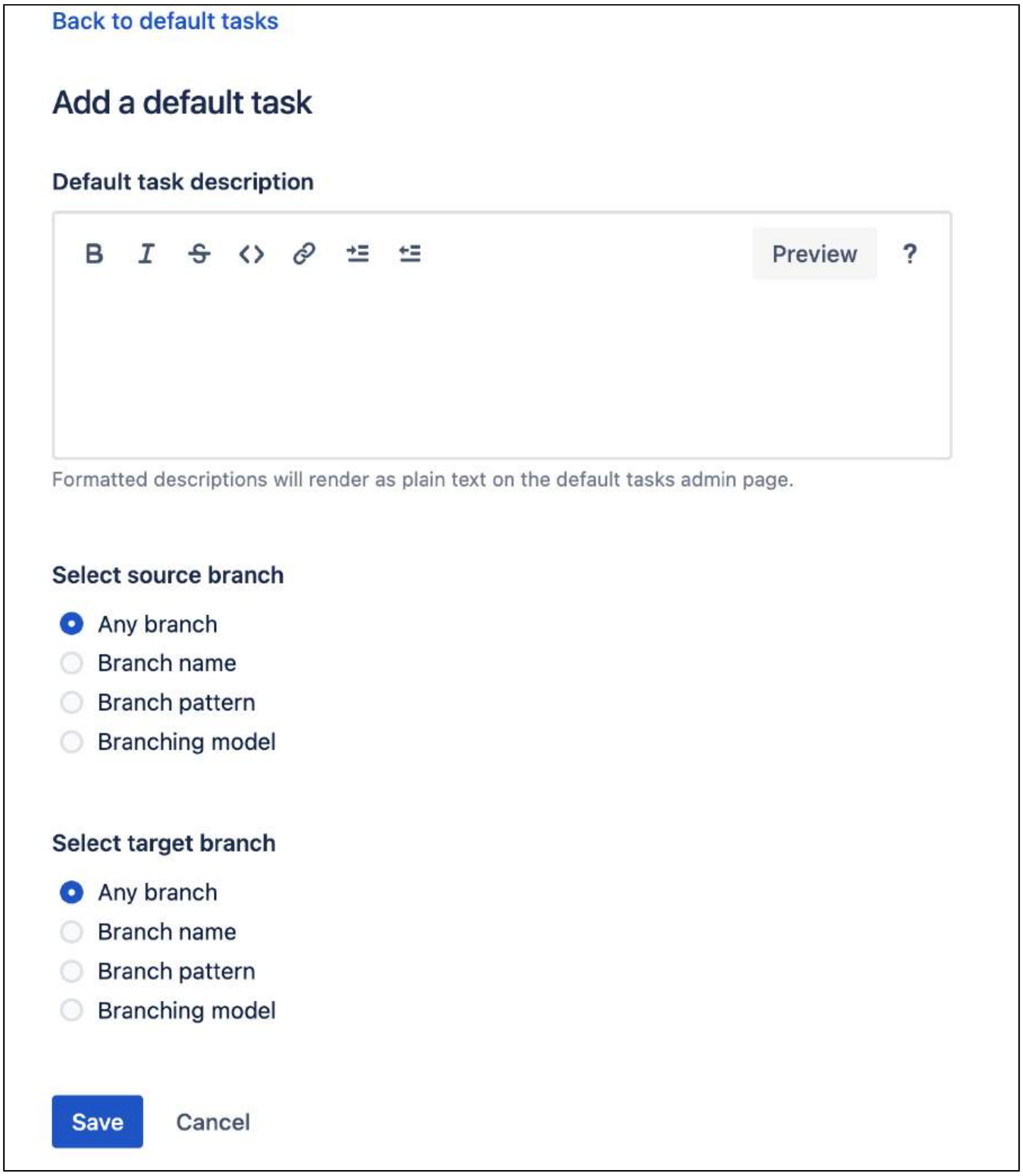
If a default task exists at the project level, you cannot create the same task as the repository level. We detect duplicates by checking the source and target branches, as well as the description (including all formatting).

To create default tasks for projects or repositories:

1. From either the **Project** or **Repository settings**, select **Default tasks**.
2. Select **Add a default task**.
3. Enter the task details in the **Default task description** field.

   Markup, emojis, and @mentions are all supported in the description and will be rendered when the task is created.

4. You can configure the default task to only apply for certain pull requests when they are opened by setting a specific source and target branch. If you would like the default task to apply to all pull requests, select **Any branch** for both source and target branch. Learn more about branching models
5. Select **Save**.

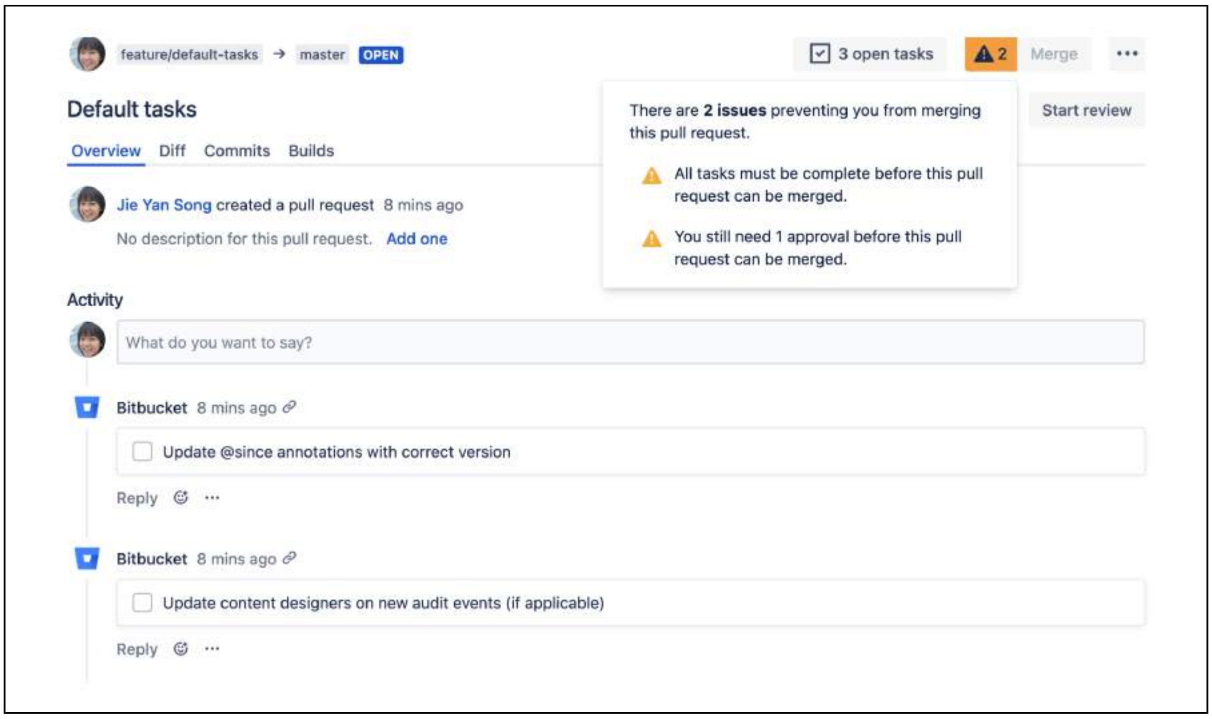


View default tasks

Default tasks are displayed on the pull request overview page under the user **Bitbucket**.

To view default tasks, navigate to your pull request and look at its **Activity**.

When reviewing the pull request, you may also view them by selecting the **Open tasks list** button.


feature/default-tasks → master OPEN

3 open tasks ⚠ 2 Merge •••

Default tasks

Overview Diff Commits Builds

There are **2 issues** preventing you from merging this pull request.

⚠ All tasks must be complete before this pull request can be merged.

⚠ You still need 1 approval before this pull request can be merged.

Start review

Jie Yan Song created a pull request 8 mins ago

No description for this pull request. Add one

Activity

What do you want to say?

Bitbucket 8 mins ago

☐ Update @since annotations with correct version

Reply

Bitbucket 8 mins ago

☐ Update content designers on new audit events (if applicable)

Reply

Edit or delete a default task

You must be an admin with project or repository permissions to edit or delete default tasks for projects or repositories.

1. From either the **Project** or **Repository settings**, select **Default tasks**.
2. Select the **default task description** link or select **•••** > **Edit** or **Delete** for the specific task.

Note that:

- edits will only apply to newly opened pull requests
- deleting a default task will no longer create it when a pull request is opened. Pull requests previously opened will retain the deleted task

Bitbucket search syntax

This page explains Bitbucket Data Center's search syntax to help you find exactly what you're looking for.

Considerations

There are some restrictions on how searches are performed:

- Searches may include "." and "_", but all other punctuation characters are ignored. (e.g. `!"#$%&'()*+,-/:;<=>?@[\]^`{|}~`)
- To search for multiple words in exact order, put them in quotes (e.g. `"find this phrase"`). As with other queries, all punctuation except "." and "_" is ignored (e.g. `"find-this-phrase"` effectively searches for `"find this phrase"`).
- Only the default branch is searchable (for most repositories the default branch will be `master or main`).
- Wildcard searches (e.g. `qu?ck buil*`) and regular expressions in queries are not supported.
- Single characters within search terms are ignored as they're not indexed by Bitbucket for performance reasons (e.g. searching for "foo a bar" is the same as searching for just "foo bar" as the character "a" in the search is ignored).
- Case is not preserved, however search operators must be in ALL CAPS.
- Queries cannot have more than 9 expressions (e.g. combinations of terms and operators).
- The maximum length of a query cannot exceed 250 characters.
- Only files smaller than 512 KiB are searchable.
- Only code you have permission to view will appear in the search results.
- Archived repositories are excluded from search results by default.

A query in Bitbucket has to contain at least one search **term**, which can either be a *single word* or a *phrase* surrounded by quotes.

Operators

Search operators are words that can be added to searches to help narrow down the results. Operators must be in ALL CAPS. These are the search operators that can be used to search for files:

- `AND`
- `OR`
- `NOT`
- `-`
- `(  )`

Multiple terms can be used, and they form a boolean query that implicitly uses the `AND` operator. So a query for "`bitbucket server`" is equivalent to "`bitbucket AND server`".

Term	Example query	Usage
`AND`	`bitbucket AND server`	Matches files that contain both "`bitbucket`" and "`server`".
`OR`	`bitbucket OR server`	Matches files that contain either "`bitbucket`" or "`server`" (or both).
`NOT`	`bitbucket NOT jira`	Matches files that contain "`bitbucket`" but don't contain "`jira`".
`-`	`bitbucket -jira`	Use before a term, matches files that contain "`bitbucket`" but don't contain "`jira`".
`( )`	`bitbucket AND (server OR cloud)`	Matches files that contain "`bitbucket`" and either "`server`" or "`cloud`"

Modifiers

Modifiers can be used to further restrict search results. Use a modifier in the form "`key:value`". If there are multiple modifiers in a query they are implicitly combined using "`AND`" and apply to the whole search expression. These are the search modifiers that can be used to search for files.

Repository and Project modifiers

`repo: <reponame> or repository: <reponame>`

Search within a particular repository. Must be used with a `project:` modifier.

Term	Example query	Usage

`repo:`	`jira repo: bitbucket project:atlassian`
	
	or
	
	`jira repository: bitbucket project:atlassian`
	
	or
	
	`jira repo: atlassian /bitbucket`
		Matches files within the "`bitbucket`" repository within the "`atlassian`" project that contain the term "`jira`".

`project: <project key/name>`

Search all repositories within a particular project for the search term.

Term	Example query	Usage
`project:`	`jira project: atlassian`	Matches files within the "`atlassian`" project that contain the term "`jira`".

`archived: <true/false/*>`

Filter repositories based on their status.

Term	Example query	Usage
`archived:`	`archived: true`	Matches only repositories that are archived.
	`archived: false`	Matches only repositories that are active. Note that this filter is used by default.
	`archived:*`	Matches all repositories (both archived and active)

Path modifier

`path: <directory or file name>`

Restrict search to only consider files with the search term in their path.

Term	Example query	Usage

`path:`	`react path:frontend`	Matches files within directories named `frontend` containing the term `react`.
	`react path:frontend/*/package.lock`	Matches `package.lock` files within directories named `frontend` containing the term `react`.

Language and file extension modifiers

`lang: or language: <language>`

Code search can be restricted to only consider a particular language or a particular file extension. For some languages adding a lang criteria is equivalent to specifying the file extension. For example, "`lang:java`" is equivalent to "`ext:java`". For other languages multiple file extensions are mapped to a single language. For example, "`.hs`", "`.lhs`" and "`.hs-bootare`" file extensions are used for the Haskell programming language, and will be matched when specifying "`lang:haskell`".

Term	Example query	Usage
`lang:`	`jira lang:java` or `jira language:java`	Matches files that contain the term "`jira`" within Java files, files with `.java`, `.class`, or `.jar` extension.

`ext: or extension: <file extension>`

Term	Example query	Usage
`ext:`	`jira ext:lhs` or `jira extension:lhs`	Matches files that contain the term "`jira`" within Haskell files with the `.lhs` extension.

Fork modifier

`fork: <true or false>`

Exclude results from repositories based on whether or not they are forks.

Term	Example query	Usage
`fork:`	`fork:true`	Includes only results that are from repositories that are forks.
	`fork:false`	Includes only results that are from repositories that are not forks.

Manage webhooks

Webhooks provide a way to configure Bitbucket Data Center to make requests to your server or another external service, whenever certain events occur. A webhook consists of:

- One or more events – the default event is a repository push, but you can select multiple events to trigger the webhook.
- A URL – the endpoint where you want Bitbucket to send the event payloads when a matching event happens. You can add additional event context such as project or repo key as URL variables and send data to multiple URLs using a single webhook.

On this page:

There are two stages to the webhook: Creating webhooks and Triggering webhooks. Once you've created a webhook for an event, every time that event occurs, Bitbucket sends a payload request that describes the event to the specified URL.

You can create webhooks both at the project and the repository level. A webhooks created at the project level is inherited by all repositories in that project.

If you're having problems with a webhook, see Troubleshooting webhooks.

When to use webhooks

Use webhooks to integrate applications with Bitbucket. For example:

- Every time a user pushes commits in a repository, you may want to notify your CI server to start a build.
- Every time a user pushes commits or creates a pull request, you may want to display a notification in your application.
- Every time a user pushes commits to a repository, and a mirror synchronizes those changes, you may want to notify your continuous integration system to start a build.

Advantages of webhooks

Without webhooks, you need to poll the API if you want to detect when events occur in Bitbucket. However, polling the API is inconvenient, inefficient, and error-prone.

Webhooks mean the API doesn't have to check for the same activity every minute.

Securing your webhook

You can secure your webhook using a secret token or by using basic authentication.

Secret token: Use secret tokens to authenticate the payload and ensure that contents are not tampered between Bitbucket and your endpoint. Combined with HTTPS,

it helps ensure the message transmitted is the one that Bitbucket intended to send.

When you define a secret for a webhook, each request is signed via a Hash-based Message Authentication Code (HMAC). The default for this algorithm is HMACSha256. The header X-Hub-Signature is defined and contains the HMAC. For example, the header of the POST request would be plain text encoded as follows:

```
x-hub-signature: sha256=c3383246d4fd871e66e962b50cc12222222222222222222222222222222222222
```

To authenticate the validity of the message payload, the receiver can perform the HMAC algorithm on the received body with the secret as the key to the HMAC algorithm. If the results do not match, it may indicate there was a problem with transmission that has caused the message payload to change.

Basic authentication: If your endpoint uses basic authentication (a username and password), use this method to secure your webhook. When the webhook data is sent, the authorisation header will be included in the HTTP request. The authentication credentials for the `Authorization` header are base64 encoded.

Creating webhooks

You can create a webhook through Bitbucket, or with the API.

Project admins can create project-level webhooks (which are inherited and displayed at the repository-level) and repository admins can create repository-level webhooks using the below steps:

1. Navigate to the project or repository based on where you want to create the webhook.
2. Select **Project Settings** > **Webhook** or **Repository Settings** > **Webhook**, and then select **Create webhook**.
3. Enter a **Title** with a short description, and the **URL** of the application server.
   You can also add URL variable. Learn how to add URL variables
4. **Optional**: Select an authentication method and add additional details based on the authentication method you've selected.
5. **Optional**: To integrate with internal URLs that are using a self-signed certificate, clear the enable SSL /TLS certificate verification checkbox. Learn more about using self-signed certificates
6. **Webhook events:** Select the event/s to trigger the webhook.
   By default, the event for the webhook is a repository push, as demonstrated by the **Repository push** field.
7. **Optional**: Use the Test connection button if required.
8. **Optional**: If you don't want the webhook to be active after you create it, toggle off **Active**.
9. Select **Create**.

To create a webhook using the API, you need to know the format of the HTTP request that Bitbucket expects and the format of the HTTP response that Bitbucket returns to your server.

Adding URL variables

You can add the following URL variables:

URL variables	Can be used with
`project.key`	All events
`repo.slug`	Repository and pull request events
`repo.ref.branchName`	Repository push events
`pr.fromRef.branchName`	Pull request events
`pr.toRef.branchName`	Pull request events

Triggering webhooks

When an event associated with a webhook occurs, Bitbucket sends a request to the webhook URL containing the event payload.

You can create webhooks for the following events:

Project events

- Modified (available in project-level webhooks only)

Repository events

- Push
- Modified
- Forked
- Comment added to commit
- Comment edited on commit
- Comment deleted on commit
- Mirror synchronized
- Secret detected

Pull request events

- Opened
- Source branch updated
- Modified
- Reviewers updated
- Approved
- Unapproved
- Changes requested
- Merged
- Declined
- Deleted
- Comment added
- Comment edited
- Comment deleted

When changes to multiple branches are pushed together, a separate webhook request is sent for each branch change.

Disabling webhooks

As a system administrator, you might want to disable webhooks for security reasons.

When you disable webhooks, the webhook configurations won’t be deleted or lost in any other way. You can re-enable webhooks at any time and have all the webhook configurations up and running.

By disabling webhooks, you prevent full-read server-side request forgeries (SSRF) that can be performed through webhooks by any user with permission to create repositories or with access to project settings. You can also prevent blind SSRFs through the repository importation functionality by users with minimum permissions.

A server-side request forgery is an attack on a server when the server is tricked into connecting to a malicious resource by reading or submitting data to a URL that an attacker provided. As a result, the attacker can access sensitive information like machine credentials, connect to internal services like HTTP databases, send POST requests to internal services, cause internal DoS attacks, or do remote code execution.

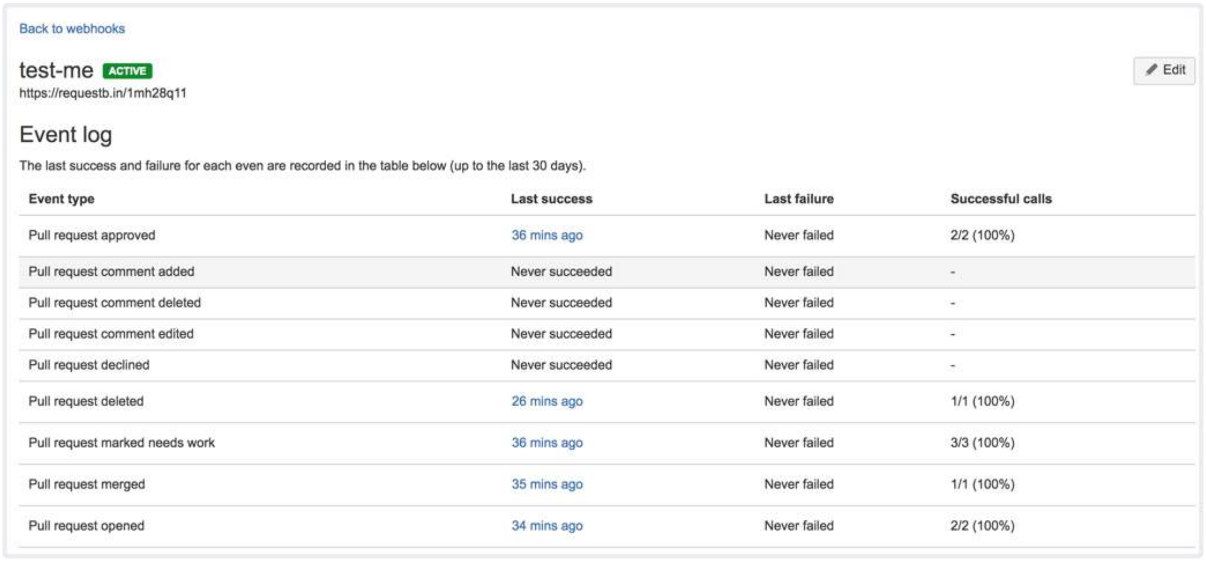
To prevent these problems and disable webhooks:

1. Go to **Administration** and select **Manage apps**. Open **UPM** (Universal Plugin Manager).
2. Find and disable the following plugins:
    a. **Atlassian webhooks** plugin provides webhooks capability.
    b. **Bitbucket Server webhooks** plugin provides webhooks support for Bitbucket.

Troubleshooting webhooks

When you perform an action to trigger a webhook and it doesn't work, you can use the **Event log** page to figure out what went wrong.

To view the event log and troubleshoot, navigate to the **Webhooks** page and select **View details** (from the **A ctions** column) against the webhook that doesn't work.



Back to webhooks

test-me ACTIVE

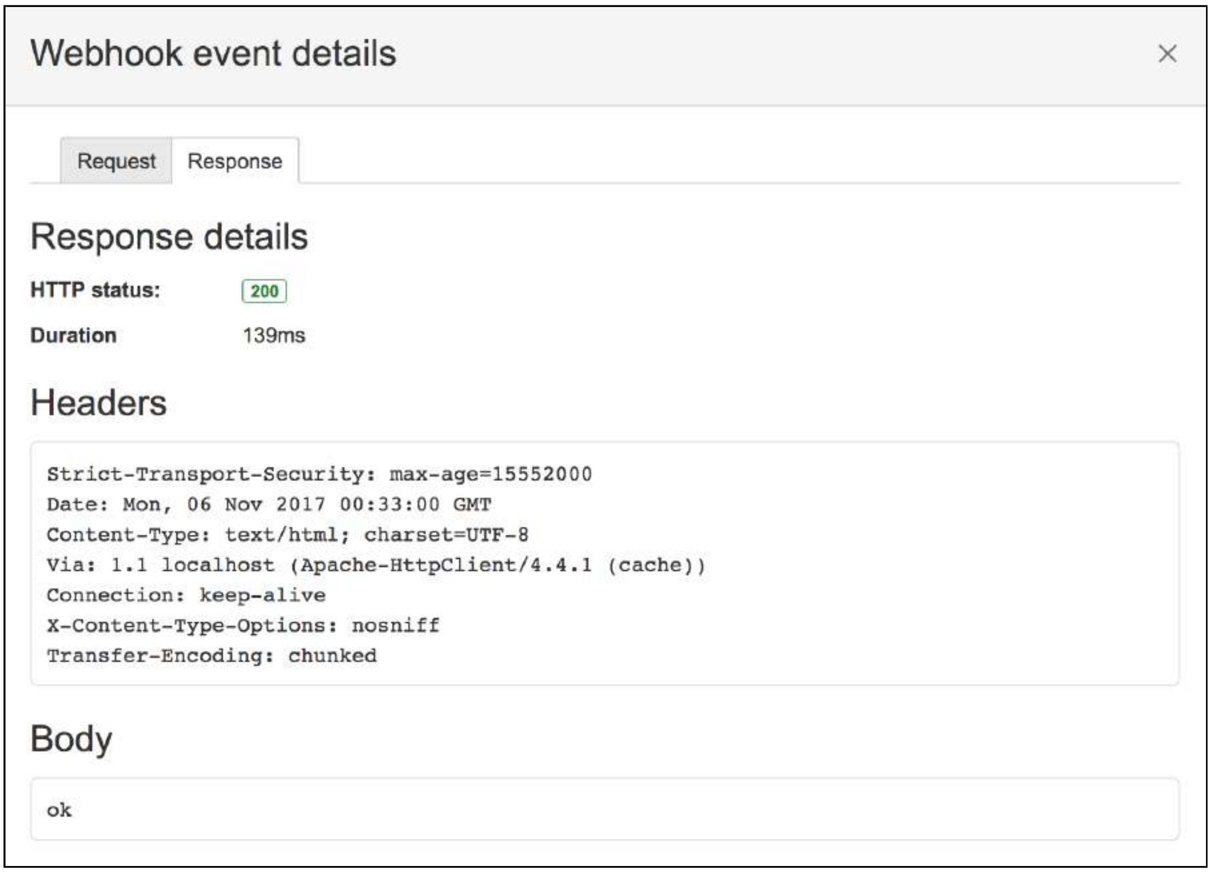
https://requestb.in/1mh28q11

Event log

The last success and failure for each even are recorded in the table below (up to the last 30 days).

Event type	Last success	Last failure	Successful calls
Pull request approved	36 mins ago	Never failed	2/2 (100%)
Pull request comment added	Never succeeded	Never failed	-
Pull request comment deleted	Never succeeded	Never failed	-
Pull request comment edited	Never succeeded	Never failed	-
Pull request declined	Never succeeded	Never failed	-
Pull request deleted	26 mins ago	Never failed	1/1 (100%)
Pull request marked needs work	36 mins ago	Never failed	3/3 (100%)
Pull request merged	35 mins ago	Never failed	1/1 (100%)
Pull request opened	34 mins ago	Never failed	2/2 (100%)

Click through the latest request results (such as Webhook event details) to troubleshoot the issue.



Webhook event details

Request | Response

Response details

HTTP status: 200

Duration 139ms

Headers

```
Strict-Transport-Security: max-age=15552000
Date: Mon, 06 Nov 2017 00:33:00 GMT
Content-Type: text/html; charset=UTF-8
Via: 1.1 localhost (Apache-HttpClient/4.4.1 (cache))
Connection: keep-alive
X-Content-Type-Options: nosniff
Transfer-Encoding: chunked
```

Body

```
ok
```

Circuit breaking

To help protect your instance of Bitbucket, circuit breaking has been implemented in the Bitbucket webhooks system. This means badly behaving webhooks are skipped for a period of time if they are consistently failing.

By default, when a webhook fails five times, it is considered unhealthy and is skipped.

Initially, it will only be skipped for a short period (10 seconds) but as it continues to fail it will gradually skip for longer periods, up to a max of 10 hours.

A webhook may also be skipped if there are too many webhooks in flight. If there are 250 webhooks being invoked, further requests will be skipped until the number in flight drops below 250.

These limits are entirely configurable if your instance has different requirements. For more information, see Configuration properties.

If a webhook is being skipped, you can see so via the JMX metrics output by Bitbucket, or via the logs.

Event payload

When you have a webhook with an event, Bitbucket Data Center sends the event request to the server URL for the webhook whenever that event occurs. This page describes the structure of these requests.

For Bitbucket to send event payload requests for a webhook with HTTPS endpoints, make sure your URL has a valid SSL certificate that a public certificate authority has signed. Learn how to use self-signed certificates

The following payloads contain some of the common entity types – `User`, `Repository`, `Comment`, and `Pull Request` – which have consistent representations in all the payloads where they appear. For example, the `acto` property in the `repo:refs_changed` payload is a representation of the event's user.

The following events are supported:

Project event	**Trigger**
Project modified	The name of a project is modified.
Repository event	**Trigger**
Push	A push is made to the repository.
Modified	The name of a repository is modified.
Forked	A repository is forked.
Comment added	A comment is added to a commit in the repository.
Comment edited	A commit comment is modified in the repository.
Comment deleted	A commit comment is deleted in the repository.
Mirror synchronized	A mirror finishes synchronizing the repository.
Secret deleted	A secret is pushed to the repository.
Pull request event	**Trigger**
Opened	A pull request is created.
Source branch updated	The source branch of a pull request is updated.
Target branch updated	The target branch of a pull request is updated.
Modified	A pull request is modified.
Reviewers updated	The reviewers in a pull request are updated.
Approved	A pull request is approved.
Unapproved	A pull request is unapproved.
Changes requested	A pull request is marked as **Changes requested**.
Merged	A pull request is merged.
Declined	A pull request is declined.
Deleted	A pull request is deleted.
Comment added	A comment is added to a pull request.
Comment edited	A comment on a pull request is edited.

Comment deleted	A comment on a pull request is deleted.

HTTP headers

All event payload requests may have the following HTTP headers:

HTTP header	Description
`X-Request-Id`	A unique UUID for each webhook request
`X-Event-Key`	The event that kicked off this webhook. For example, a repository push will have `repo:refs_changed`.
`X-Hub-Signature`	See Webhook secrets
`Authorization`	The Base64 encoded credentials that authenticate the webhook request. This header will only be present if the webhook has basic authentication configured.

Project events

You can create project-level webhooks for the following events and all the events that occur in a repository.

Modified

A user updates the **Name** of a project. This payload, with an event key of project`:modified` , provides the following fields:

Parameter	Description
`old`	The details of the old version of the project.
`new`	The defaults of the current version of the project.
`actor`	The user who made the update.

```
{
    "eventKey": "project:modified",
    "date": "2023-01-19T15:44:47+1100",
    "actor": {
        "name": "admin",
        "emailAddress": "admin@example.com",
        "active": true,
        "displayName": "Administrator",
        "id": 2,
        "slug": "admin",
        "type": "NORMAL"
    },
    "old": {
        "key": "PROJECT_1",
        "id": 7,
        "name": "Project 1",
        "public": false,
        "type": "NORMAL"
    },
    "new": {
        "key": "PROJECT_2",
        "id": 7,
        "name": "Project 2",
        "public": false,
        "type": "NORMAL"
    }
}
```

Repository events

You can create webhooks for the following events that occur in a repository.

Push

A user pushes one or more commits to a repository. This payload, with an event key of `repo:refs_changed`, provides the following fields:

Parameter	Description
`actor`	The user who pushed the commits.
`repository`	The repository with the commits.
`changes`	The details of the push.
`commits`	The details of the commit pushed. By default, the maximum number of commits included is 5. If the number of commits pushed is greater than the limit set, the list will include only the most recent commits.
`toCommit`	The details of the new head commit.

```
{
  "eventKey": "repo:refs_changed",
  "date": "2023-01-13T22:26:25+1100",
  "actor": {
    "name": "admin",
    "emailAddress": "admin@example.com",
    "active": true,
    "displayName": "Administrator",
    "id": 2,
    "slug": "admin",
    "type": "NORMAL"
    },
    "repository": {
      "slug": "rep_1",
      "id": 1,
      "name": "rep_1",
      "hierarchyId": "af05451fc6eb4bf4e0bd",
      "scmId": "git",
      "state": "AVAILABLE",
      "statusMessage": "Available",
      "forkable": true,
      "project": {
          "key": "PROJECT_1",
          "id": 1,
          "name": "Project 1",
          "description": "PROJECT_1",
          "public": false,
          "type": "NORMAL"
      },
      "public": false,
      "archived": false
    },
    "changes": [
      {
        "ref": {
          "id": "refs/heads/master",
          "displayId": "master",
          "type": "BRANCH"
        },
        "refId": "refs/heads/master",
        "fromHash": "197a3e0d2f9a2b3ed1c4fe5923d5dd701bee9fdd",
        "toHash": "a00945762949b7b787ecabc388c0e20b1b85f0b4",
        "type": "UPDATE"
      }
    ],
    "commits": [
      {
        "id": "a00945762949b7b787ecabc388c0e20b1b85f0b4",
        "displayId": "a0094576294",
        "author": {
          "name": "Administrator",
          "emailAddress": "admin@example.com"
        },
        "authorTimestamp": 1673403328000,
        "committer": {
          "name": "Administrator",
          "emailAddress": "admin@example.com"
        },
        "committerTimestamp": 1673403328000,
        "message": "My commit message",
        "parents": [
            {
              "id": "197a3e0d2f9a2b3ed1c4fe5923d5dd701bee9fdd",
              "displayId": "197a3e0d2f9"
            }
        ]
      }
    ],
    "toCommit": {
        "id": "a00945762949b7b787ecabc388c0e20b1b85f0b4",
        "displayId": "a0094576294",
        "author": {
            "name": "Administrator",
            "emailAddress": "admin@example.com"
        },
        "authorTimestamp": 1673403328000,
        "committer": {
            "name": "Administrator",
            "emailAddress": "admin@example.com"
        },
        "committerTimestamp": 1673403328000,
        "message": "My commit message",
        "parents": [
            {
                "id": "197a3e0d2f9a2b3ed1c4fe5923d5dd701bee9fdd",
                "displayId": "197a3e0d2f9",
                "author": {
                    "name": "Administrator",
                    "emailAddress": "admin@example.com"
                },
                "authorTimestamp": 1673403292000,
                "committer": {
                    "name": "Administrator",
                    "emailAddress": "admin@example.com"
                },
                "committerTimestamp": 1673403292000,
                "message": "My commit message",
                "parents": [
                    {
                      "id": "f870ce6bf6fe633e1a2bbe655970bde25535669f",
                      "displayId": "f870ce6bf6f"
                    }
                ]
              }
          ]
      }
}
```

Modified

A user updates the **Name** of a repository. This payload, with an event key of `repo:modified` , provides the following fields:

Parameter	Description
`old`	The details of the old version of the repository.
`new`	The defaults of the current version of the repository.
`actor`	The user who made the update.

```
{
  "eventKey":"repo:modified",
  "date":"2017-09-19T09:51:20+1000",
  "actor":{
    "name":"admin",
    "emailAddress":"admin@example.com",
    "id":1,
    "displayName":"Administrator",
    "active":true,
    "slug":"admin",
    "type":"NORMAL"
  },
  "old":{
    "slug":"repository",
    "id":84,
    "name":"repository",
    "scmId":"git",
    "state":"AVAILABLE",
    "statusMessage":"Available",
    "forkable":true,
    "project":{
      "key":"PROJ",
      "id":84,
      "name":"project",
      "public":false,
      "type":"NORMAL"
    },
    "public":false
  },
  "new":{
    "slug":"repository2",
    "id":84,
    "name":"repository2",
    "scmId":"git",
    "state":"AVAILABLE",
    "statusMessage":"Available",
    "forkable":true,
    "project":{
      "key":"PROJ",
      "id":84,
      "name":"project",
      "public":false,
      "type":"NORMAL"
    },
    "public":false
  }
}
```

Fork

A user forks a repository. This payload, with an event key of `repo:fork`, provides the following fields:

Parameter	Description
`actor`	The user who forks the repository. This user is also the owner of the fork.
`repository`	The new repository.
`repository.origin`	The original repository that was forked.

```
{
  "eventKey":"repo:forked",
  "date":"2017-09-19T09:48:26+1000",
  "actor":{
    "name":"admin",
    "emailAddress":"admin@example.com",
    "id":1,
    "displayName":"Administrator",
    "active":true,
    "slug":"admin",
    "type":"NORMAL"
  },
  "repository":{
    "slug":"repository2",
    "id":86,
    "name":"repository2",
    "scmId":"git",
    "state":"AVAILABLE",
    "statusMessage":"Available",
    "forkable":true,
    "origin":{
      "slug":"repository",
      "id":84,
      "name":"repository",
      "scmId":"git",
      "state":"AVAILABLE",
      "statusMessage":"Available",
      "forkable":true,
      "project":{
        "key":"PROJ",
        "id":84,
        "name":"project",
        "public":false,
        "type":"NORMAL"
      },
      "public":false
    },
    "project":{
      "key":"~ADMIN",
      "id":22,
      "name":"Administrator",
      "type":"PERSONAL",
      "owner":{
        "name":"admin",
        "emailAddress":"admin@example.com",
        "id":1,
        "displayName":"Administrator",
        "active":true,
        "slug":"admin",
        "type":"NORMAL"
      }
    },
    "public":false
  }
}
```

Commit comment created

A user comments on a commit in a repository. This payload, with an event key of `repo:comment:added`, provi des the following fields:

Parameter	Description
`actor`	The user who comments on the commit.
`comment`	The comment created.

`repository`	The repository with the commit.
`commit`	The hash.

```
{
  "eventKey":"repo:comment:added",
  "date":"2017-09-19T09:53:06+1000",
  "actor":{
    "name":"admin",
    "emailAddress":"admin@example.com",
    "id":1,
    "displayName":"Administrator",
    "active":true,
    "slug":"admin",
    "type":"NORMAL"
  },
  "comment":{
    "properties":{
      "repositoryId":84
    },
    "id":42,
    "version":0,
    "text":"This is a great line of code!",
    "author":{
      "name":"admin",
      "emailAddress":"admin@example.com",
      "id":1,
      "displayName":"Administrator",
      "active":true,
      "slug":"admin",
      "type":"NORMAL"
    },
    "createdDate":1505778786337,
    "updatedDate":1505778786337,
    "comments":[

    ],
    "tasks":[

    ],
    "permittedOperations":{
      "editable":true,
      "deletable":true
    }
  },
  "repository":{
    "slug":"repository",
    "id":84,
    "name":"repository",
    "scmId":"git",
    "state":"AVAILABLE",
    "statusMessage":"Available",
    "forkable":true,
    "project":{
      "key":"PROJ",
      "id":84,
      "name":"project",
      "public":false,
      "type":"NORMAL"
    },
    "public":false
  },
  "commit":"178864a7d521b6f5e720b386b2c2b0ef8563e0dc"
}
```

Commit edit on comment

A user edits a comment on a commit in a repository. This payload, with an event key of `repo:comment:edited`, provides the following fields:

Parameter	Description
`actor`	The user who edits the commit.
`comment`	The comment edited.
`previousComment`	The text of the comment prior to editing.
`repository`	The repository with the commit.
`commit`	The hash of the commit.

```
{
  "eventKey":"repo:comment:edited",
  "date":"2017-09-19T09:55:03+1000",
  "actor":{
    "name":"admin",
    "emailAddress":"admin@example.com",
    "id":1,
    "displayName":"Administrator",
    "active":true,
    "slug":"admin",
    "type":"NORMAL"
  },
  "comment":{
    "properties":{
      "repositoryId":84
    },
    "id":42,
    "version":1,
    "text":"This is a okay line of code!",
    "author":{
      "name":"admin",
      "emailAddress":"admin@example.com",
      "id":1,
      "displayName":"Administrator",
      "active":true,
      "slug":"admin",
      "type":"NORMAL"
    },
    "createdDate":1505778786337,
    "updatedDate":1505778903525,
    "comments":[

    ],
    "tasks":[

    ],
    "permittedOperations":{
      "editable":true,
      "deletable":true
    }
  },
  "repository":{
    "slug":"repository",
    "id":84,
    "name":"repository",
    "scmId":"git",
    "state":"AVAILABLE",
    "statusMessage":"Available",
    "forkable":true,
    "project":{
      "key":"PROJ",
      "id":84,
      "name":"project",
      "public":false,
      "type":"NORMAL"
    },
    "public":false
  },
  "commit":"178864a7d521b6f5e720b386b2c2b0ef8563e0dc",
  "previousComment":"This is a great line of code!"
}
```

Comment deleted on commit

A user deletes a comment on a commit in a repository. This payload, with an event key of `repo:comment:deleted`, provides the following fields:

Parameter	Description

`actor`	The user who deletes the commit.
`comment`	The comment deleted.
`repository`	The repository with the commit.
`commit`	The hash of the commit.

```
{
  "eventKey":"repo:comment:deleted",
  "date":"2017-09-19T09:56:29+1000",
  "actor":{
    "name":"admin",
    "emailAddress":"admin@example.com",
    "id":1,
    "displayName":"Administrator",
    "active":true,
    "slug":"admin",
    "type":"NORMAL"
  },
  "comment":{
    "id":42,
    "version":1,
    "text":"This is a okay line of code!",
    "author":{
      "name":"admin",
      "emailAddress":"admin@example.com",
      "id":1,
      "displayName":"Administrator",
      "active":true,
      "slug":"admin",
      "type":"NORMAL"
    },
    "createdDate":1505778786337,
    "updatedDate":1505778903525,
    "comments":[

    ],
    "tasks":[

    ]
  },
  "repository":{
    "slug":"repository",
    "id":84,
    "name":"repository",
    "scmId":"git",
    "state":"AVAILABLE",
    "statusMessage":"Available",
    "forkable":true,
    "project":{
      "key":"PROJ",
      "id":84,
      "name":"project",
      "public":false,
      "type":"NORMAL"
    },
    "public":false
  },
  "commit":"178864a7d521b6f5e720b386b2c2b0ef8563e0dc"
}
```

Mirror synchronized

A mirror has finished synchronizing this repository. This payload, with an event key of `mirror:repo_synchronized`, provides the following fields:

Parameter	Description
`mirrorServer`	The mirror which synchronized the changes. This JSON object contains both the `name` and the `id` of the `mirrorServer` which synchronized the changes.
`syncType`	The sync type the mirror used to synchronize the changes which are announced by this webhook. This value can be `snapshot` or `incremental` for mirrors 6.7 and higher. It defaults to `smart Mirror` for mirrors before version 6.7.
`repository`	The repository.
`repository.links`	This JSON object contains the HTTP and SSH clone URLs of the primary server as well as the mirror that synchronized these changes. It also contains a link to view this repository in Bitbucket.
`changes`	The ref changes for this push.
`refLimitExceeded`	If this value is `true`, the list of `changes` will be empty because it exceeded the limit of refs that can be included.

```
{
  "eventKey": "mirror:repo_synchronized",
  "date": "2019-07-11T16:18:20+1000",
  "mirrorServer": {
    "id": "B88H-IR7J-5PV0-VCNS",
    "name": "Mirror Name"
  },
  "syncType": "INCREMENTAL",
  "refLimitExceeded": false,
  "repository": {
    "slug": "testrepo",
    "id": 1,
    "name": "testrepo",
    "scmId": "git",
    "state": "AVAILABLE",
    "statusMessage": "Available",
    "forkable": true,
    "project": {
      "key": "TP",
      "id": 1,
      "name": "testp",
      "public": false,
      "type": "NORMAL"
    },
    "public": false,
"links": {
"clone": [
{
"href": "ssh://git@example.com:7997/project/repository.git",
"name": "ssh"
},
{
"href": "https://example.com/scm/project/repository.git",
"name": "http"
}
],
"self": [
{
"href": "https://example.com/projects/project/repos/repo/browse"
}
]
}


  },
  "changes": [
    {
      "ref": {
        "id": "refs/heads/master",
        "displayId": "master",
        "type": "BRANCH"
      },
      "refId": "refs/heads/master",
      "fromHash": "b5616b9",
      "toHash": "d055eca",
      "type": "UPDATE"
    }
  ]
}
```

Secret detected

A user pushes one or more commits that contain a secret to a repository. This payload, with an event key of `repo:secret_detected,` provides the following fields:

Parameter	Description
`actor`	The user who pushed the commits.

`secretLocations`	The details of the commits that contain a secret.

```
{
    "eventKey": "repo:secret_detected",
    "date": "2023-01-19T15:36:34+1100",
    "actor": {
      "id": 2,
      "username": "admin",
      "slug": "admin",
      "locale": null,
      "deletedDate": null,
      "timeZone": null,
      "active": false,
      "emailAddress": null,
      "crowdBacked": false,
      "backingCrowdUser": null,
      "name": "admin",
      "type": "NORMAL",
      "displayName": "admin"
    },
    "secretLocations": [
      {
        "commitId": "020629f5db6ab5e93db8ae3bacb8686d534e53a3",
        "path": "secret.txt",
        "line": 1,
        "repository": {
            "slug": "rep_1",
            "id": 6,
            "name": "rep_1",
            "hierarchyId": "53d427c717c35d3035e8",
            "scmId": "git",
            "state": "AVAILABLE",
            "statusMessage": "Available",
            "forkable": true,
            "project": {
              "key": "PROJECT_1",
              "id": 7,
              "name": "Project 1",
              "public": false,
              "type": "NORMAL",
            },
            "public": false,
            "archived": false,
        },
        "ruleName": "Bitbucket DC HTTP access token"
      }
    ]
}
```

Pull request events

You can create webhooks for the following events that occur on a pull request.

Opened

Parameter	Description
`actor`	The user who created the pull request.
`pullrequest`	Details of the pull request created.

```
{
  "eventKey": "pr:opened",
  "date": "2017-09-19T09:58:11+1000",
  "actor": {
    "name": "admin",
    "emailAddress": "admin@example.com",
    "id": 1,
    "displayName": "Administrator",
    "active": true,
    "slug": "admin",
    "type": "NORMAL"
  },
  "pullRequest": {
    "id": 1,
    "version": 0,
    "title": "a new file added",
    "state": "OPEN",
    "open": true,
    "closed": false,
         "draft": false,
    "createdDate": 1505779091796,
    "updatedDate": 1505779091796,
    "fromRef": {
      "id": "refs/heads/a-branch",
      "displayId": "a-branch",
      "latestCommit": "ef8755f06ee4b28c96a847a95cb8ec8ed6ddd1ca",
      "repository": {
        "slug": "repository",
        "id": 84,
        "name": "repository",
        "scmId": "git",
        "state": "AVAILABLE",
        "statusMessage": "Available",
        "forkable": true,
        "project": {
          "key": "PROJ",
          "id": 84,
          "name": "project",
          "public": false,
          "type": "NORMAL"
        },
        "public": false
      }
    },
    "toRef": {
      "id": "refs/heads/master",
      "displayId": "master",
      "latestCommit": "178864a7d521b6f5e720b386b2c2b0ef8563e0dc",
      "repository": {
        "slug": "repository",
        "id": 84,
        "name": "repository",
        "scmId": "git",
        "state": "AVAILABLE",
        "statusMessage": "Available",
        "forkable": true,
        "project": {
          "key": "PROJ",
          "id": 84,
          "name": "project",
          "public": false,
          "type": "NORMAL"
        },
        "public": false
      }
    },
    "locked": false,
    "author": {
      "user": {
        "name": "admin",
        "emailAddress": "admin@example.com",
        "id": 1,
        "displayName": "Administrator",
        "active": true,
        "slug": "admin",
        "type": "NORMAL"
      },
      "role": "AUTHOR",
      "approved": false,
      "status": "UNAPPROVED"
    },
    "reviewers": [
    ],
    "participants": [

    ],
    "links": {
      "self": [
        null
      ]
    }
  }
}
```

Source branch updated

Parameter	Description
`actor`	The user who created the pull request.
`pullrequest`	Details of the pull request created.
`previousFromHash`	Previous from-ref hash

```
{
  "eventKey": "pr:from_ref_updated",
  "date": "2020-02-20T14:49:41+1100",
  "actor": {
    "name": "admin",
    "emailAddress": "admin@example.com",
    "id": 1,
    "displayName": "Administrator",
    "active": true,
    "slug": "admin",
    "type": "NORMAL",
    "links": {
      "self": [
        {
          "href": "http://localhost:7990/bitbucket/users/admin"
        }
      ]
    }
  },
  "pullRequest": {
    "id": 2,
    "version": 16,
    "title": "Webhook",
    "state": "OPEN",
    "open": true,
    "closed": false,
         "draft": false,
    "createdDate": 1582065825700,
    "updatedDate": 1582170581372,
    "fromRef": {
      "id": "refs/heads/pr-webhook",
      "displayId": "pr-webhook",
      "latestCommit": "aab847db240ccae221f8036605b00f777eba95d2",
      "repository": {
        "slug": "dvcs",
        "id": 33,
        "name": "dvcs",
        "hierarchyId": "09992c6ad9e001f01120",
        "scmId": "git",
        "state": "AVAILABLE",
        "statusMessage": "Available",
        "forkable": true,
        "project": {
          "key": "GIT",
          "id": 62,
          "name": "Bitbucket",
          "public": false,
          "type": "NORMAL",
          "links": {
            "self": [
              {
                "href": "http://localhost:7990/bitbucket/projects/GIT"
              }
            ]
          }
        },
        "public": false,
        "links": {
          "clone": [
            {
              "href": "ssh://git@localhost:7999/git/dvcs.git",
              "name": "ssh"
            },
            {
              "href": "http://localhost:7990/bitbucket/scm/git/dvcs.git",
              "name": "http"
            }
          ],
          "self": [
            {
              "href": "http://localhost:7990/bitbucket/projects/GIT/repos/dvcs/browse"
            }
          ]
        }
      }
    },
    "toRef": {
      "id": "refs/heads/master",
      "displayId": "master",
      "latestCommit": "86448735f9dee9e1fb3d3e5cd9fbc8eb9d8400f4",
      "repository": {
        "slug": "dvcs",
        "id": 33,
        "name": "dvcs",
        "hierarchyId": "09992c6ad9e001f01120",
        "scmId": "git",
        "state": "AVAILABLE",
        "statusMessage": "Available",
        "forkable": true,
        "project": {
          "key": "GIT",
          "id": 62,
          "name": "Bitbucket",
          "public": false,
          "type": "NORMAL",
          "links": {
            "self": [
              {
                "href": "http://localhost:7990/bitbucket/projects/GIT"
              }
            ]
          }
        },
        "public": false,
        "links": {
          "clone": [
            {
              "href": "ssh://git@localhost:7999/git/dvcs.git",
              "name": "ssh"
            },
            {
              "href": "http://localhost:7990/bitbucket/scm/git/dvcs.git",
              "name": "http"
            }
          ],
          "self": [
            {
              "href": "http://localhost:7990/bitbucket/projects/GIT/repos/dvcs/browse"
            }
          ]
        }
        }
      },
      "locked": false,
      "author": {
        "user": {
          "name": "admin",
          "emailAddress": "admin@example.com",
          "id": 1,
          "displayName": "Administrator",
          "active": true,
          "slug": "admin",
          "type": "NORMAL",
          "links": {
            "self": [
              {
                "href": "http://localhost:7990/bitbucket/users/admin"
              }
            ]
          }
        },
        "role": "AUTHOR",
        "approved": false,
        "status": "UNAPPROVED"
      },
      "reviewers": [],
      "participants": [],
      "links": {
        "self": [
          {
            "href": "http://localhost:7990/bitbucket/projects/GIT/repos/dvcs/pull-requests/2"
          }
        ]
      }
    },
    "previousFromHash": "99f3ea32043ba3ecaa28de6046b420de70257d80"
}
```

Target branch updated

Parameter	Description
`actor`	The user who created the pull request.
`pullrequest`	Details of the pull request created.
`previousToHash`	Previous to-ref hash

```
{
  "eventKey": "pr:from_ref_updated",
  "date": "2020-02-20T14:49:41+1100",
  "actor": {
    "name": "admin",
    "emailAddress": "admin@example.com",
    "id": 1,
    "displayName": "Administrator",
    "active": true,
    "slug": "admin",
    "type": "NORMAL",
    "links": {
      "self": [
        {
          "href": "http://localhost:7990/bitbucket/users/admin"
        }
      ]
    }
  },
  "pullRequest": {
    "id": 2,
    "version": 16,
    "title": "Webhook",
    "state": "OPEN",
    "open": true,
    "closed": false,
         "draft": false,
    "createdDate": 1582065825700,
    "updatedDate": 1582170581372,
    "fromRef": {
      "id": "refs/heads/pr-webhook",
      "displayId": "pr-webhook",
      "latestCommit": "aab847db240ccae221f8036605b00f777eba95d2",
      "repository": {
        "slug": "dvcs",
        "id": 33,
        "name": "dvcs",
        "hierarchyId": "09992c6ad9e001f01120",
        "scmId": "git",
        "state": "AVAILABLE",
        "statusMessage": "Available",
        "forkable": true,
        "project": {
          "key": "GIT",
          "id": 62,
          "name": "Bitbucket",
          "public": false,
          "type": "NORMAL",
          "links": {
            "self": [
              {
                "href": "http://localhost:7990/bitbucket/projects/GIT"
              }
            ]
          }
        },
        "public": false,
        "links": {
          "clone": [
            {
              "href": "ssh://git@localhost:7999/git/dvcs.git",
              "name": "ssh"
            },
            {
              "href": "http://localhost:7990/bitbucket/scm/git/dvcs.git",
              "name": "http"
            }
          ],
          "self": [
            {
              "href": "http://localhost:7990/bitbucket/projects/GIT/repos/dvcs/browse"
            }
          ]
        }
      }
    },
    "toRef": {
      "id": "refs/heads/master",
      "displayId": "master",
      "latestCommit": "86448735f9dee9e1fb3d3e5cd9fbc8eb9d8400f4",
      "repository": {
        "slug": "dvcs",
        "id": 33,
        "name": "dvcs",
        "hierarchyId": "09992c6ad9e001f01120",
        "scmId": "git",
        "state": "AVAILABLE",
        "statusMessage": "Available",
        "forkable": true,
        "project": {
          "key": "GIT",
          "id": 62,
          "name": "Bitbucket",
          "public": false,
          "type": "NORMAL",
          "links": {
            "self": [
              {
                "href": "http://localhost:7990/bitbucket/projects/GIT"
              }
            ]
          }
        },
        "public": false,
        "links": {
          "clone": [
            {
              "href": "ssh://git@localhost:7999/git/dvcs.git",
              "name": "ssh"
            },
            {
              "href": "http://localhost:7990/bitbucket/scm/git/dvcs.git",
              "name": "http"
            }
          ],
          "self": [
            {
              "href": "http://localhost:7990/bitbucket/projects/GIT/repos/dvcs/browse"
            }
          ]
        }
      }
    },
    "locked": false,
    "author": {
      "user": {
        "name": "admin",
        "emailAddress": "admin@example.com",
        "id": 1,
        "displayName": "Administrator",
        "active": true,
        "slug": "admin",
        "type": "NORMAL",
        "links": {
          "self": [
            {
              "href": "http://localhost:7990/bitbucket/users/admin"
            }
          ]
        }
      },
      "role": "AUTHOR",
      "approved": false,
      "status": "UNAPPROVED"
    },
    "reviewers": [],
    "participants": [],
    "links": {
      "self": [
        {
          "href": "http://localhost:7990/bitbucket/projects/GIT/repos/dvcs/pull-requests/2"
        }
      ]
    }
  },
  "previousToHash": "5a68d32291b91cfbc18f99731ea93cce25601942"
}
```

Modified

Parameter	Description
`actor`	The user who created the pull request.
`pullrequest`	Details of the pull request created.
`previousTitle`	Previous title of the pull request, may not have changed

`previousDescription`	Previous description of the pull request, may not have changed
`previousTarget`	Previous target of the pull request, may not have changed
`previousDraft`	Previous draft status of the pull request, may not have changed Learn more about draft pull requests

```
{
  "eventKey": "pr:modified",
  "date": "2018-04-24T10:15:30+1000",
  "actor": {
    "name": "Administrator",
    "emailAddress": "example@atlassian.com",
    "id": 110653,
    "displayName": "Administrator",
    "active": true,
    "slug": "pathompson",
    "type": "NORMAL"
  },
  "pullRequest": {
    "id": 1,
    "version": 1,
    "title": "A new title",
    "description": "A new description",
    "state": "OPEN",
    "open": true,
    "closed": false,
         "draft": false,
    "createdDate": 1524528879329,
    "updatedDate": 1524528930110,
    "fromRef": {
      "id": "refs/heads/new-branch",
      "displayId": "new-branch",
      "latestCommit": "5a705e60111a4213da46839d9cbf4fc43639b771",
      "repository": {
        "slug": "example",
        "id": 12087,
        "name": "example",
        "scmId": "git",
        "state": "AVAILABLE",
        "statusMessage": "Available",
        "forkable": true,
        "project": {
          "key": "~ADMIN",
          "id": 8504,
          "name": "Administrator",
          "type": "PERSONAL",
          "owner": {
            "name": "Administrator",
            "emailAddress": "example@atlassian.com",
            "id": 110653,
            "displayName": "Administrator",
            "active": true,
            "slug": "admin",
            "type": "NORMAL"
          }
        },
        "public": false
      }
    },
    "toRef": {
      "id": "refs/heads/master",
      "displayId": "master",
      "latestCommit": "860c4eb4ed0f969b47144234ba13c31c498cca69",
      "repository": {
        "slug": "example",
        "id": 12087,
        "name": "example",
        "scmId": "git",
        "state": "AVAILABLE",
        "statusMessage": "Available",
        "forkable": true,
        "project": {
          "key": "~ADMIN",
          "id": 8504,
          "name": "Administrator",
          "type": "PERSONAL",
          "owner": {
            "name": "Administrator",
            "emailAddress": "example@atlassian.com",
            "id": 110653,
            "displayName": "Administrator",
            "active": true,
            "slug": "admin",
            "type": "NORMAL"
          }
        },
        "public": false
      }
    },
    "locked": false,
    "author": {
      "user": {
        "name": "Administrator",
        "emailAddress": "example@atlassian.com",
        "id": 110653,
        "displayName": "Administrator",
        "active": true,
        "slug": "admin",
        "type": "NORMAL"
      },
      "role": "AUTHOR",
      "approved": false,
      "status": "UNAPPROVED"
    },
    "reviewers": [
      {
        "user": {
          "name": "User",
          "emailAddress": "user@atlassian.com",
          "id": 36303,
          "displayName": "User",
          "active": true,
          "slug": "user",
          "type": "NORMAL"
        },
        "role": "REVIEWER",
        "approved": false,
        "status": "UNAPPROVED"
      }
    ],
    "participants": [

    ]
  },
  "previousTitle": "A cool PR",
  "previousDescription": "A neat description",
  "previousDraft": false,
  "previousTarget": {
    "id": "refs\/heads\/master",
    "displayId": "master",
    "type": "BRANCH",
    "latestCommit": "860c4eb4ed0f969b47144234ba13c31c498cca69",
    "latestChangeset": "860c4eb4ed0f969b47144234ba13c31c498cca69"
  }
}
```

Reviewers Updated

Parameter	Description
`actor`	The user who created the pull request.

`pullrequest`	Details of the pull request created.
`removedReviewers`	Users that are no longer reviewers
`addedReviewers`	Users that have been added as reviewers

```
{
  "eventKey": "pr:reviewer:updated",
  "date": "2018-04-24T10:20:07+1000",
  "actor": {
    "name": "Administrator",
    "emailAddress": "admin@atlassian.com",
    "id": 110653,
    "displayName": "Administrator",
    "active": true,
    "slug": "admin",
    "type": "NORMAL"
  },
  "pullRequest": {
    "id": 1,
    "version": 2,
    "title": "A title",
    "description": "A description",
    "state": "OPEN",
    "open": true,
    "closed": false,
         "draft": false,
    "createdDate": 1524528879329,
    "updatedDate": 1524529207598,
    "fromRef": {
      "id": "refs/heads/new-branch",
      "displayId": "new-branch",
      "latestCommit": "5a705e60111a4213da46839d9cbf4fc43639b771",
      "repository": {
        "slug": "example",
        "id": 12087,
        "name": "example",
        "scmId": "git",
        "state": "AVAILABLE",
        "statusMessage": "Available",
        "forkable": true,
        "project": {
          "key": "~ADMIN",
          "id": 8504,
          "name": "Administrator",
          "type": "PERSONAL",
          "owner": {
            "name": "admin",
            "emailAddress": "example@atlassian.com",
            "id": 110653,
            "displayName": "Administrator",
            "active": true,
            "slug": "admin",
            "type": "NORMAL"
          }
        },
        "public": false
      }
    },
    "toRef": {
      "id": "refs/heads/master",
      "displayId": "master",
      "latestCommit": "860c4eb4ed0f969b47144234ba13c31c498cca69",
      "repository": {
        "slug": "example",
        "id": 12087,
        "name": "example",
        "scmId": "git",
        "state": "AVAILABLE",
        "statusMessage": "Available",
        "forkable": true,
        "project": {
          "key": "~ADMIN",
          "id": 8504,
          "name": "Administrator",
          "type": "PERSONAL",
          "owner": {
            "name": "Administrator",
            "emailAddress": "admin@atlassian.com",
            "id": 110653,
            "displayName": "Administrator",
            "active": true,
            "slug": "admin",
            "type": "NORMAL"
          }
        },
        "public": false
      }
    },
    "locked": false,
    "author": {
      "user": {
        "name": "Administrator",
        "emailAddress": "admin@atlassian.com",
        "id": 110653,
        "displayName": "Administrator",
        "active": true,
        "slug": "admin",
        "type": "NORMAL"
      },
      "role": "AUTHOR",
      "approved": false,
      "status": "UNAPPROVED"
    },
    "reviewers": [
      {
        "user": {
          "name": "pathompson_admin",
          "emailAddress": "pathompson@atlassian.com",
          "id": 129659,
          "displayName": "Paul Thompson Admin",
          "active": true,
          "slug": "pathompson_admin",
          "type": "NORMAL"
        },
        "role": "REVIEWER",
        "approved": false,
        "status": "UNAPPROVED"
      }
    ],
    "participants": [

    ]
  },
  "addedReviewers": [
    {
      "name": "new user",
      "emailAddress": "user2@atlassian.com",
      "id": 129659,
      "displayName": "New User",
      "active": true,
      "slug": "new_user",
      "type": "NORMAL"
    }
  ],
  "removedReviewers": [
    {
      "name": "user",
      "emailAddress": "user@atlassian.com",
      "id": 36303,
      "displayName": "User",
      "active": true,
      "slug": "user",
      "type": "NORMAL"
    }
  ]
}
```

Approved

A user approves a pull request for a repository. This payload, with an event key of `pr:reviewer:approved`, pr ovides the following fields:

Parameter	Description
`actor`	The user which made the approval.
`pullrequest`	Details of the pull request approved.
`participant`	Details of the PR participant status of the user making the change
`previousStatus`	The state of the approval before this change

```
{
  "eventKey":"pr:reviewer:approved",
  "date":"2017-09-19T10:10:01+1000",
  "actor":{
    "name":"user",
    "emailAddress":"user@example.com",
    "id":2,
    "displayName":"User",
    "active":true,
    "slug":"user",
    "type":"NORMAL"
  },
  "pullRequest":{
    "id":1,
    "version":1,
    "title":"a new file added",
    "description":"A new description, added a user",
    "state":"OPEN",
    "open":true,
    "closed":false,
         "draft": false,
    "createdDate":1505779091796,
    "updatedDate":1505779257496,
    "fromRef":{
      "id":"refs/heads/a-branch",
      "displayId":"a-branch",
      "latestCommit":"ef8755f06ee4b28c96a847a95cb8ec8ed6ddd1ca",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "toRef":{
      "id":"refs/heads/master",
      "displayId":"master",
      "latestCommit":"178864a7d521b6f5e720b386b2c2b0ef8563e0dc",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "locked":false,
    "author":{
      "user":{
        "name":"admin",
        "emailAddress":"admin@example.com",
        "id":1,
        "displayName":"Administrator",
        "active":true,
        "slug":"admin",
        "type":"NORMAL"
      },
      "role":"AUTHOR",
      "approved":false,
      "status":"UNAPPROVED"
    },
    "reviewers":[
      {
        "user":{
          "name":"user",
          "emailAddress":"user@example.com",
          "id":2,
          "displayName":"User",
          "active":true,
          "slug":"user",
          "type":"NORMAL"
        },
        "lastReviewedCommit":"ef8755f06ee4b28c96a847a95cb8ec8ed6ddd1ca",
        "role":"REVIEWER",
        "approved":true,
        "status":"APPROVED"
      }
    ],
    "participants":[

    ],
    "links":{
      "self":[
        null
      ]
    }
  },
  "participant":{
    "user":{
      "name":"user",
      "emailAddress":"user@example.com",
      "id":2,
      "displayName":"User",
      "active":true,
      "slug":"user",
      "type":"NORMAL"
    },
    "lastReviewedCommit":"ef8755f06ee4b28c96a847a95cb8ec8ed6ddd1ca",
    "role":"REVIEWER",
    "approved":true,
    "status":"APPROVED"
  },
  "previousStatus":"UNAPPROVED"
}
```

Unapproved

A user removes an approval from a pull request for a repository. This payload, with an event key of `pr:reviewer:unapproved`, provides the following fields:

Parameter	Description
`actor`	The user which removed the approval.
`pullrequest`	Details of the pull request unapproved.
`participant`	Details of the PR participant status of the user making the change
`previousStatus`	The state of the approval before this change

```
{
  "eventKey":"pr:reviewer:unapproved",
  "date":"2017-09-19T10:13:43+1000",
  "actor":{
    "name":"user",
    "emailAddress":"user@example.com",
    "id":2,
    "displayName":"User",
    "active":true,
    "slug":"user",
    "type":"NORMAL"
  },
  "pullRequest":{
    "id":1,
    "version":1,
    "title":"a new file added",
    "description":"A new description, added a user",
    "state":"OPEN",
    "open":true,
    "closed":false,
         "draft": false,
    "createdDate":1505779091796,
    "updatedDate":1505779257496,
    "fromRef":{
      "id":"refs/heads/a-branch",
      "displayId":"a-branch",
      "latestCommit":"ef8755f06ee4b28c96a847a95cb8ec8ed6ddd1ca",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "toRef":{
      "id":"refs/heads/master",
      "displayId":"master",
      "latestCommit":"178864a7d521b6f5e720b386b2c2b0ef8563e0dc",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "locked":false,
    "author":{
      "user":{
        "name":"admin",
        "emailAddress":"admin@example.com",
        "id":1,
        "displayName":"Administrator",
        "active":true,
        "slug":"admin",
        "type":"NORMAL"
      },
      "role":"AUTHOR",
      "approved":false,
      "status":"UNAPPROVED"
    },
    "reviewers":[
      {
        "user":{
          "name":"user",
          "emailAddress":"user@example.com",
          "id":2,
          "displayName":"User",
          "active":true,
          "slug":"user",
          "type":"NORMAL"
        },
        "lastReviewedCommit":"ef8755f06ee4b28c96a847a95cb8ec8ed6ddd1ca",
        "role":"REVIEWER",
        "approved":false,
        "status":"UNAPPROVED"
      }
    ],
    "participants":[

    ]
  },
  "participant":{
    "user":{
      "name":"user",
      "emailAddress":"user@example.com",
      "id":2,
      "displayName":"User",
      "active":true,
      "slug":"user",
      "type":"NORMAL"
    },
    "lastReviewedCommit":"ef8755f06ee4b28c96a847a95cb8ec8ed6ddd1ca",
    "role":"REVIEWER",
    "approved":false,
    "status":"UNAPPROVED"
  },
  "previousStatus":"APPROVED"
}
```

Changes requested

A user marks a pull request as changes requested. This payload, with an event key of pr:reviewer:changes requested, provides the following fields:

Parameter	Description

`actor`	The user who marked the PR as "Changes requested".
`pullrequest`	Details of the pull request marked "Changes requested".
`participant`	Details of the PR participant status of the user making the change.
`previousStatus`	The state of the approval before this change.

```
{
  "eventKey":"pr:reviewer:changes_requested",
  "date":"2017-09-19T10:14:47+1000",
  "actor":{
    "name":"user",
    "emailAddress":"user@example.com",
    "id":2,
    "displayName":"User",
    "active":true,
    "slug":"user",
    "type":"NORMAL"
  },
  "pullRequest":{
    "id":1,
    "version":1,
    "title":"a new file added",
    "description":"A new description, added a user",
    "state":"OPEN",
    "open":true,
    "closed":false,
         "draft": false,
    "createdDate":1505779091796,
    "updatedDate":1505779257496,
    "fromRef":{
      "id":"refs/heads/a-branch",
      "displayId":"a-branch",
      "latestCommit":"ef8755f06ee4b28c96a847a95cb8ec8ed6ddd1ca",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "toRef":{
      "id":"refs/heads/master",
      "displayId":"master",
      "latestCommit":"178864a7d521b6f5e720b386b2c2b0ef8563e0dc",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "locked":false,
    "author":{
      "user":{
        "name":"admin",
        "emailAddress":"admin@example.com",
        "id":1,
        "displayName":"Administrator",
        "active":true,
        "slug":"admin",
        "type":"NORMAL"
      },
      "role":"AUTHOR",
      "approved":false,
      "status":"UNAPPROVED"
    },
    "reviewers":[
      {
        "user":{
          "name":"user",
          "emailAddress":"user@example.com",
          "id":2,
          "displayName":"User",
          "active":true,
          "slug":"user",
          "type":"NORMAL"
        },
        "lastReviewedCommit":"ef8755f06ee4b28c96a847a95cb8ec8ed6ddd1ca",
        "role":"REVIEWER",
        "approved":false,
        "status":"CHANGES_REQUESTED"
      }
    ],
    "participants":[

    ]
  },
  "participant":{
    "user":{
      "name":"user",
      "emailAddress":"user@example.com",
      "id":2,
      "displayName":"User",
      "active":true,
      "slug":"user",
      "type":"NORMAL"
    },
    "lastReviewedCommit":"ef8755f06ee4b28c96a847a95cb8ec8ed6ddd1ca",
    "role":"REVIEWER",
    "approved":false,
    "status":"CHANGES_REQUESTED"
  },
  "previousStatus":"UNAPPROVED"
}
```

Merged

A user merges a pull request for a repository. This payload, with an event key of `pr:merged`, provides the following fields:

Parameter	Description
`actor`	The user who merged the pull request.
`pullrequest`	Details of the pull request merged.

```
{
  "eventKey":"pr:merged",
  "date":"2017-09-19T10:39:36+1000",
  "actor":{
    "name":"user",
    "emailAddress":"user@example.com",
    "id":2,
    "displayName":"User",
    "active":true,
    "slug":"user",
    "type":"NORMAL"
  },
  "pullRequest":{
    "id":9,
    "version":2,
    "title":"file edited online with Bitbucket",
    "state":"MERGED",
    "open":false,
    "closed":true,
         "draft": false,
    "createdDate":1505781560908,
    "updatedDate":1505781576361,
    "closedDate":1505781576361,
    "fromRef":{
      "id":"refs/heads/admin/file-1505781548644",
      "displayId":"admin/file-1505781548644",
      "latestCommit":"45f9690c928915a5e1c4366d5ee1985eea03f05d",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "toRef":{
      "id":"refs/heads/master",
      "displayId":"master",
      "latestCommit":"8d2ad38c918fa6943859fca2176c89ea98b92a21",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "locked":false,
    "author":{
      "user":{
        "name":"admin",
        "emailAddress":"admin@example.com",
        "id":1,
        "displayName":"Administrator",
        "active":true,
        "slug":"admin",
        "type":"NORMAL"
      },
      "role":"AUTHOR",
      "approved":false,
      "status":"UNAPPROVED"
    },
    "reviewers":[

    ],
    "participants":[
      {
        "user":{
          "name":"user",
          "emailAddress":"user@example.com",
          "id":2,
          "displayName":"User",
          "active":true,
          "slug":"user",
          "type":"NORMAL"
        },
        "role":"PARTICIPANT",
        "approved":false,
        "status":"UNAPPROVED"
      }
    ],
    "properties":{
      "mergeCommit":{
        "displayId":"7e48f426f0a",
        "id":"7e48f426f0a6e47c5b5e862c31be6ca965f82c9c"
      }
    },
  }
}
```

Declined

A user declines a pull request for a repository. This payload, with an event key of `pr:declined`, provides the following fields:

Parameter	Description
`actor`	The user who declined the pull request.
`pullrequest`	Details of the pull request declined.

```
{
  "eventKey":"pr:declined",
  "date":"2017-09-19T11:14:43+1000",
  "actor":{
    "name":"admin",
    "emailAddress":"admin@example.com",
    "id":1,
    "displayName":"Administrator",
    "active":true,
    "slug":"admin",
    "type":"NORMAL"
  },
  "pullRequest":{
    "id":10,
    "version":2,
    "title":"Commit message",
    "state":"DECLINED",
    "open":false,
    "closed":true,
         "draft": false,
    "createdDate":1505783668760,
    "updatedDate":1505783683969,
    "closedDate":1505783683969,
    "fromRef":{
      "id":"refs/heads/decline-me",
      "displayId":"decline-me",
      "latestCommit":"2d9fb6b9a46eafb1dcef7b008d1a429d45ca742c",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "toRef":{
      "id":"refs/heads/master",
      "displayId":"master",
      "latestCommit":"7e48f426f0a6e47c5b5e862c31be6ca965f82c9c",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "locked":false,
    "author":{
      "user":{
        "name":"admin",
        "emailAddress":"admin@example.com",
        "id":1,
        "displayName":"Administrator",
        "active":true,
        "slug":"admin",
        "type":"NORMAL"
      },
      "role":"AUTHOR",
      "approved":false,
      "status":"UNAPPROVED"
    },
    "reviewers":[
      {
        "user":{
          "name":"user",
          "emailAddress":"user@example.com",
          "id":2,
          "displayName":"User",
          "active":true,
          "slug":"user",
          "type":"NORMAL"
        },
        "role":"REVIEWER",
        "approved":false,
        "status":"UNAPPROVED"
      }
    ],
    "participants":[
    ]
  }
}
```

Deleted

A user deletes a pull request for a repository. This payload, with an event key of `pr:deleted`, provides the following fields:

Parameter	Description
`actor`	The user who deleted the pull request.
`pullrequest`	Details of the pull request deleted.

```
{
  "eventKey":"pr:deleted",
  "date":"2017-09-19T11:16:17+1000",
  "actor":{
    "name":"admin",
    "emailAddress":"admin@example.com",
    "id":1,
    "displayName":"Administrator",
    "active":true,
    "slug":"admin",
    "type":"NORMAL"
  },
  "pullRequest":{
    "id":10,
    "version":3,
    "title":"Commit message",
    "state":"OPEN",
    "open":true,
    "closed":false,
         "draft": false,
    "createdDate":1505783668760,
    "updatedDate":1505783750704,
    "fromRef":{
      "id":"refs/heads/decline-me",
      "displayId":"decline-me",
      "latestCommit":"2d9fb6b9a46eafb1dcef7b008d1a429d45ca742c",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "toRef":{
      "id":"refs/heads/master",
      "displayId":"master",
      "latestCommit":"7e48f426f0a6e47c5b5e862c31be6ca965f82c9c",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "locked":false,
    "author":{
      "user":{
        "name":"admin",
        "emailAddress":"admin@example.com",
        "id":1,
        "displayName":"Administrator",
        "active":true,
        "slug":"admin",
        "type":"NORMAL"
      },
      "role":"AUTHOR",
      "approved":false,
      "status":"UNAPPROVED"
    },
    "reviewers":[
      {
        "user":{
          "name":"user",
          "emailAddress":"user@example.com",
          "id":2,
          "displayName":"User",
          "active":true,
          "slug":"user",
          "type":"NORMAL"
        },
        "role":"REVIEWER",
        "approved":false,
        "status":"UNAPPROVED"
      }
    ],
    "participants":[

    ]
  }
}
```

Comment added

A user comments on a pull request. This payload, with an event key of `pr:comment:added`, provides the following fields:

Parameter	Description
`actor`	The user that created the comment.
`pullRequest`	The pull request comment on.
`comment`	The comment created.
`commentParentId`	Id of the parent comment if one exists.

```
{
  "eventKey":"pr:comment:added",
  "date":"2017-09-19T11:21:06+1000",
"actor":{
  "name":"admin",
  "emailAddress":"admin@example.com",
  "id":1,
  "displayName":"Administrator",
  "active":true,
  "slug":"admin",
  "type":"NORMAL"
},
"pullRequest":{
  "id":11,
  "version":1,
  "title":"A cool PR",
  "state":"OPEN",
  "open":true,
  "closed":false,
       "draft": false,
  "createdDate":1505783860548,
  "updatedDate":1505783878981,
  "fromRef":{
    "id":"refs/heads/comment-pr",
    "displayId":"comment-pr",
    "latestCommit":"ddc19f786996396d57e17c8f6d1d05d00318ad10",
    "repository":{
      "slug":"repository",
      "id":84,
      "name":"repository",
      "scmId":"git",
      "state":"AVAILABLE",
      "statusMessage":"Available",
      "forkable":true,
      "project":{
        "key":"PROJ",
        "id":84,
        "name":"project",
        "public":false,
        "type":"NORMAL"
      },
      "public":false
    }
  },
  "toRef":{
    "id":"refs/heads/master",
    "displayId":"master",
    "latestCommit":"7e48f426f0a6e47c5b5e862c31be6ca965f82c9c",
    "repository":{
      "slug":"repository",
      "id":84,
      "name":"repository",
      "scmId":"git",
      "state":"AVAILABLE",
      "statusMessage":"Available",
      "forkable":true,
      "project":{
        "key":"PROJ",
        "id":84,
        "name":"project",
        "public":false,
        "type":"NORMAL"
      },
      "public":false
    }
  },
  "locked":false,
  "author":{
    "user":{
      "name":"admin",
      "emailAddress":"admin@example.com",
      "id":1,
      "displayName":"Administrator",
      "active":true,
      "slug":"admin",
      "type":"NORMAL"
    },
    "role":"AUTHOR",
    "approved":false,
      "status":"UNAPPROVED"
    },
    "reviewers":[

    ],
    "participants":[

    ]
  },
  "comment":{
    "properties":{
      "repositoryId":84
    },
    "id":62,
    "version":0,
    "text":"I am a PR comment",
    "author":{
      "name":"admin",
      "emailAddress":"admin@example.com",
      "id":1,
      "displayName":"Administrator",
      "active":true,
      "slug":"admin",
      "type":"NORMAL"
    },
    "createdDate":1505784066751,
    "updatedDate":1505784066751,
    "comments":[

    ],
    "tasks":[

    ]
  },
  "commentParentId":43
}
```

Comment edited

This payload, with an event key of `pr:comment:edited`, provides the following fields:

Parameter	Description
`actor`	The user that edited the comment.
`pullRequest`	The pull request where the comment exists.
`comment`	The comment edited.
`commentParentId`	Id of the parent comment if one exists.
`previousComment`	Text of the previous comment.

```
{
  "eventKey":"pr:comment:edited",
  "date":"2017-09-19T11:24:19+1000",
  "actor":{
    "name":"admin",
    "emailAddress":"admin@example.com",
    "id":1,
    "displayName":"Administrator",
    "active":true,
    "slug":"admin",
    "type":"NORMAL"
  },
  "pullRequest":{
    "id":11,
    "version":1,
    "title":"A cool PR",
    "state":"OPEN",
    "open":true,
    "closed":false,
         "draft": false,
    "createdDate":1505783860548,
    "updatedDate":1505783878981,
    "fromRef":{
      "id":"refs/heads/comment-pr",
      "displayId":"comment-pr",
      "latestCommit":"ddc19f786996396d57e17c8f6d1d05d00318ad10",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "toRef":{
      "id":"refs/heads/master",
      "displayId":"master",
      "latestCommit":"7e48f426f0a6e47c5b5e862c31be6ca965f82c9c",
      "repository":{
        "slug":"repository",
        "id":84,
        "name":"repository",
        "scmId":"git",
        "state":"AVAILABLE",
        "statusMessage":"Available",
        "forkable":true,
        "project":{
          "key":"PROJ",
          "id":84,
          "name":"project",
          "public":false,
          "type":"NORMAL"
        },
        "public":false
      }
    },
    "locked":false,
    "author":{
      "user":{
        "name":"admin",
        "emailAddress":"admin@example.com",
        "id":1,
        "displayName":"Administrator",
        "active":true,
        "slug":"admin",
        "type":"NORMAL"
      },
      "role":"AUTHOR",
      "approved":false,
      "status":"UNAPPROVED"
    },
    "reviewers":[

    ],
    "participants":[

    ]
  },
  "comment":{
    "properties":{
      "repositoryId":84
    },
    "id":62,
    "version":1,
    "text":"I am a PR comment that was edited",
    "author":{
      "name":"admin",
      "emailAddress":"admin@example.com",
      "id":1,
      "displayName":"Administrator",
      "active":true,
      "slug":"admin",
      "type":"NORMAL"
    },
    "createdDate":1505784066751,
    "updatedDate":1505784259446,
    "comments":[

    ],
    "tasks":[

    ]
  },
  "commentParentId":43,
  "previousComment":"I am a PR comment"
}
```

Comment deleted

A user deletes a comment on a pull request. This payload, with an event key of `pr:comment:deleted`, provide s the following fields:

Parameter	Description
`actor`	The user that deleted the comment.
`pullRequest`	The pull request where the comment existed.
`comment`	The comment deleted.
`commentParentId`	Id of the parent comment if one exists.

```
{
  "eventKey":"pr:comment:deleted",
  "date":"2017-09-19T11:25:47+1000",
  "actor":{
    "name":"admin",
    "emailAddress":"admin@example.com",
    "id":1,
    "displayName":"Administrator",
    "active":true,
    "slug":"admin",
    "type":"NORMAL"
  },
  "pullRequest":{
    "id":11,
    "version":1,
    "title":"A cool PR",
    "state":"OPEN",
    "open":true,
    "closed":false,
         "draft": false,
    "createdDate":1505783860548,
    "updatedDate":1505783878981,
    "fromRef":{
      "id":"refs/heads/comment-pr",
      "displayId":"comment-pr",
        "latestCommit":"ddc19f786996396d57e17c8f6d1d05d00318ad10",
        "repository":{
          "slug":"repository",
          "id":84,
          "name":"repository",
          "scmId":"git",
          "state":"AVAILABLE",
          "statusMessage":"Available",
          "forkable":true,
          "project":{
            "key":"PROJ",
            "id":84,
            "name":"project",
            "public":false,
            "type":"NORMAL"
          },
          "public":false
        }
      },
      "toRef":{
        "id":"refs/heads/master",
        "displayId":"master",
        "latestCommit":"7e48f426f0a6e47c5b5e862c31be6ca965f82c9c",
        "repository":{
          "slug":"repository",
          "id":84,
          "name":"repository",
          "scmId":"git",
          "state":"AVAILABLE",
          "statusMessage":"Available",
          "forkable":true,
          "project":{
            "key":"PROJ",
            "id":84,
            "name":"project",
            "public":false,
            "type":"NORMAL"
          },
          "public":false
        }
      },
      "locked":false,
      "author":{
        "user":{
          "name":"admin",
          "emailAddress":"admin@example.com",
          "id":1,
          "displayName":"Administrator",
          "active":true,
          "slug":"admin",
          "type":"NORMAL"
        },
        "role":"AUTHOR",
        "approved":false,
        "status":"UNAPPROVED"
      },
      "reviewers":[

      ],
      "participants":[

      ]
    },
    "comment":{
      "id":62,
      "version":1,
      "text":"I am a PR comment that was edited",
      "author":{
        "name":"admin",
        "emailAddress":"admin@example.com",
        "id":1,
        "displayName":"Administrator",
        "active":true,
        "slug":"admin",
        "type":"NORMAL"
      },
      "createdDate":1505784066751,
      "updatedDate":1505784259446,
      "comments":[

      ],
      "tasks":[

      ]
    },
    "commentParentId":43
}
```

If you use self-signed certificates

Atlassian applications allow the use of SSL within our products, however Atlassian Support does not provide assistance for configuring it. Consequently, Atlassian **cannot guarantee providing any support for it**.

- If assistance with conversions of certificates is required, please consult with the vendor who provided the certificate.
- If assistance with configuration is required, please raise a question on Atlassian Answers.

If you're on a Bitbucket version 8.8 or above, you can configure your webhook to skip certificate verification.

If you're on a Bitbucket version lower than 8.8, in order to trust a self-signed certificate, the public certificate need to be imported in the Java keystore that Bitbucket Data Center uses. In this example, it is *.atlassian.com, and we cover how to install it below.

If you're unable to install Portecle on the server or prefer the command line please see our Command Line Installation section below.

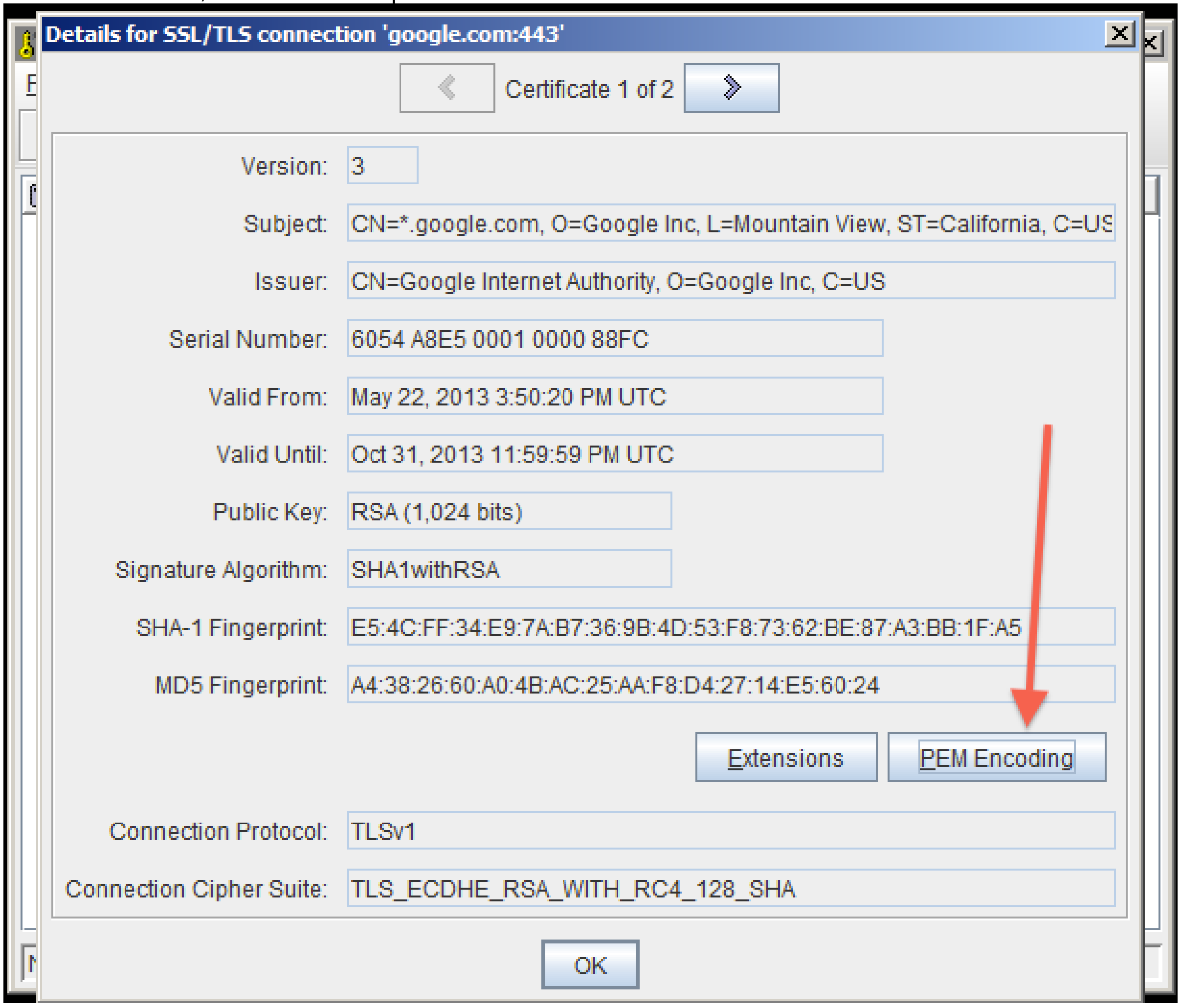
Obtain and import the endpoint's public certificate

1. Download and install the Portecle app onto the server that runs Bitbucket.
   This is a third-party application and not supported by Atlassian.
2. Ensure the <JAVA_HOME> variable is pointing to the same version of Java that Bitbucket uses.
   If running on a Linux/UNIX server, X11 will need to be forwarded when connecting to the server (so you can use the GUI), as below:

   ```
   ssh -X user@server
   ```

3. Select the **Examine** menu and then click **Examine SSL/TLS Connection**:
4. Enter the SSL Host and Port of the target system:

5. Wait for it to load, then select the public certificate and click on PEM:



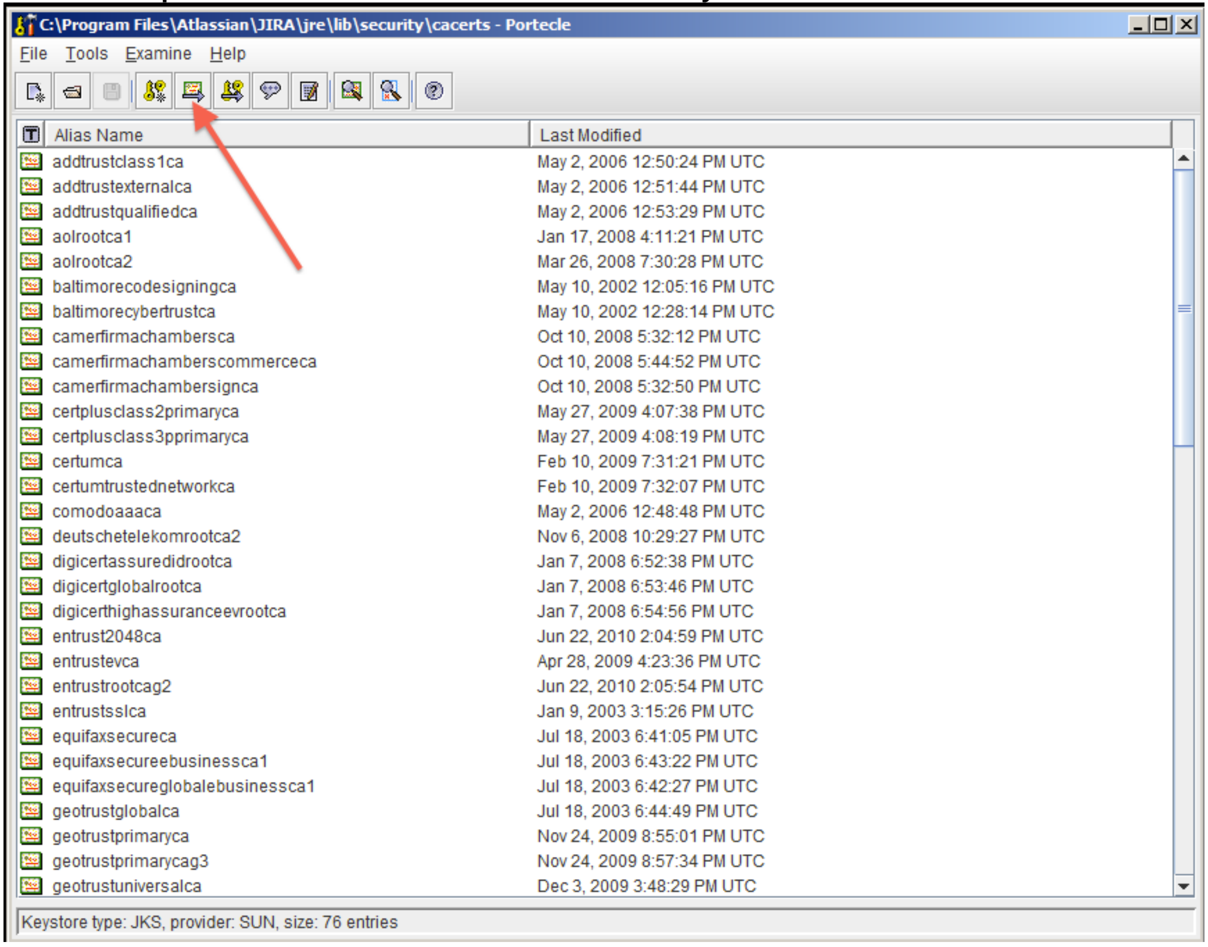
Details for SSL/TLS connection 'google.com:443'

Certificate 1 of 2

Version:	3
Subject:	CN=*.google.com, O=Google Inc, L=Mountain View, ST=California, C=US
Issuer:	CN=Google Internet Authority, O=Google Inc, C=US
Serial Number:	6054 A8E5 0001 0000 88FC
Valid From:	May 22, 2013 3:50:20 PM UTC
Valid Until:	Oct 31, 2013 11:59:59 PM UTC
Public Key:	RSA (1,024 bits)
Signature Algorithm:	SHA1withRSA
SHA-1 Fingerprint:	E5:4C:FF:34:E9:7A:B7:36:9B:4D:53:F8:73:62:BE:87:A3:BB:1F:A5
MD5 Fingerprint:	A4:38:26:60:A0:4B:AC:25:AA:F8:D4:27:14:E5:60:24
Connection Protocol:	TLSv1
Connection Cipher Suite:	TLS_ECDHE_RSA_WITH_RC4_128_SHA

6. Export the certificate and save it.
7. Go back to the main screen and select the **Open an existing keystore from disk** option, select `cacerts` (for example `$JAVA_HOME/lib/security/cacerts`) then enter the password (the default is `changeit`).

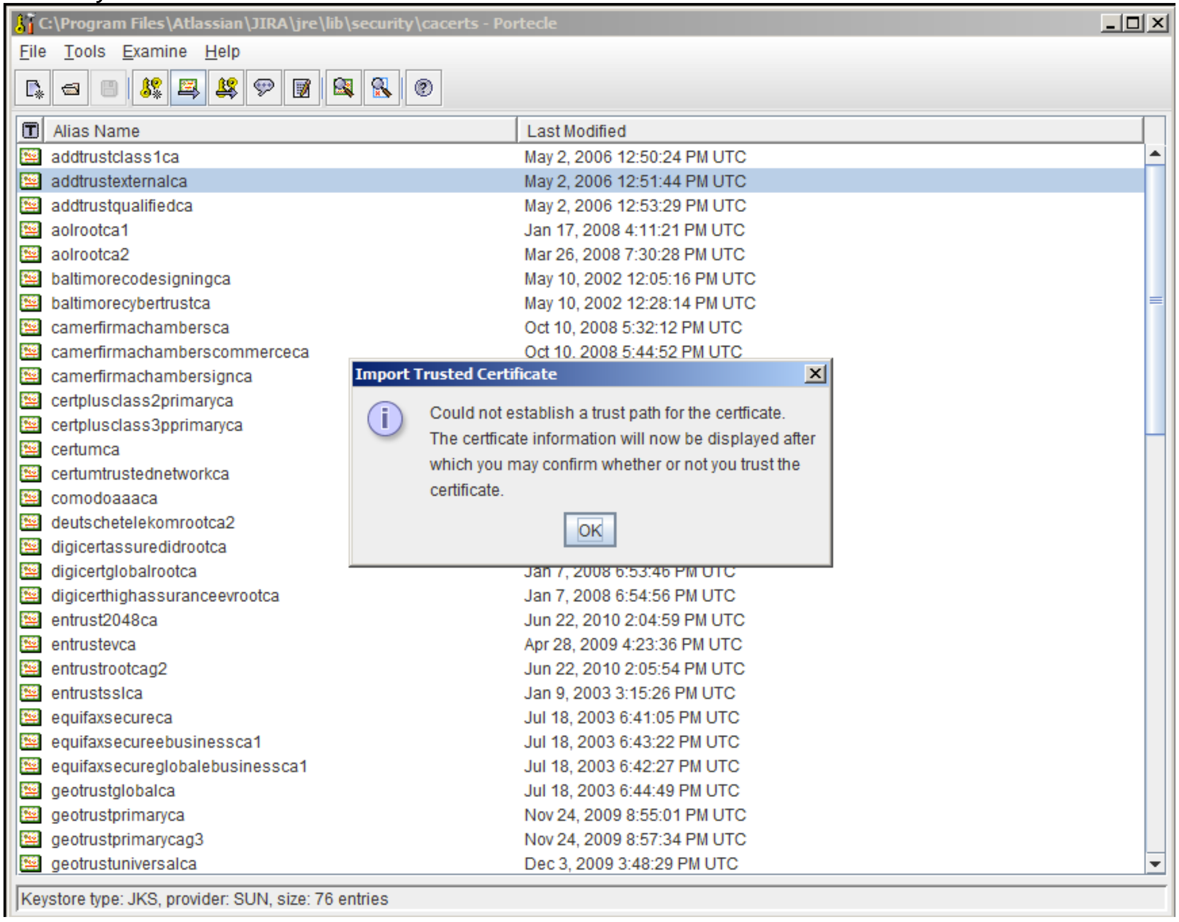
8. Select the **Import a trusted certificate into the loaded keystore** button:


C:\Program Files\Atlassian\JIRA\jre\lib\security\cacerts - Portecle
File Tools Examine Help

Alias Name	Last Modified
addtrustclass1ca	May 2, 2006 12:50:24 PM UTC
addtrustexternalca	May 2, 2006 12:51:44 PM UTC
addtrustqualifiedca	May 2, 2006 12:53:29 PM UTC
aolrootca1	Jan 17, 2008 4:11:21 PM UTC
aolrootca2	Mar 26, 2008 7:30:28 PM UTC
baltimorecodesigningca	May 10, 2002 12:05:16 PM UTC
baltimorecybertrustca	May 10, 2002 12:28:14 PM UTC
camerfirmachambersca	Oct 10, 2008 5:32:12 PM UTC
camerfirmachamberscommerceca	Oct 10, 2008 5:44:52 PM UTC
camerfirmachambersignca	Oct 10, 2008 5:32:50 PM UTC
certplusclass2primaryca	May 27, 2009 4:07:38 PM UTC
certplusclass3pprimaryca	May 27, 2009 4:08:19 PM UTC
certumca	Feb 10, 2009 7:31:21 PM UTC
certumtrustednetworkca	Feb 10, 2009 7:32:07 PM UTC
comodoaaaca	May 2, 2006 12:48:48 PM UTC
deutschetelekomrootca2	Nov 6, 2008 10:29:27 PM UTC
digicertassuredidrootca	Jan 7, 2008 6:52:38 PM UTC
digicertglobalrootca	Jan 7, 2008 6:53:46 PM UTC
digicerthighassuranceevrootca	Jan 7, 2008 6:54:56 PM UTC
entrust2048ca	Jun 22, 2010 2:04:59 PM UTC
entrustevca	Apr 28, 2009 4:23:36 PM UTC
entrustrootcag2	Jun 22, 2010 2:05:54 PM UTC
entrustsslca	Jan 9, 2003 3:15:26 PM UTC
equifaxsecureca	Jul 18, 2003 6:41:05 PM UTC
equifaxsecureebusinessca1	Jul 18, 2003 6:43:22 PM UTC
equifaxsecureglobalebusinessca1	Jul 18, 2003 6:42:27 PM UTC
geotrustglobalca	Jul 18, 2003 6:44:49 PM UTC
geotrustprimaryca	Nov 24, 2009 8:55:01 PM UTC
geotrustprimarycag3	Nov 24, 2009 8:57:34 PM UTC
geotrustuniversalca	Dec 3, 2009 3:48:29 PM UTC

Keystore type: JKS, provider: SUN, size: 76 entries

9. Select the certificate that was saved in step 6 and confirm that you trust it, giving it an appropriate alias (e.g.: confluence).
   a. You may hit this error:


C:\Program Files\Atlassian\JIRA\jre\lib\security\cacerts - Portecle
File Tools Examine Help
Import Trusted Certificate
OK

Alias Name	Last Modified
addtrustclass1ca	May 2, 2006 12:50:24 PM UTC
addtrustexternalca	May 2, 2006 12:51:44 PM UTC
addtrustqualifiedca	May 2, 2006 12:53:29 PM UTC
aolrootca1	Jan 17, 2008 4:11:21 PM UTC
aolrootca2	Mar 26, 2008 7:30:28 PM UTC
baltimorecodesigningca	May 10, 2002 12:05:16 PM UTC
baltimorecybertrustca	May 10, 2002 12:28:14 PM UTC
camerfirmachambersca	Oct 10, 2008 5:32:12 PM UTC
camerfirmachamberscommerceca	Oct 10, 2008 5:44:52 PM UTC
camerfirmachambersignca	
certplusclass2primaryca	
certplusclass3pprimaryca	
certumca	
certumtrustednetworkca	
comodoaaaca	
deutschetelekomrootca2	
digicertassuredidrootca	
digicertglobalrootca	Jan 7, 2008 6:53:46 PM UTC
digicerthighassuranceevrootca	Jan 7, 2008 6:54:56 PM UTC
entrust2048ca	Jun 22, 2010 2:04:59 PM UTC
entrustevca	Apr 28, 2009 4:23:36 PM UTC
entrustrootcag2	Jun 22, 2010 2:05:54 PM UTC
entrustsslca	Jan 9, 2003 3:15:26 PM UTC
equifaxsecureca	Jul 18, 2003 6:41:05 PM UTC
equifaxsecureebusinessca1	Jul 18, 2003 6:43:22 PM UTC
equifaxsecureglobalebusinessca1	Jul 18, 2003 6:42:27 PM UTC
geotrustglobalca	Jul 18, 2003 6:44:49 PM UTC
geotrustprimaryca	Nov 24, 2009 8:55:01 PM UTC
geotrustprimarycag3	Nov 24, 2009 8:57:34 PM UTC
geotrustuniversalca	Dec 3, 2009 3:48:29 PM UTC

Could not establish a trust path for the certficate.
The certficate information will now be displayed after which you may confirm whether or not you trust the certificate.

Keystore type: JKS, provider: SUN, size: 76 entries

   b. If so, hit OK, and then accept the certificate as trusted.
10. Save the Key Store to disk:
11. Restart Bitbucket.
12. Test that you can connect to the host.

Command Line Installation

1. Fetch the certificate, replacing google.com with the FQDN of the server Bitbucket is attempting to connect to:
   Unix:

   ```
   openssl s_client -connect google.com:443 < /dev/null | sed -ne '/-BEGIN
   CERTIFICATE-/,/-END CERTIFICATE-/p' > public.crt
   ```

   Windows:

   ```
   openssl s_client -connect google.com:443 < NUL | sed -ne '/-BEGIN CERTIFICATE-
   /,/-END CERTIFICATE-/p' > public.crt
   ```

   The command above will only be executed if you have Sed for Windows as well as OpenSSL installed on your environment. If you don't have Sed or OpenSSL or you don't want to install it, use the instructions below as an alternative. Issue the following command:

   ```
   openssl s_client -connect google.com:443
   ```

   Save the output to a file called `public.cert.` Edit the the `public.cert` file so it contains only what is between the `BEGIN CERTIFCATE` and `END CERTIFICATE`lines. This is how your file should look like after you edited it:

   ```
   -----BEGIN CERTIFICATE-----
   < Certificate content as fetched by the command line.
   Don't change this content, only remove what is before
   and after the BEGIN CERTIFICATE and END CERTIFICATE.
   That's what your Sed command is doing for you :-) >
   -----END CERTIFICATE-----
   ```

- Import the certificate:

   ```
   <JAVA_HOME>/bin/keytool -import -alias <server_name> -keystore <JAVA_HOME>/jre
   /lib/security/cacerts -file public.crt
   ```

Alternative KeyStore Locations

Java will normally use a system-wide keystore in `$JAVA_HOME/jre/lib/security/cacerts`, but it is possible to use a different keystore by specifying a parameter, **-Djavax.net.ssl.trustStore=/path/to/keystore**, where '/path/to/keystore' is the absolute file path of the alternative keystore.

However, setting this **is not recommended** because if Java is told to use a custom keystore (eg. containing a self-signed certificate), then Java will not have access to the root certificates of signing authorities found in `$JAVA_HOME/jre/lib/security/cacerts`, and accessing most CA-signed SSL sites will fail. It is better to add new certificates (eg. self-signed) to the system-wide keystore (as above).

Debugging

Problems are typically one of two forms:

- The certificate was installed into the incorrect keystore.
- The keystore does not contain the certificate of the SSL service you're connecting to.

Notifications

An email server must be configured in Bitbucket Data Center for email notifications to be sent. See Setting up your mail server. Note that if the mail server fails, notifications will be dropped.

Batched email notifications

Notifications are aggregated by user for each pull request and are emailed in a batch. The batch gets sent if things go quiet for a while (default is 10 minutes), or when the oldest notification gets 'stale' (default is 30 minutes), whichever comes first.

By default, email notifications are batched. However:

- You can change your personal account settings (on the **Notification settings** tab) so that you recieve notifications immediately.
- Pull request notifications and repository notifications have separate settings for notifications to be batched or recieved immediately. E.g., you can opt to receive pull request notifications immediately, but receive repository notifications in a batch.
- A Bitbucket admin can configure the period of inactivity and the staleness timeout period in the config properties file.
- A Bitbucket admin can change the notification mode for the Bitbucket instance to 'immediate' using a s ystem property, but users can still opt in for batched notifications.

Using 'mentions to notify someone

From Bitbucket 2.0, 'mentions' can be used to notify another user about the pull request description or comment you are writing. Bitbucket sends an email to that person – the emails are batched if they have opted for batching in their personal account settings.

To use mentions, simply start typing '@' and then the users display name, username or email address, and choose from the list that Bitbucket offers. You can use quotes for unusual names, for example if it has spaces. Use Control-Shift-P or Command-Shift-P to preview the mention.

Pull request notifications

Bitbucket Data Center sends email notifications to the author, reviewers, and watchers of a pull request when the below events occur.

Pull request event	Notification recipients
A pull request is opened	The reviewers of the pull request
The pull request is merged	The watchers of the pull request
The pull request is declined	The watchers of the pull request
The pull request is reopened	The watchers of the pull request
The pull request is deleted	The watchers of the pull request
A reviewer is added	The added reviewer
A reviewer is removed	The removed reviewer
The reviewers are updated	The pull request author
The pull request is approved	The watchers of the pull request
The pull request is reviewed	The pull request author
The pull request is unapproved	The watchers of the pull request
A commit is made to the source branch	The watchers of the pull request
The destination branch is changed	The watchers of the pull request
A comment is added	The watchers of the pull request
A comment is replied to	The watchers of the pull request
A comment is liked	The pull request author and the comment author
Auto-merge is requested for a pull request	The watchers of the pull request
Auto-merge is canceled for a pull request	The watchers of the pull request
A draft pull request is created	The reviewers of the draft pull request if they've been added
A draft pull request is marked as ready for review	The watchers and reviewers of the draft pull request
An open pull request is converted to a draft	The watchers and reviewers of the pull request

The pull request author and reviewers are automatically added as watchers.

By default, pull request notifications are batched. You can change your personal account settings in Bitbucket (from the **Notification settings** tab) so that you get all pull request notifications immediately.

However, in the following situations, notifications are always sent immediately:

- When a pull request is first opened, notifications are immediately sent to the reviewers.
- When a pull request is deleted, notifications are immediately sent to all watchers.
- When a pull request is reopened, notifications are immediately sent to the reviewers who have opted in for immediate notifications.
- When someone is added as a reviewer to a pull request, a notification is immediately sent to them.
- When someone is removed as a reviewer from a pull request, a notification is immediately sent to them.

- When someone is mentioned in the description of a pull request, a notification is immediately sent to them.
- When a draft pull request is created and reviewers are added to it, notifications are immediately sent to the reviewers.

You don't receive notifications for events you initiate yourself. See also Pull requests.

Repository notifications

You can watch a repository by visiting the source page of the repository and clicking the **watch** button. From here you can select which events to watch.

ⓘ The **watch** button will only be visible if an email server has been configured in Bitbucket Data Center. For information on how to do this see Setting up your mail server.

Bitbucket sends email notifications to the **watchers of a repository** when the following events occur.

Pull request event	Notification recipients
A pull request is opened	The watchers of the repository with a pull request notification scope of `STATE CHANGES` or `ALL ACTIVITY`
A pull request is merged	The watchers of the repository with a pull request notification scope of `STATE CHANGES` or `ALL ACTIVITY`
A pull request is declined	The watchers of the repository with a pull request notification scope of `STATE CHANGES` or `ALL ACTIVITY`
A pull request is reopened	The watchers of the repository with a pull request notification scope of `STATE CHANGES` or `ALL ACTIVITY`
A pull request is deleted	The watchers of the repository with a pull request notification scope of `STATE CHANGES` or `ALL ACTIVITY`
The pull request is approved	The watchers of the repository with a pull request notification scope of `ALL ACTIVITY`
The pull request is unapproved	The watchers of the repository with a pull request notification scope of `ALL ACTIVITY`
A commit is made to a pull request source branch	The watchers of the repository with a pull request notification scope of `ALL ACTIVITY`
The destination branch is changed	The watchers of the repository with a pull request notification scope of `ALL ACTIVITY`
A comment is added	The watchers of the repository with a pull request notification scope of `ALL ACTIVITY`
A comment is replied to	The watchers of the repository with a pull request notification scope of `ALL ACTIVITY`
A commit is pushed to the repository on the default branch	The watchers of the repository with a push notification scope of `DEFAULT BRANCH`
A commit is pushed to the repository on a non-default branch	The watchers of the repository with a push notification scope of `DEFAULT BRANCH` or `ALL BRANCHES`
Auto-merge is requested for a pull request	The watchers of the repository with a pull request notification scope of `ALL ACTIVITY`
Auto-merge is canceled for a pull request	The watchers of the repository with a pull request notification scope of `ALL ACTIVITY`
A draft pull request is created	The watchers of the repository with a pull request notification scope of `STATE CHANGES` or `ALL ACTIVITY`

A draft pull request is opened for review	The watchers of the repository with a pull request notification scope of `ALL ACTIVITY`
An open pull request is converted to a draft	The watchers of the repository with a pull request notification scope of `ALL ACTIVITY`

Pull request notifications

The below notification scopes are available for **pull requests** when watching a repository.

Notification scope	Explanation
All activity	Notifications will be sent for **all** pull request activity within the repository.
State changes	Notifications will only be sent for pull request **state changes** (opened, merged, declined, reopened, deleted) within the repository.
None	**No** notifications will be sent for pull requests within the repository (for pull requests you are not watching).

Note that if you're watching a particular pull request, this takes precedence over your repository pull request notification scope. For example, if you are watching a repository with the state changes pull request option selected, and are watching a particular pull request, you will receive all notifications for that pull request, and only state change notifications for other pull requests.

⚠ Notifications for a pull request being *deleted* are only sent to **immediate** repository watchers (and watchers of the pull request). **Batched** repository watchers will not receive this notification.

Push notifications

The below notification scopes are available for **pushes** when watching a repository.

Notification scope	Explanation
All branches	Notifications will be sent for all pushes to the repository.
Default branch	Notifications will be sent for pushes to the default branch of the repository.
None	No notifications will be sent for pushes to the repository.

⚠ A notification will only be sent if a push **adds or removes at least one commit**. If the push updates one or more refs without actually adding or removing a commit (e.g., pushing a new tag to a commit already in the repository on Bitbucket), then no push notification will be sent.

If you watch a repository *and* a specific pull request within it, you will receive **pull request notifications** for that pull request.

Your repository notifications will not include this pull request. Repository notifications about pull requests will **only** be sent for pull requests you are not watching.

You can manage all of your watched repositories in your Bitbucket personal account settings (on the **Watched repositories** tab).

By default, repository notifications are batched. You can change your personal account settings (on the **Notificat ion settings** tab) so that you get all repository notifications immediately.

You don't receive notifications for events you initiate yourself.

Markdown syntax guide

Bitbucket Data Center uses Markdown for formatting text, as specified in CommonMark (with a few extensions).

You can use Markdown in the following places:

- any pull request's descriptions or comments, or
- in README files (if they have the .md file extension).

To preview your markdown, use `Control+Shift+P` or `Command+Shift+P`.

Note that Bitbucket Data Center doesn't support HTML tags and all HTML tags are escaped.

On this page:

Markdown syntax

The page below contains examples of Markdown syntax. For a full list of all the Markdown syntax, consult the CommonMark help or specification.

Headings

```
# This is an H1
## This is an H2
###### This is an H6

This is also an H1
==================

This is also an H2
------------------
```

Paragraphs

Paragraphs are separated by empty lines. To create a new paragraph, press <return> twice.

```
Paragraph 1

Paragraph 2
```

Character styles

```
*Italic characters*
_Italic characters_
**bold characters**
__bold characters__
~~strikethrough text~~
```

Unordered list

```
*   Item 1
*   Item 2
*   Item 3
    *   Item 3a
    *   Item 3b
    *   Item 3c
```

Ordered list

```
1.  Step 1
2.  Step 2
3.  Step 3
    1.  Step 3.1
    2.  Step 3.2
    3.  Step 3.3
```

List in list

```
1.  Step 1
2.  Step 2
3.  Step 3
    *  Item 3a
        *  Item 3b
        *  Item 3c
```

Quotes or citations

```
Introducing my quote:

> Neque porro quisquam est qui
> dolorem ipsum quia dolor sit amet,
> consectetur, adipisci velit...
```

Inline code characters

````
Use the backtick to refer to a `function()`.

There is a literal ``backtick (`)`` here.
````

Code blocks

~~~
Indent every line of the block by at least 4 spaces.

This is a normal paragraph:

    This is a code block.
    With multiple lines.

Alternatively, you can use 3 backtick quote marks before and after the block, like this:

```
This is a code block
```

To add syntax highlighting to a code block, add the name of the language immediately
after the backticks:

```javascript
var oldUnload = window.onbeforeunload;
window.onbeforeunload = function() {
    saveCoverage();
    if (oldUnload) {
        return oldUnload.apply(this, arguments);
    }
};
```
~~~

Bitbucket uses CodeMirror to apply syntax highlighting to the rendered markdown in comments, READMEs and pull request descriptions. All the common coding languages are supported, including C, C++, Java, Scala, Python and JavaScript. See Configuring syntax highlighting for file extensions.

Within a code block, ampersands (&) and angle brackets (< and >) are automatically converted into HTML entities.

Links to external websites

```
This is [an example](http://www.example.com/) inline link.

[This link](http://example.com/ "Title") has a title attribute.

Links are also auto-detected in text: http://example.com/
```

Linking issue keys to JIRA applications

When you use Jira application issue keys (of the default format) in comments and pull request descriptions Bitbucket automatically links them to the Jira application instance.

The default Jira application issue key format is two or more uppercase letters (`[A-Z][A-Z]+`), followed by a hyphen and the issue number, for example TEST-123.

Linking to pull requests

Introduced with Bitbucket 4.9, you can reference pull requests from comments and descriptions in other pull requests. The syntax for linking to pull request looks like this:

```
projectkey/repo-slug#pr_id
```

To link to a pull request in the *same project and repository*, you only need to include the pull request ID.

```
#123
```

To link to a pull request in the *same project* but a *different repository*, include the repository slug before the pull request ID.

```
example-repo#123
```

To link to a pull request in a *different project and repository*, include the project key and the repository slug before the pull request ID.

```
PROJ/example-repo#123
```

Images

Inline image syntax looks like this:

```
![Alt text](/path/to/image.jpg)
![Alt text](/path/to/image.png "Optional title attribute")
![Alt text](/url/to/image.jpg)
```

For example:

```
...
![Mockup for feature A](http://monosnap.com/image/bOcxxxxLGF.png)
...
```

Reference image links look like this:

```
![Alt text][id]
```

Where 'id' is the name of a previously defined image reference, using syntax similar to link references:

```
[id]: url/to/image.jpg "Optional title attribute"
```

An example using reference image links:

```
...
<--Collected image definitions-->
[MockupA]: http://monosnap.com/image/bOcxxxxLGF.png "Screenshot of Feature A mockup"
...
<!--Using an image reference-->
![Mockup for feature A][MockupA]
...
```

You can specify image height and width as `key=value` pairs inside curly braces { } after the applicable image node. For example:

```
![text](/url.png){width=640 height=480}
```

Tables

```
| Day     | Meal    | Price |
| --------|---------|-------|
| Monday  | pasta   | $6    |
| Tuesday | chicken | $8    |
```

Backslash escapes

Certain characters can be escaped with a preceding backslash to preserve the literal display of a character instead of its special Markdown meaning. This applies to the following characters:

```
\   backslash
`   backtick
*   asterisk
_   underscore
{}  curly braces
[]  square brackets
()  parentheses
#   hash mark
>   greater than
+   plus sign
-   minus sign (hyphen)
.   dot
!   exclamation mark
```

README files

If your repository contains a `README.md` file at the root level, Bitbucket displays its contents on the repository's **Source** page if the file has the .md extension. The file can contain only Markdown.

Requesting add-ons

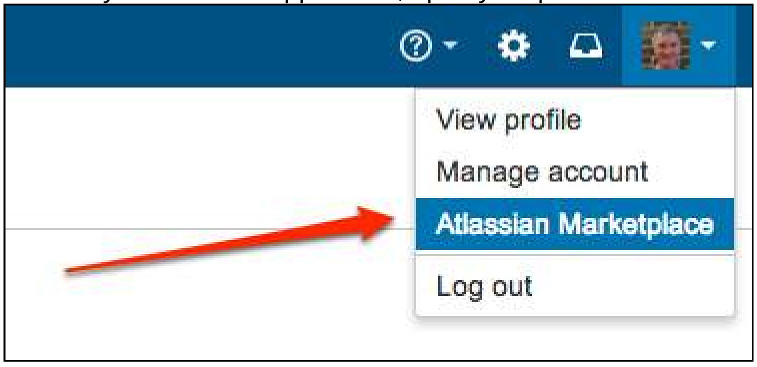
The Atlassian Marketplace website offers hundreds of add-ons that your administrator can install to enhance and extend Atlassian Bitbucket Data Center. If the add-on request feature is enabled for your Bitbucket instance, you can submit requests for add-ons from the Marketplace to your Bitbucket administrator.

The 'Atlassian Marketplace for Bitbucket' page provides an integrated view of the Atlassian Marketplace from within your Bitbucket instance. The page offers the same features as the Marketplace website, such as searching and category filtering, but tailors the browsing experience to Bitbucket.

This in-product view of the Marketplace gives day-to-day Bitbucket users, not just administrators, an easy way to discover add-ons that can help them get work done. When you find an add-on of interest, you can submit a request to your administrator for the add-on with just a few clicks.

Submitting an add-on request

To browse for add-ons in the Atlassian Marketplace, follow these steps:

1. From anywhere in the application, open your profile menu and choose **Atlassian Marketplace**:


2. In the Atlassian Marketplace page, use the search box to find add-ons or use the category menus to browse or filter by add-ons by type, popularity, price or other criteria. You can see what your fellow users have requested by choosing the **Most Requested** filter.
3. When you find an add-on that interests you, click **Request** to generate a request for your administrator.
4. Optionally, type a personal message to your administrators in the text box. This message is visible to administrators in the details view for the add-on.
5. Click **Submit Request** when done.
6. Click **Close** to dismiss the 'Success!' message dialog box.

At this point, a notification appears in the interface your administrators use to administer add-ons. Also, your request message will appear in the add-on details view, visible from the administrator's 'Find New Add-ons' page. From there, your administrator can purchase the add-on, try it out or dismiss requests.

Updating an add-on request

After submitting the request, you can update your message at any time. Click the **Update Request** button next to the listing in the Atlassian Marketplace page to modify the message to your administrator.

The administrator is not notified of the update. However, your updated message will appear as you have modified it in the details view for the add-on immediately.

Set the default time zone

You can adjust the default time zone in Bitbucket Data Center individually or for all users. Setting time zones gives remote users and distributed teams accurate, local timestamps in the application and notification emails. However, setting the default time zone for all users won't override individual user's time zone settings.

To set the default time zone for all users:

1. Log in to Bitbucket as an admin.
2. From the administration area, select **Server settings** (under 'Settings').
3. In the **Time Zone** field, specify the appropriate time zone.

To set the default time zone for a single user (yourself):

1. Click your profile picture (in the upper-right), then select **Manage account**.
2. In the **Time Zone** field, specify the appropriate time zone.

Download a repository archive

With Bitbucket Data Center you can download an archive of source files at a particular point in time; you can download your source as a .zip file from the actions dropdown menu from the Source view, Commits list, and Branches list. You can also download the archive of individual branches, commits, and tags.

To download a single file, navigate to the file in the repository, select **Raw file** and save the file that opens up in your browser.

On this page:

What's the difference between *downloading* and *cloning* a repository?

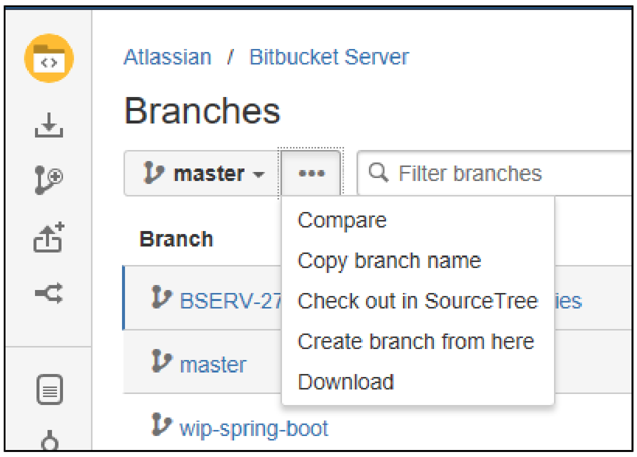
Cloning a repository copies the source files of a remote repository to your local machine, as well as the repository's Git history (branches, commits, tags, etc.). Cloning also creates a remote connection (usually called origin) pointing back to the cloned repository. You can only clone into a local directory that is a properly initialized Git repository (using the `git init` command).

Downloading a repository archive only copies a repository's source files from a specific point in time, depending on what was chosen to be copied. The biggest difference to downloading an archive is that you are not copying the repository history, or creating a connection to the remote repository. You are only getting the source files, and none of the Git metadata stored in the `.git` directory.

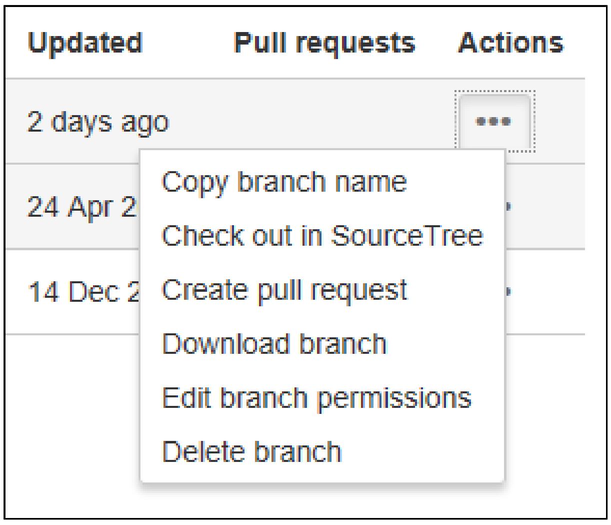
Download your source as a .zip file

To download a repository archive of a branch:

1. Go to either the Source view, Commit view, or Branches list of a repository.
2. Using the branch selector to choose a branch.
3. Click the actions dropdown next to the branch selector, then select **Download**.

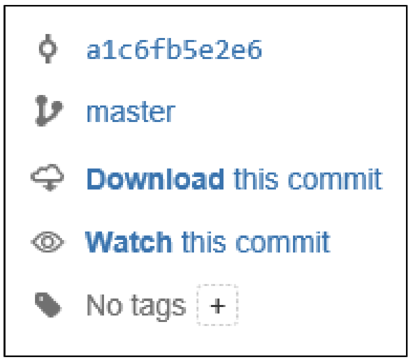


You can also download a repository archive of a specific branch in the actions menu of any branch, as viewed from the Branches list.



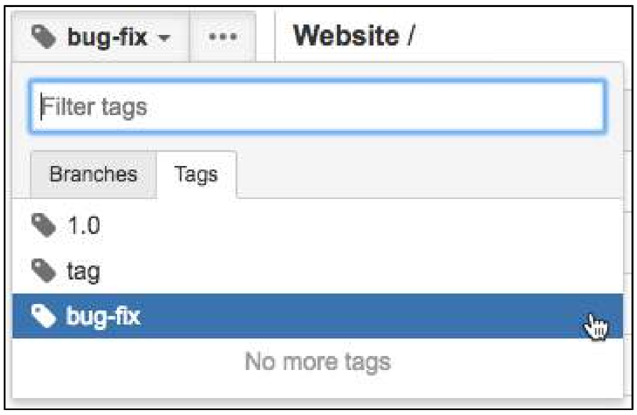
To download a repository archive from a commit:

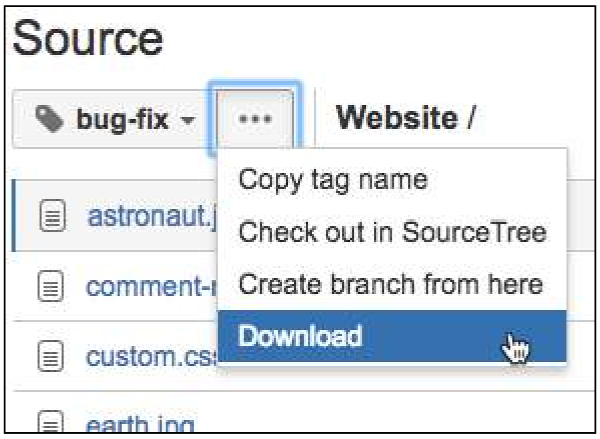
1. Click on the hash number of a commit to view a single commit.
2. Click **Download this commit** in the upper-right panel.



To download a repository archive from a tag:

1. Go to either the Source view, Commit view, or Branches list of a repository.
2. Using the branch selector to choose a tag.
3. Click the actions dropdown next to the branch selector, then select **Download**.





Download your source as a .tar or .tar.gz file

When you download your source file from Bitbucket's UI, you are downloading the file in .zip format. However, it is possible to edit the URL and get the archive as other formats, like .tar, .gz, or .tar.gz.

To download your source as a file format other than .zip:

1. Follow any of the instructions listed above, so that you are viewing the source you want to download.
2. Right-click the Download link and copy the URL address.
3. Paste the URL in the browser, it would look something like this:

   ```
   .../projects/TIS/repos/website/archive?format=zip
   ```

4. Change **`format=zip`** to the format of your choice.

   For **.tar.gz files**, change the argument to **`format=tgz`**.

   For **.tar files**, change the argument to **`format=tar`**.
5. When you hit **Enter** the file will download from your browser.

Creating a Contributions guidelines file

Bitbucket Data Center lets you and your team create and share Git repositories, which allows you to collaborate with other developers within your organization. In most cases, individuals or teams will have some guidelines that they use when working on a repository, such as recommendations on who should review a pull request, info on best practices for coding, or desired file structures. You can add these guidelines to a file in your repo, and a link will be displayed to this file when:

- you access **Clone** in your sidebar (the link will direct you to the relevant page),
- you're about to create a pull request (the link will display the guidelines in a dialog), and
- you're viewing a pull request (the link will display the guidelines in a dialog).

To construct your file, it must:

- be saved to the root directory of your repository,
- have the title **Contributing** which is not case sensitive,
- the contents of the file can be constructed using the markdown syntax in Bitbucket, and
- the file can have no extension, or the following extensions:
    - .md
    - .markdown
    - .mdown
    - .mkdn
    - .mkd
    - .text
    - .txt

Once you've created your file, you and your teammates can add and update the content, just as you would for any file in your repository.

Working with Git LFS Files

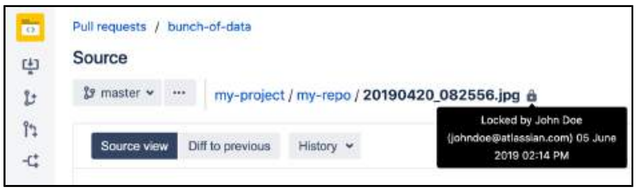
Git Large File Storage (LFS) is a Git extension that improves how large files are handled. It replaces them with tiny text pointers that are stored on a remote server instead of in their repository, speeding up operations like cloning and fetching in Bitbucket Data Center.

Using Git LFS, you can also lock LFS files to stop others from editing them. This can be helpful if you work with large binary assets that can't be merged like images, videos, or 3D models.

On this page:

Related pages:

- Git Large File Storage
- Getting Git Right



Pull requests / bunch-of-data
Source
master
my-project / my-repo / 20190420_082556.jpg
Locked by John Doe (johndoe@atlassian.com) 05 June 2019 02:14 PM
Source view
Diff to previous
History

When files are locked, an icon appears next to them. Hover over it to see who locked the file and when they did this.

To work with Git LFS files you need to know how to:

1. Install the Git LFS client
2. Track Git LFS files and make them lockable
3. Lock and unlock Git LFS files
4. Unlock Git LFS files locked by other people

By default, Git LFS is disabled in Bitbucket for each repository and can only be turned on by repository admins. For more information, see Git Large File Storage.

Installing the Git LFS client

To use Git LFS you first need to install the client on your local machine.

To install the Git LFS client:

1. Check that you have Git 1.8.2 or newer by running:

```
git --version
```

2. Download and run the Git LFS installer. If you use Linux or Mac OS X you can also use a package manager to install `git-lfs`.

3. Run this command in a terminal or command prompt:

```
git lfs install
```

LFS filters will be added to the `.gitconfig` file in your home directory and will be available for all your repositories. You only need to do this once.

Tracking Git LFS files and making them lockable

Once you've installed the Git LFS client, you need to register the folder paths or file types you want it to handle using the `track` command. If you want to be able to 'lock' these files, you must also include the `--lockable` flag. This needs to be done for each repository.

To track a folder path or file type:

1. Change to the repository directory.

2. Run this command. Note: you can remove the `--lockable` flag if you don't need it.

```
git lfs track '<pattern>' --lockable
```

Here `'<pattern>'` can be used to match:

- A folder path, or paths, such as `'path/to/some/folders/*'`.
- File names, or file types, such as `bckgrnd.bin`, `'*.psd'` or `'*.*'`.
- Note: when using wildcards you need to include quotes to stop your shell from expanding them.

The pattern will then be added to the repository's `.gitattributes` file.

3. Commit and push the changes to `.gitattributes` :

```
git add .gitattributes
git commit -m "add Git LFS to the repo"
git push origin master
```

You should push the changes whenever you change what files are being tracked so everyone who clones the repo has the tracking patterns.

Now, when you add file names that match the pattern, they will automatically be handled by LFS. You can add multiple patterns this way, and you can see the patterns being tracked using the command, `git lfs track`.

Locking and unlocking Git LFS files

Once a Git LFS file has been registered as 'lockable', it can be 'locked' to stop others from editing it while you're working on it. This can be helpful if you work with large binary assets that can't be merged.

File locking follows a few rules:

- Each file can only be locked by one person at a time.
- Locked files can only be unlocked by the person who locked them (see below for how to force unlock files).
- If your 'push' contains locked files that you didn't lock it will be rejected.
- If your 'merge' contains locked files that you didn't lock it will be blocked.

To lock a Git LFS file:

Change to the repository directory and run the command:

```
git lfs lock <filename>
```

You can also lock a Git LFS file directly in source view by clicking the **Lock** button. A lock icon will then be displayed next to the file name.

To unlock a Git LFS file that you locked:

Change to the repository directory and run the command:

```
git lfs unlock <filename>
```

You can also unlock a Git LFS file directly in source view by clicking the **Unlock** button. The lock icon displayed next to the file is then removed to indicate an unlocked file.

Unlocking files locked by other people

Locked files in Bitbucket can only be unlocked by the person who locked them, so at times you may need to find out who locked a file so you can ask them for help.

When you try to lock, unlock, push, or merge a locked file that has been locked by another person, the error message will include the username and email address of the person who locked it so you can contact them. You can also run a command to see all locked files in a repository:

To see all locked files:

Change to the repository directory and run the command:

```
git lfs locks
```

There may also be times when you can’t ask for a file to be unlocked. For example, the person who locked it may have left your organization. If you find yourself in a situation like this, you can use the force flag to unlock the file.

To force unlock a file:

Change to the repository directory and run the command:

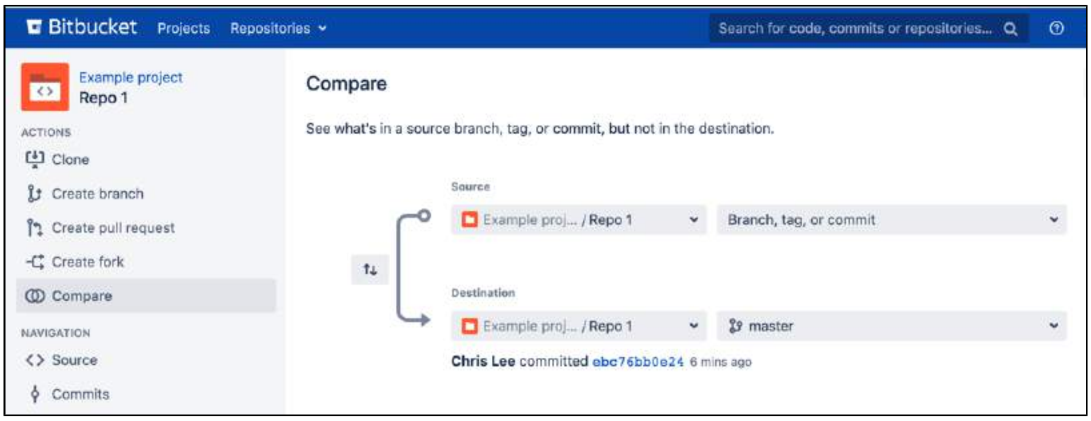
```
git lfs unlock <filename> --force
```

More information

Learn more about using Git LFS at our website, Getting Git Right.

Compare branches, tags, and commits

You can quickly find revision changes using the **Compare** page.



Comparing revisions

Available in Bitbucket Data Center 6.3 onwards.

To compare revisions in Bitbucket Data Center:

1. Navigate to the repository where you want to compare revisions.
2. From the sidebar, click **Compare**.
3. In the **Compare** page, from both the **Source** and **Destination** dropdown, select any combination of branches, tags, or commits. The source and target branches, commits, or tags may be located in different forks.
4. Once selections are made, the comparison results display in a diff and a commits list tab.

Bitbucket uses `git diff ...`

A three-dot diff is a comparison between the commit where the feature branch was last synched with the destination branch and the most recent version of the feature branch.

A two-dot diff is the direct comparison of two committish references such as SHAs.

Commit history

You can see the commit history of a repository in Bitbucket Data Center by navigating directly to the commits page of a repository. You can also view the commit history for a specific file.

To view all the commits on a branch in a repository, select **Commits**.

To view the commit history associated with a specific file:

1. Select a file within the **Source** view on a repository.
2. Select **History**.

On the commit details page, you can also check if a commit has been signed and verified.

View merge commits

To view merge commits from the commit history of a specific file:

1. Select a file within the **Source** view on a repository.
2. Select **History**.
3. Toggle **Follow renames** off.

View the history of a file's rename

To include the file’s commit history prior to it being renamed:

1. Select a file within the **Source** view on a repository.
2. Select **History**.
3. Toggle **Follow renames** on.

Note: With Follow renames toggled on, you will not see merge commits in the list.

Verify commit signatures

For increased transparency and to help you meet your security and compliance needs, you can now view the status of commit signature verification next to a commit hash on the **Commits** page. You can also view the details of the keys used to sign the commits.

When the **Verify commit signature** hook is enabled, Bitbucket requires all pushed commits to be signed and verifies that the signatures belong to a valid and trusted key or certificate.

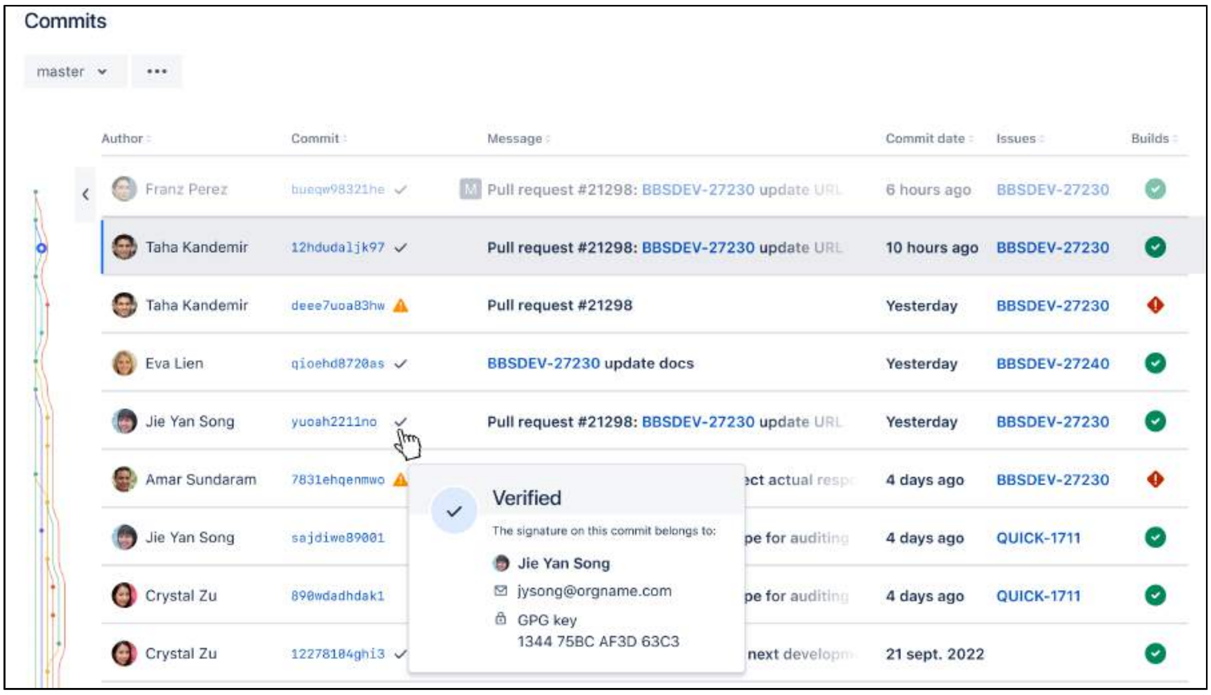
We support the following keys for signing commits:

- GPG keys
- X.509 (S/MIME) certificates
- SSH keys

To check if a commit has been signed and verified, open the commit details page or the pull request commits tab.

Next to commit hashes, you'll find the following indicators:

- The **Verified** icon ✓ means that a trusted author has signed the commit and the signature has been verified. Select the **Verified** icon to check the details of the key used to sign the commit. For example, this can be a GPG key, an SSH key, or an X.509 certificate with an X.509 issuer certificate.
- The **Not verified** icon ⚠ means that the commit has been signed but the signature can't be verified. This can happen when the **Verify commit signature hook** was disabled and:
  - The key used to sign the commit hasn't been uploaded to a Bitbucket user account.
  - The key used to sign the commit is either not supported or invalid.



Commits

master

Author	Commit	Message	Commit date	Issues	Builds
Franz Perez	bueqw98321he ✓	Pull request #21298: BBSDEV-27230 update URL	6 hours ago	BBSDEV-27230	✓
Taha Kandemir	12hdudaljk97 ✓	Pull request #21298: BBSDEV-27230 update URL	10 hours ago	BBSDEV-27230	✓
Taha Kandemir	deee7uoa83hw ⚠	Pull request #21298	Yesterday	BBSDEV-27230	◆
Eva Lien	qioehd8720as ✓	BBSDEV-27230 update docs	Yesterday	BBSDEV-27240	✓
Jie Yan Song	yuoah2211no ✓	Pull request #21298: BBSDEV-27230 update URL	Yesterday	BBSDEV-27230	✓
Amar Sundaram	7831ehqenmwo ⚠	ect actual resp	4 days ago	BBSDEV-27230	◆
Jie Yan Song	sajdiwe89001	pe for auditing	4 days ago	QUICK-1711	✓
Crystal Zu	890wdadhdak1	pe for auditing	4 days ago	QUICK-1711	✓
Crystal Zu	12278184ghi3 ✓	next developm	21 sept. 2022		✓

Verified

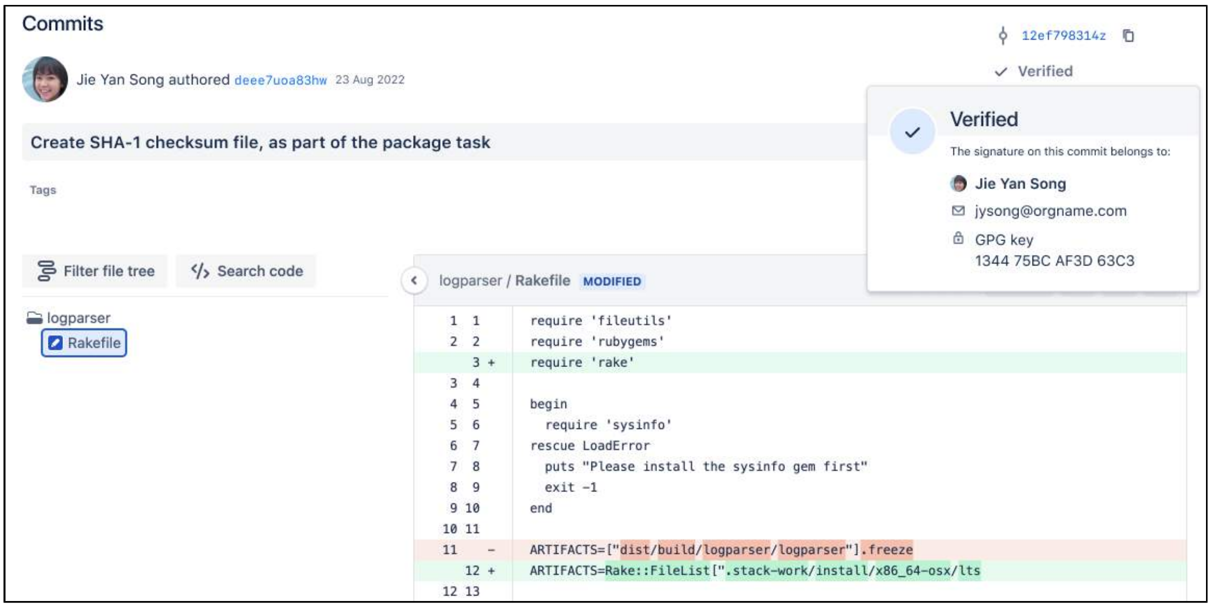
The signature on this commit belongs to:

Jie Yan Song

jysong@orgname.com

GPG key
1344 75BC AF3D 63C3

If you open the commit details, you'll also find the information about signature verification.



Commits

12ef798314z

Verified

Jie Yan Song authored deee7uoa83hw 23 Aug 2022

Create SHA-1 checksum file, as part of the package task

Tags

Filter file tree | Search code

logparser
Rakefile

logparser / Rakefile MODIFIED

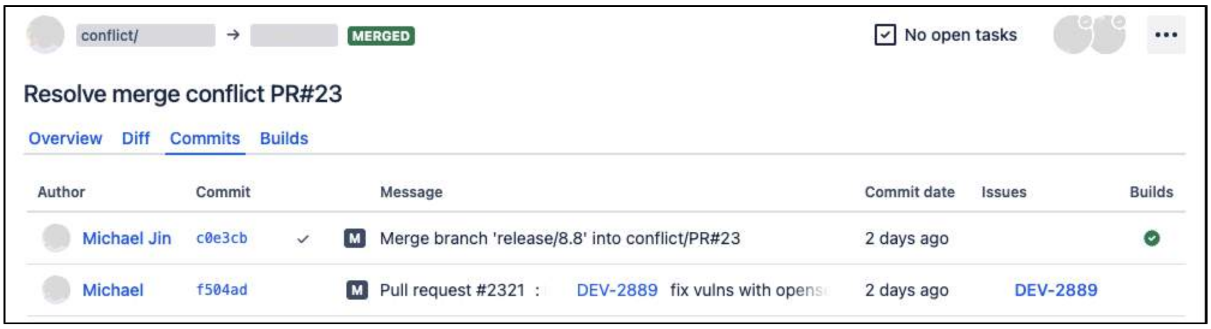
Verified

The signature on this commit belongs to:

Jie Yan Song
jysong@orgname.com
GPG key
1344 75BC AF3D 63C3

```
   require 'fileutils'
   require 'rubygems'
+  require 'rake'

   begin
     require 'sysinfo'
   rescue LoadError
     puts "Please install the sysinfo gem first"
     exit -1
   end

-  ARTIFACTS=["dist/build/logparser/logparser"].freeze
+  ARTIFACTS=Rake::FileList[".stack-work/install/x86_64-osx/lts
```

When you open the pull request commits tab, the view will be the following:



conflict/ → MERGED

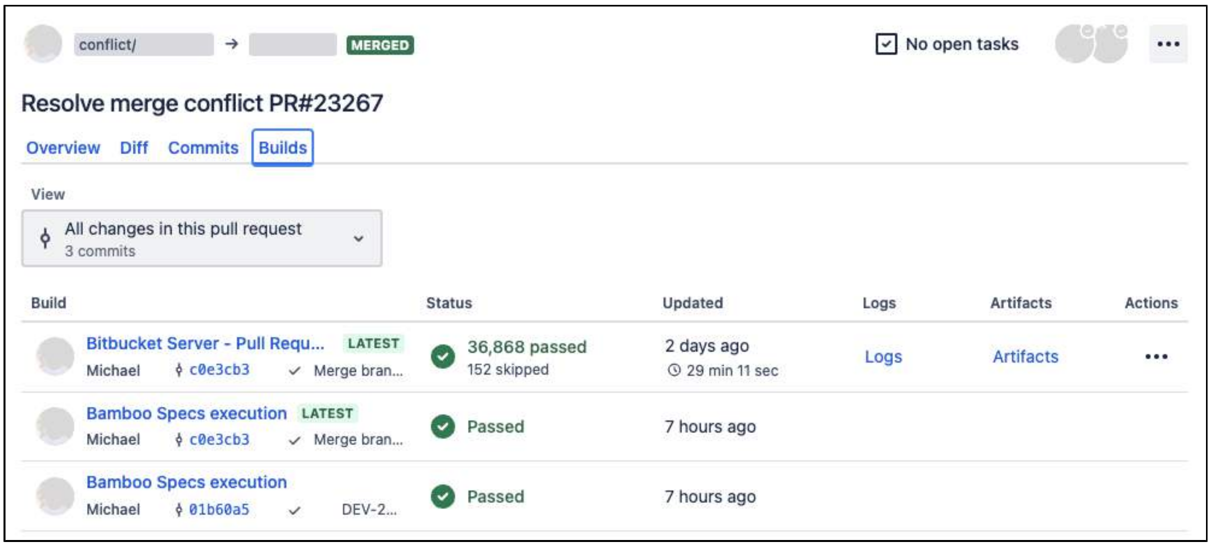
No open tasks

Resolve merge conflict PR#23

Overview | Diff | Commits | Builds

Author	Commit	Message	Commit date	Issues	Builds
Michael Jin	c0e3cb ✓	M Merge branch 'release/8.8' into conflict/PR#23	2 days ago		✓
Michael	f504ad	M Pull request #2321 : DEV-2889 fix vulns with opens	2 days ago	DEV-2889	

When you open the pull request builds tab, the view will be the following:



conflict/ → MERGED

No open tasks

Resolve merge conflict PR#23267

Overview | Diff | Commits | Builds

View

All changes in this pull request
3 commits

Build	Status	Updated	Logs	Artifacts	Actions
Bitbucket Server - Pull Requ... LATEST Michael c0e3cb3 ✓ Merge bran...	36,868 passed 152 skipped	2 days ago 29 min 11 sec	Logs	Artifacts	•••
Bamboo Specs execution LATEST Michael c0e3cb3 ✓ Merge bran...	Passed	7 hours ago			
Bamboo Specs execution Michael 01b60a5 ✓ DEV-2...	Passed	7 hours ago			

A commit can have no **Verified** or **Not verified** status when:

- The commit was created before you upgraded to Bibucket 8.13.
- The commit hasn’t been signed.
- The commit has been made through the Bitbucket web interface (a reviewer’s suggestion, a pull request merge, etc.) that’s why the commit couldn’t be signed.

Commits are batched for verification and the signature verification status may not be immediately visible on the **Commits** page.

Administer Bitbucket Data Center

This section includes guidance on administration actions that can be performed for Bitbucket.

Users and groups

Bitbucket Data Center comes with an internal user directory already built-in that is enabled by default at installation. When you create the first administrator during the setup procedure, that administrator's username and other details are stored in the internal directory.

Bitbucket Admins and Sys Admins can manage users and groups in Bitbucket as described on this page. You can also set up Bitbucket to use external user directories.

Note that:

- Even after users have been added to the user directory, they will not be able to log in to Bitbucket until they have been given global access permissions.
- Permissions can also be applied separately at the level of projects, repositories and branc hes.

On this page

Related pages:

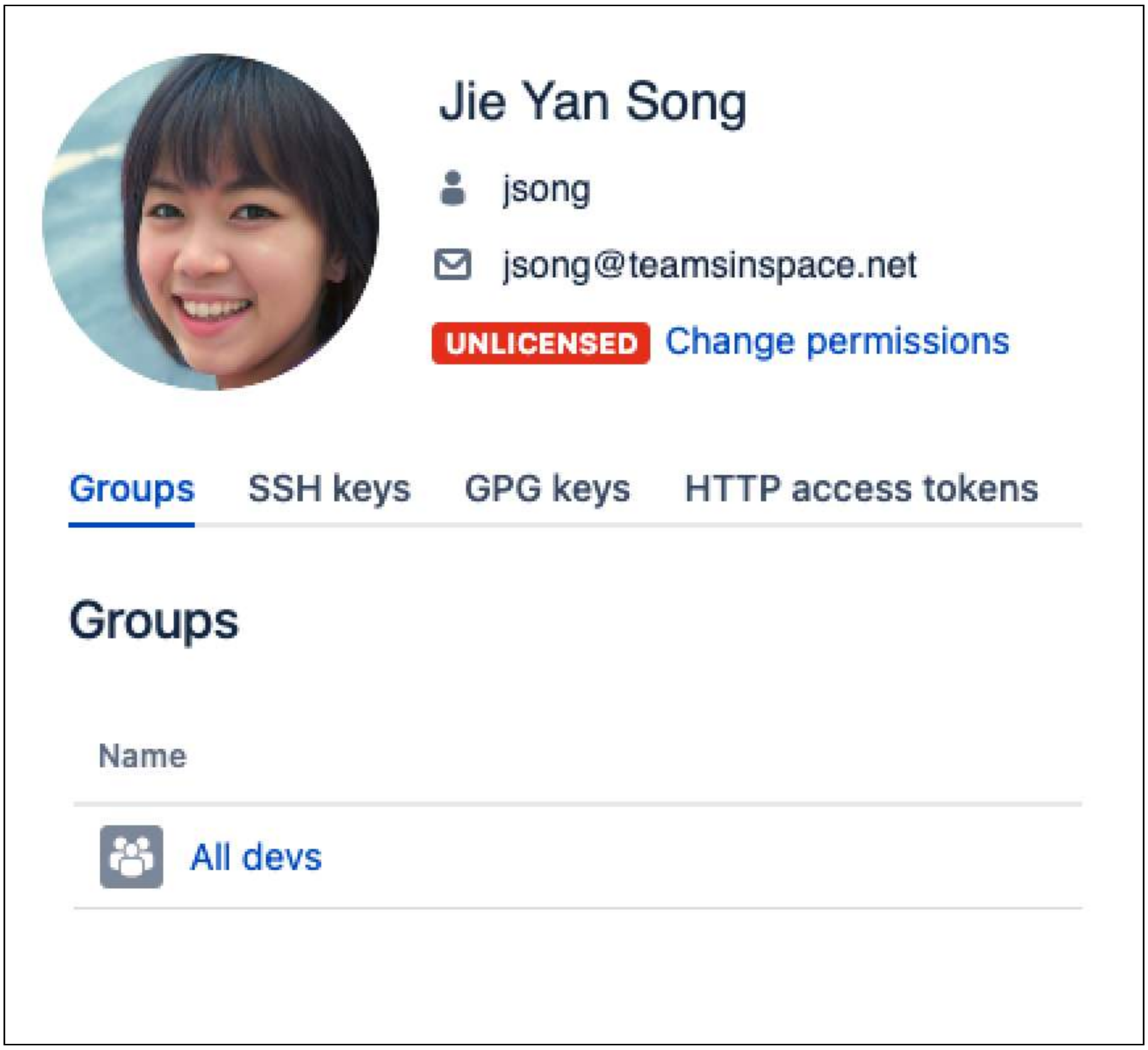
- Get started with Git
- External user directories

Managing 500+ users across Atlassian products?
Find out how easy, scalable and effective it can be with Crowd!
See centralized user management.

Creating a user

To create a user:

1. In the administration area, click **Users** (under 'Accounts') and then **Create user** (on the 'Users' screen).
2. Complete the form. You can either set the user's password now, or have Bitbucket email the user with a link that they can use to set the password themselves:
3. Once you've created the user, click **Change permissions** to set up their access permissions. Note that a user doesn't have access to Bitbucket until global access permissions have been set.
   a. **Set up user permissions**


Jie Yan Song

jsong

jsong@teamsinspace.net

UNLICENSED Change permissions

Groups

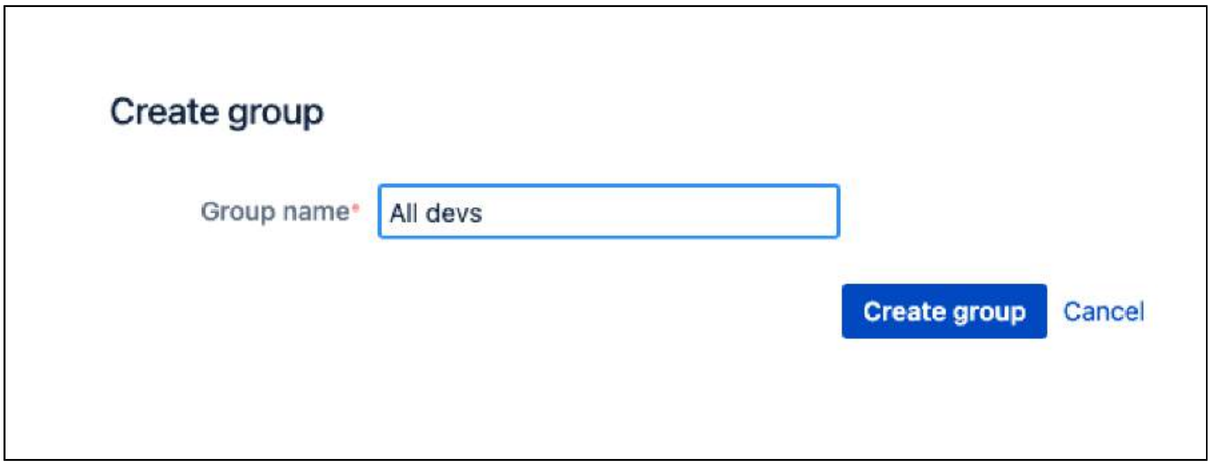
Name
All devs

See Global permissions for more information.

Creating a group

To create a group, from the administration area:

1. Click **Groups** (under 'Accounts') and then **Create group.**
2. Enter the name for the new group, and click **Create group** (again):


Create group

Group name* All devs

3. Now you can add users to your new group (see the next section).

Adding users to groups

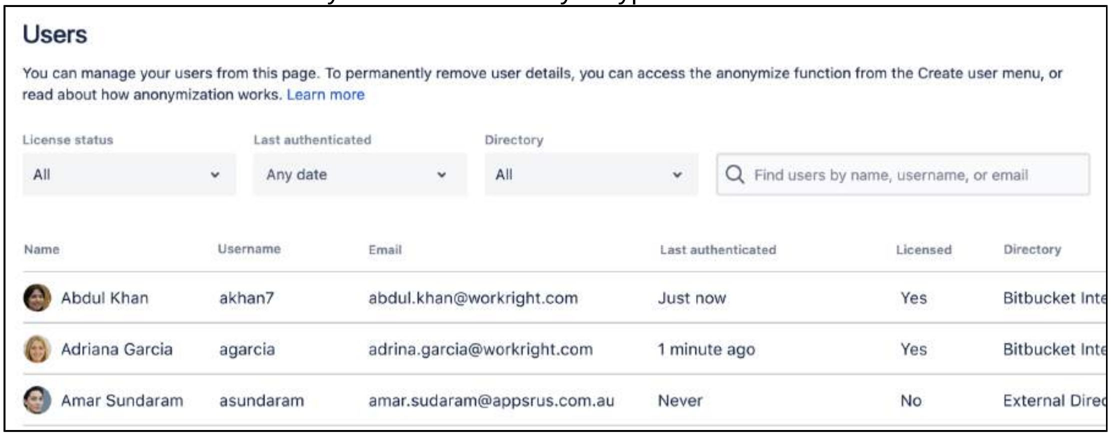
You can add users to groups in two ways:

- add a particular user to multiple groups, from the user's account page in the admin area.
- add multiple users to a particular group, from the group's page.

From the user account page

To add a user to a group from the user's account page,

1. Click **Users** in the Administration section, and then use the filter to find the user:
   a. **Filters:** Use filters to sort users by their license status, last authentication time, and directory.
   b. **User search:** Filter users by name or email as you type.



Users

You can manage your users from this page. To permanently remove user details, you can access the anonymize function from the Create user menu, or read about how anonymization works. Learn more

License status: All | Last authenticated: Any date | Directory: All | Find users by name, username, or email

Name	Username	Email	Last authenticated	Licensed	Directory
Abdul Khan	akhan7	abdul.khan@workright.com	Just now	Yes	Bitbucket Inte
Adriana Garcia	agarcia	adrina.garcia@workright.com	1 minute ago	Yes	Bitbucket Inte
Amar Sundaram	asundaram	amar.sudaram@appsrus.com.au	Never	No	External Direc

2. On the account page for the user, use the filter to find a group to which you want to add the user.
3. Click **Add** for each group in turn.

From the group page

To add a user to a group from the group's page,

1. Click **Groups** (under "Accounts') in the administration area, and use the filter to find the group.
2. On the page for the group, use the filter to find a user to add to the group.
3. Click **Add** for each user you select, to make them a member of the group.

Changing usernames

You can change the username for a user account that is hosted in Bitbucket's internal user directory.

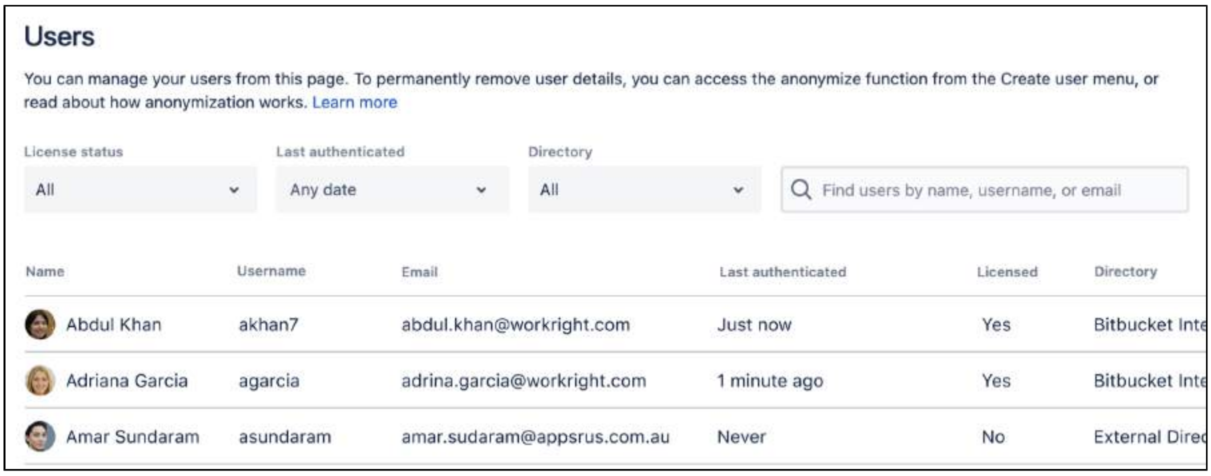
To change a user's username:

1. Go to **Users** in the Administration section, use the filter to find the user.
2. On the account page for the user, click **Rename**.

Identifying licensed users

On the **Users** page, you can also identify licensed users. For example, if a licensed user has been idle for six months or more, you can find them quickly and revoke their permissions safely.

To find out if a user is licensed, check the **Licensed** column.



Users

You can manage your users from this page. To permanently remove user details, you can access the anonymize function from the Create user menu, or read about how anonymization works. Learn more

License status	Last authenticated	Directory	
All	Any date	All	Find users by name, username, or email

Name	Username	Email	Last authenticated	Licensed	Directory
Abdul Khan	akhan7	abdul.khan@workright.com	Just now	Yes	Bitbucket Inte
Adriana Garcia	agarcia	adrina.garcia@workright.com	1 minute ago	Yes	Bitbucket Inte
Amar Sundaram	asundaram	amar.sudaram@appsrus.com.au	Never	No	External Direc

You can also check how many free seats your license is providing. To do this, use the JMX metrics for licensed users statistics.

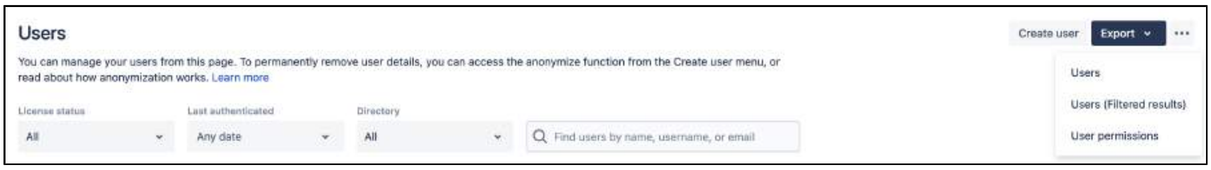
Exporting list of users and user permissions

A Data Center license is required to use this feature. Get an evaluation license to try it out, or purcha se a license now.

1. Select **Administration** > **Users**.
2. Select **Export** > **Users**, **Users (Filtered results)**, or **User permissions**.

The data is exported in CSV format. Note that for large Bitbucket instances, this export can take a long time and the resulting file might be very large. We recommend that you export this data when your Bitbucket instance is less busy.

You can also fetch user and group permissions for a specific repository or project via the REST API and generate your own reports.



Users

You can manage your users from this page. To permanently remove user details, you can access the anonymize function from the Create user menu, or read about how anonymization works. Learn more

License status: All
Last authenticated: Any date
Directory: All

Deleting users and groups

You can delete a user or group from Bitbucket's internal user directory, or the external directory from which Bitbucket sources users, such as an LDAP, Crowd or Jira Software.

When a user or group is deleted from such a directory, Bitbucket checks to see if that user still exists in another directory:

- If the user or group *does* exist in another directory, Bitbucket assumes the administrator intended to *mi grate* the user or group between directories and we leave their data intact.
- If the user or group *does not* exist in another directory, Bitbucket assumes the intent was to permanently delete them, and we delete the users permissions, SSH keys and 'rememberme' tokens.

When deleting users

In the case of users from an external directory (e.g. JIRA or LDAP) and internal users (from the internal directory), users or groups are preserved for **seven (7) days**.

This includes:

- SSH keys
- GPG Keys
- Access tokens
- All user related data stored by apps.

Notes

- If an entire directory is deleted, Bitbucket will preserve users and groups for **seven (7) days** before deleting.
- Content which might be of historical interest (comments, pull requests, etc.) is not deleted when a user or group is. Only authentication, authorization and data which serves no purpose to a user who can no longer log in is removed.
- In some situations, reordering the directories will change the directory that the current user comes from, if a user with the same username happens to exist in both. This behavior can be used in some cases to create a copy of the existing configuration, move it to the top, then remove the old one. Note, however, that duplicate usernames are not a supported configuration.
- You can enable or disable a directory at any time. If you disable a directory, your configuration details will remain but Bitbucket will not recognize the users and groups in that directory.

Limitations

- You cannot edit, disable or delete the directory that your own user account belongs to. This prevents administrators from locking themselves out of Bitbucket, and applies to internal as well as external directories.
- You cannot remove the internal directory. This limitation aligns with the recommendation that you always keep an administrator or sysadmin account active in the Bitbucket internal directory, so that you can troubleshoot problems with your user directories.
- You have to disable a directory before you can remove it. Removing a directory will remove the details from the database.

Deleting a user versus anonymizing a user

When someone leaves your organization, or no longer needs to use Bitbucket, you can **delete** their user account. Then if required, you can **anonymize** their username within Bitbucket.

Anonymizing a user means that any remaining personally identifiable information in Bitbucket after the user is deleted, is updated to be permanently non-attributable to that specific user.

Anonymizing a user after deletion

When you **anonymize** a username:

- The username is replaced with a non-attributable alias throughout Bitbucket.
- User mentions are replaced with a non-attributable alias throughout Bitbucket.
- If the user had a personal project, the personal project name and key is updated to a non-attributable alias.
- User cleanup for deletion happens immediately, if it hasn’t already taken place (eg. deleting avatars, SSH keys, permissions).

The following data **will remain** after a username is **anonymized**:

- User content (such as comments and pull requests).
- User data in Git history.

- User data in third-party plug-ins may not be anonymized.

To anonymize a deleted user in Bitbucket

Be sure the user is deleted from Bitbucket prior to anonymization, including from any external directories that the user is a member of.

If the user is not deleted prior to anonymization, the anonymization will fail.

1. From the **Create user** menu on the user list page, select **Anonymize user** from the dropdown.
2. Enter the exact username to anonymize in the username field, and click continue.
3. Read through the details of the anonymization process and tick the box to confirm you wish to anonymize this user.
4. Click **Anonymize**.

Note that once the anonymize button is clicked, the process will continue even if the browser window is closed.

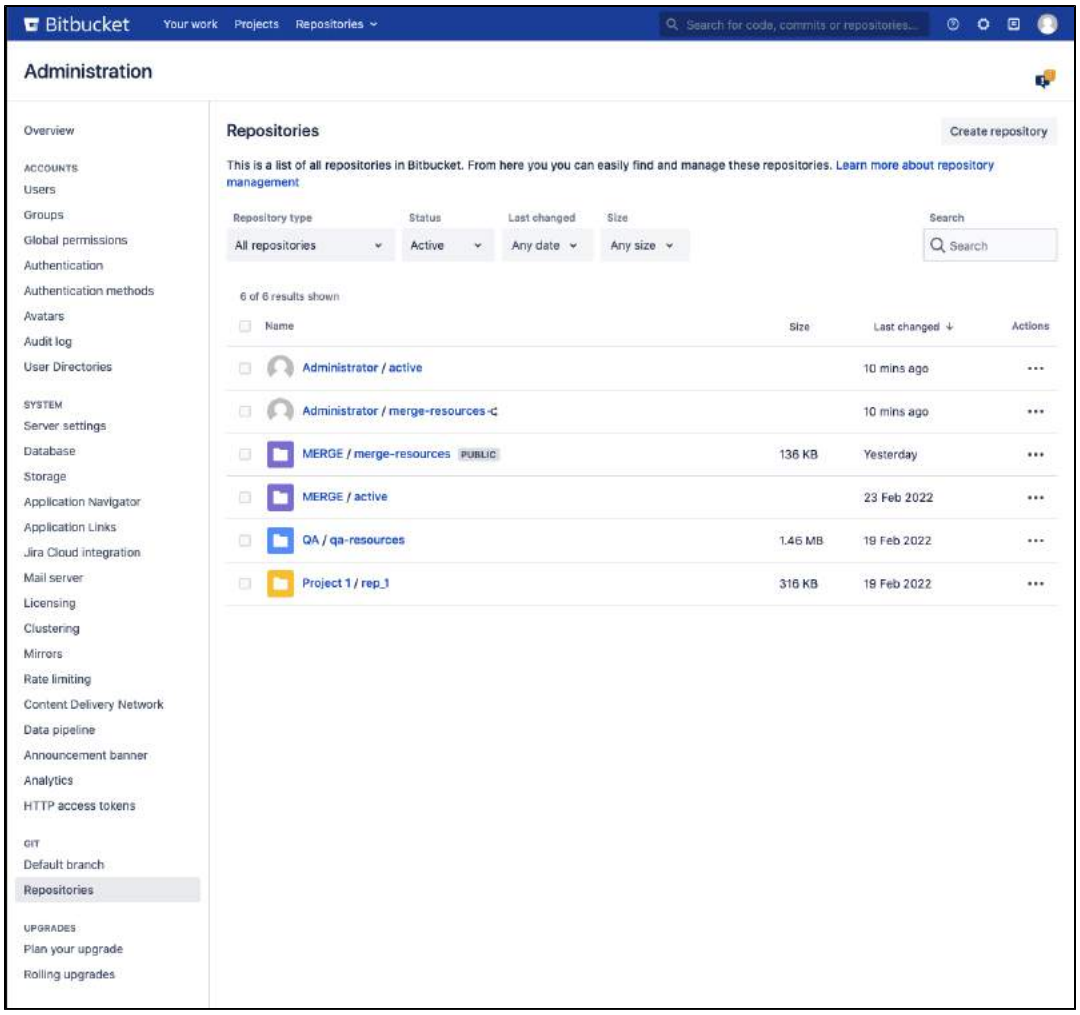
Advanced repository management

This feature is available with a Bitbucket Data Center license.

In Bitbucket Data Center, you can manage all of the repositories in your instance from the **Repositories** page in the Administration area. You can also create a new repository from here.

On this page

Related pages: Forks



Repositories

Create repository

This is a list of all repositories in Bitbucket. From here you you can easily find and manage these repositories. Learn more about repository management

Repository type: All repositories | Status: Active | Last changed: Any date | Size: Any size | Search

6 of 6 results shown

Name	Size	Last changed ↓	Actions
Administrator / active		10 mins ago	•••
Administrator / merge-resources		10 mins ago	•••
MERGE / merge-resources PUBLIC	136 KB	Yesterday	•••
MERGE / active		23 Feb 2022	•••
QA / qa-resources	1.46 MB	19 Feb 2022	•••
Project 1 / rep_1	316 KB	19 Feb 2022	•••

Filtering options include:

- **Repository type** - helps you filter on repositories by their type, such as those that are:
  - in projects
  - public
  - personal
- **Status** – lets you filter on a repository's status, which includes:
  - archived
  - active
  - all
- **Last changed** - lets you specify a date range to find repositories based on the latest changes made to them such as:
  - create
  - push
  - ref-change

    - move
    - changes to name or description
    - changes to settings for default branch, forking, and public access
- **Size -** lets you find repositories based on their size
- **Search** - find repositories by name, description, project, or user.

To view all repositories in Bitbucket, go to **Administration** > **Repositories** (under Git). Select all or multiple repositories from the list and you'll then have options to perform bulk delete or move actions on them.

Repository size

The repositories in your instance may also display an approximate size. For repositories without forks, the size is calculated by the size of their objects. For forks, the size is calculated by the size of their objects unique to the fork that is not shared with the upstream repository.

If a forked repository has not had anything added to it, it may display as 0 value. If there is no value shown, the size of the repository couldn't be calculated.

For more details about missing or 0 B repository size (as well as a delayed listing of repositories and no date shown), see our Missing information in advanced repository management pages article.

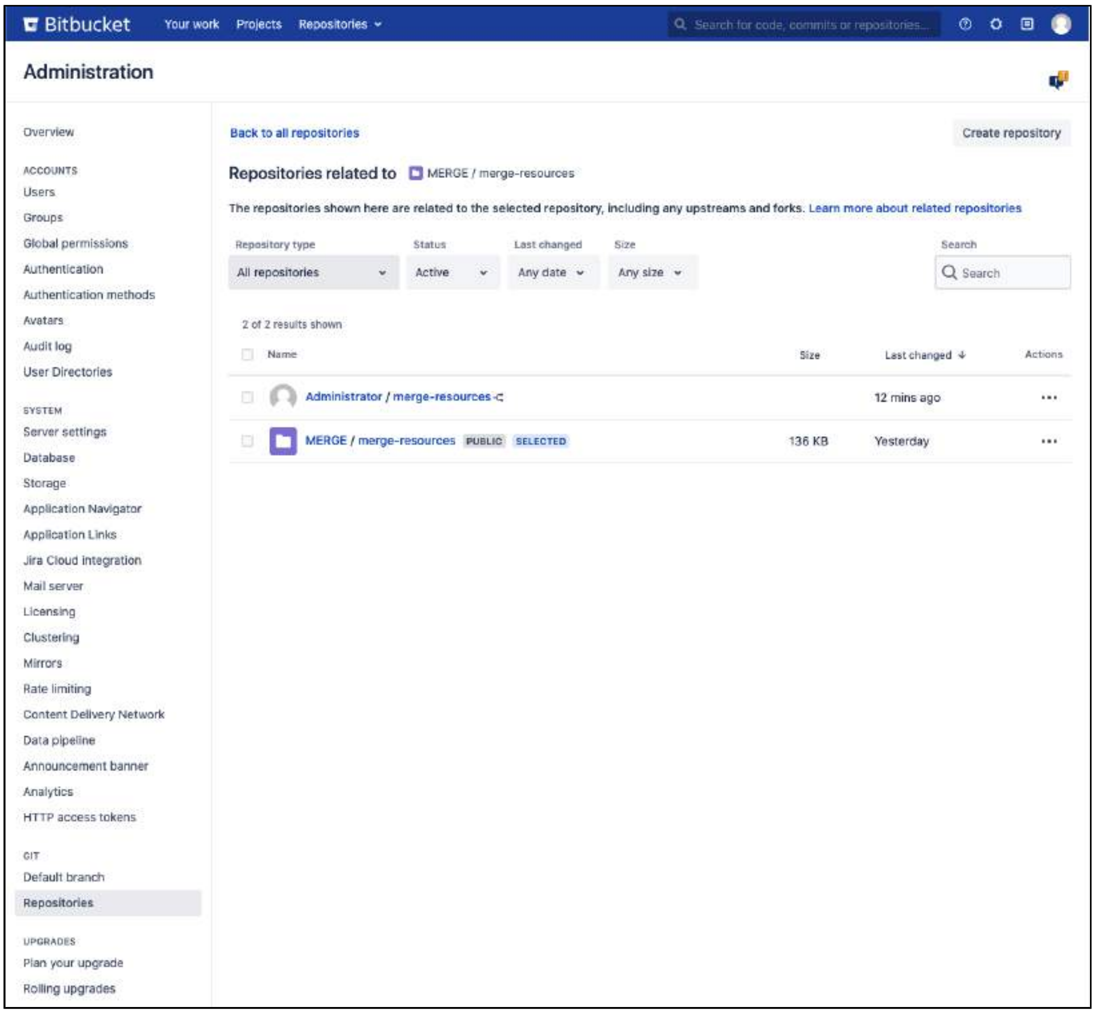
Related repositories

Advanced repository management provides the ability to review all repositories that are related to one selected from the Repositories page.

To view all related repositories:

1. On the Repositories page, select ••• > **Related repositories** next to a single repository.
2. A new page then opens so that you can review all related forks and upstream repositories.

The same filter options are available here as on the **Repositories** page.



Repositories related to MERGE / merge-resources

The repositories shown here are related to the selected repository, including any upstreams and forks. Learn more about related repositories

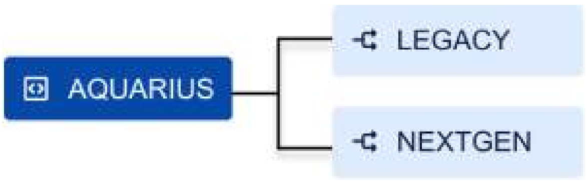
Repository type: All repositories; Status: Active; Last changed: Any date; Size: Any size; Search

2 of 2 results shown

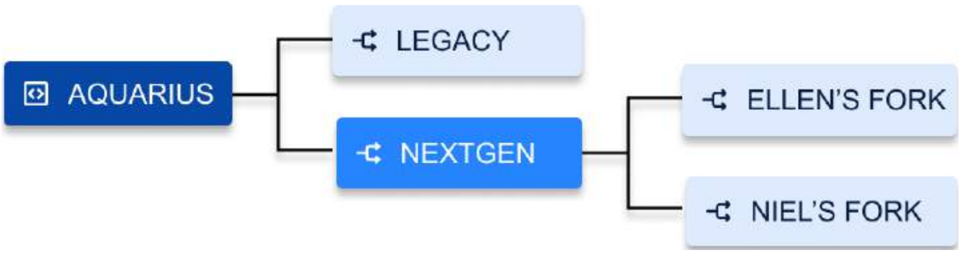
Name	Size	Last changed	Actions
Administrator / merge-resources		12 mins ago	•••
MERGE / merge-resources PUBLIC SELECTED	136 KB	Yesterday	•••

When you [fork a repository](), you create a *hierarchy* of *related repositories*. The original repository is the *root*, and any parent repository of a fork is considered an *upstream* repository.

For example, the below hierarchy shows us that AQUARIUS is the *root* repository as well as the *upstream* to forks LEGACY and NEXTGEN.



NEXTGEN is forked to create personal repositories. So then, NEXTGEN becomes an *upstream* repository with two *direct forks*, ELLEN’S FORK and NIEL’S FORK.



Delete a repository

If you’d rather not delete a repository, you can archive it instead. Learn more about how to archive repositories

You can choose to delete one or multiple repositories at once. Deleting a forked repository does not delete the upstream repository, nor will deleting an upstream delete any of the forked repositories.

> Deleting a repository that has related repositories will not remove its contents from the disk until all of its related repositories are deleted.

To delete a single repository:

1. Select a repository from the list.
2. Select ••• > **Delete**.
3. To confirm, select **Delete**.

To delete more than one repository:

1. Select all or individual checkboxes next to each repository.
2. Select **Delete**

.
3. To confirm, select **Delete**.

Move a repository

You can choose to move one or multiple repositories at once.

To move a single repository to another project:

1. Select a repository from the list.
2. Select ••• > **Move**.
3. Select the project from the **Project** list where you want to move the repository.
4. If required, change the name of the repository.
5. To confirm, select **Move**.

The repository will inherit the access rights of the project selected, and the clone URL is modified.

You'll have to update the remote using the command, `git remote set-URL`.

To move more than one repository:

1. Select all or individual checkboxes next to each repository.
2. Select **Move**

.
3. Select the project from the **Project** list where you want to move the repositories.
4. To confirm, select **Move**.

External user directories

You can connect Bitbucket Data Center to external user directories. This allows you to use existing users and groups stored in an enterprise directory, and to manage those users and groups in one place.

User management functions include:

- **Authentication:** determining which user identity is sending a request to Bitbucket.
- **Authorization**: determining the access privileges for an authenticated user.
- **User management:** maintaining profile information in user's accounts.
- **Group membership:** storing and retrieving groups, and group membership.

It is important to understand that these are separate components of a user management system. You could use an external directory for any or all of the above tasks.

There are several approaches to consider when using external user directories with Bitbucket, described briefly below:

- LDAP
- Jira applications
- Crowd
- Multiple directories

On this page

Related pages

- Connect to an LDAP directory
- Delegate authentication to an LDAP directory
- Connect Bitbucket to Crowd
- Delegate user management to Jira
- Users and groups
- External directory lockout recovery

- Bitbucket provides a "read-only" connection to external directories for user management. This means that users and groups, fetched from *any external directory*, can only be modified or updated in the external directory itself, rather than in Bitbucket.
- Connecting Atlassian Bitbucket to your external directory is not sufficient to allow your users to log in. You must explicitly grant them access to Bitbucket in the global permission screen.
- We recommend that you use groups instead of individual accounts when granting permissions. However, be careful not to add more users to those groups that your Bitbucket license allows. If the license limit is exceeded, your developers will not be able to push commits to repositories, and Bitbucket will display a warning banner. See this FAQ.
- Bitbucket comes with an internal user directory, already built-in, that is enabled by default at installation. When you create the first administrator during the setup procedure, that administrator's username and other details are stored in the internal directory.
- See also this information about deleting users and groups in Bitbucket.

LDAP

You should consider connecting to an LDAP directory server if your users and groups are stored in an enterprise directory.

There are two common ways of using an external LDAP directory with Bitbucket:

- For full user and group management, including for user authentication — see Connect to an LDAP directory for instructions.
- For delegated user authentication only, while using Bitbucket's internal directory for user and group management — see Delegate authentication to an LDAP directory for instructions.

Bitbucket is able to connect to the following LDAP directory servers:

- Microsoft Active Directory
- Apache Directory Server (ApacheDS) 1.0.x and 1.5.x
- Apple Open Directory (Read-Only)
- Fedora Directory Server (Read-Only Posix Schema)
- Novell eDirectory Server
- OpenDS
- OpenLDAP
- OpenLDAP (Read-Only Posix Schema)
- Generic Posix/RFC2307 Directory (Read-Only)
- Sun Directory Server Enterprise Edition (DSEE)
- Any generic LDAP directory server

Jira applications

You can delegate Bitbucket user and group management, as well as user authentication, to a Jira application. This is a good option if you already use a Jira application in your organization. Note that Bitbucket can only connect to a Jira application server running Jira 4.3 or later.

You should consider using Atlassian Crowd for more complex configurations with a large number of users.

See Delegate user management to Jira for configuration instructions.

Crowd

You can connect Bitbucket to Atlassian Crowd for user and group management, as well as for user authentication.

Crowd is an application security framework that handles authentication and authorization for your web-based applications. With Crowd you can integrate multiple web applications with multiple user directories, with support for single sign-on (SSO) and centralized identity management. See the Crowd Administration Guide.

You should consider connecting to Crowd if you want to use Crowd to manage existing users and groups in multiple directory types, or if you have users of other web-based applications.

See Connect Bitbucket to Crowd for configuration instructions.

Multiple directories

When Bitbucket is connected directly to multiple user directories, where duplicate user names and group names are used across those directories, the effective group memberships that Bitbucket uses for authorization can be determined using either of these two schemes:

- 'aggregating membership'
- 'non-aggregating membership'.

See Effective memberships with multiple directories for more information about these two schemes.

Note that:

- Aggregating membership is used by default for new installations of Bitbucket.
- Authentication, for when Bitbucket is connected to multiple directories, only depends on the mapped groups in those directories – the aggregation scheme is not involved at all.
- For inactive users, Bitbucket only checks if the user is active in the first (highest priority) directory in which they are found for the purpose of determining authentication. Whether a user is active or inactive does not affect how their memberships are determined.
- When a user is added to a group, they are only added to the first writeable directory available, in priority order.

- When a user is removed from a group, they are only removed from the group in the first directory the user appears in, when non-aggregating membership is used. With aggregating membership, they are removed from the group in *all* directories the user exists in.

A Bitbucket admin can change the membership scheme used by Bitbucket using the following commands:

- To change to *aggregating membership*, substitute your own values for `<username>`, `<password>` and `<base-url>` in this command:

```
curl -H 'Content-type: application/json' -X PUT -d '{"membershipAggregationEnabled":true}' -u
<username>:<password> <base-url>/rest/crowd/latest/application
```

- To change to non-*aggregating membership*, substitute your own values for `<username>`, `<password>` and `<base-url>` in this command:

```
curl -H 'Content-type: application/json' -X PUT -d '{"membershipAggregationEnabled":false}' -u
<username>:<password> <base-url>/rest/crowd/latest/application
```

Note that these operations are different from how you make these changes in Crowd. Note also that changing the aggregation scheme can affect the authorization permissions for your Bitbucket users, and how directory update operations are performed.

Connect to an LDAP directory

You can connect Bitbucket Data Center to an existing LDAP user directory, so that your existing users and groups in an enterprise directory can be used in Bitbucket. The LDAP directory is used for both user authentication and account management.

Bitbucket is able to connect to the following LDAP directory servers:

- Microsoft Active Directory
- Apache Directory Server (ApacheDS) 1.0.x and 1.5.x
- Apple Open Directory (Read-Only)
- Fedora Directory Server (Read-Only Posix Schema)
- Novell eDirectory Server
- OpenDS
- OpenLDAP
- OpenLDAP (Read-Only Posix Schema)
- Generic Posix/RFC2307 Directory (Read-Only)
- Sun Directory Server Enterprise Edition (DSEE)
- Any generic LDAP directory server

On this page

Related pages

- Deleting Users and Groups

Connecting Atlassian Bitbucket to your external directory is not sufficient to allow your users to log in. You must explicitly grant them access to Bitbucket in the global permission screen.

We recommend that you use groups instead of individual accounts when granting permissions.

License considerations

When connecting Bitbucket to an external directory, be careful not to allow access by more users than your Bitbucket license allows. If the license limit is exceeded, your developers will not be able to push commits to repositories, and Bitbucket will display a warning banner. See this FAQ.

Synchronization when Bitbucket is first connected to the LDAP directory

When you first connect Bitbucket to an existing LDAP directory, the Bitbucket internal directory is synchronized with the LDAP directory. User information, including groups and group memberships, is copied across to the Bitbucket directory.

When we performed internal testing of synchronization with an Active Directory server on our local network with 10 000 users, 1000 groups and 200 000 memberships, we found that the initial synchronization took about 5 minutes. Subsequent synchronizations with 100 modifications on the AD server took a couple of seconds to complete. See the option below.

Note that when Bitbucket is connected to an LDAP directory, you cannot update user details in Bitbucket. Updates must be done directly on the LDAP directory, perhaps using a LDAP browser tool such as Apache Directory Studio.

Option - Use LDAP filters to restrict the number of users and groups that are synchronized

You can use LDAP filters to restrict the users and groups that are synchronized with the Bitbucket internal directory. You may wish to do this in order to limit the users or groups that can access Bitbucket, or if you are concerned that synchronization performance may be poor.

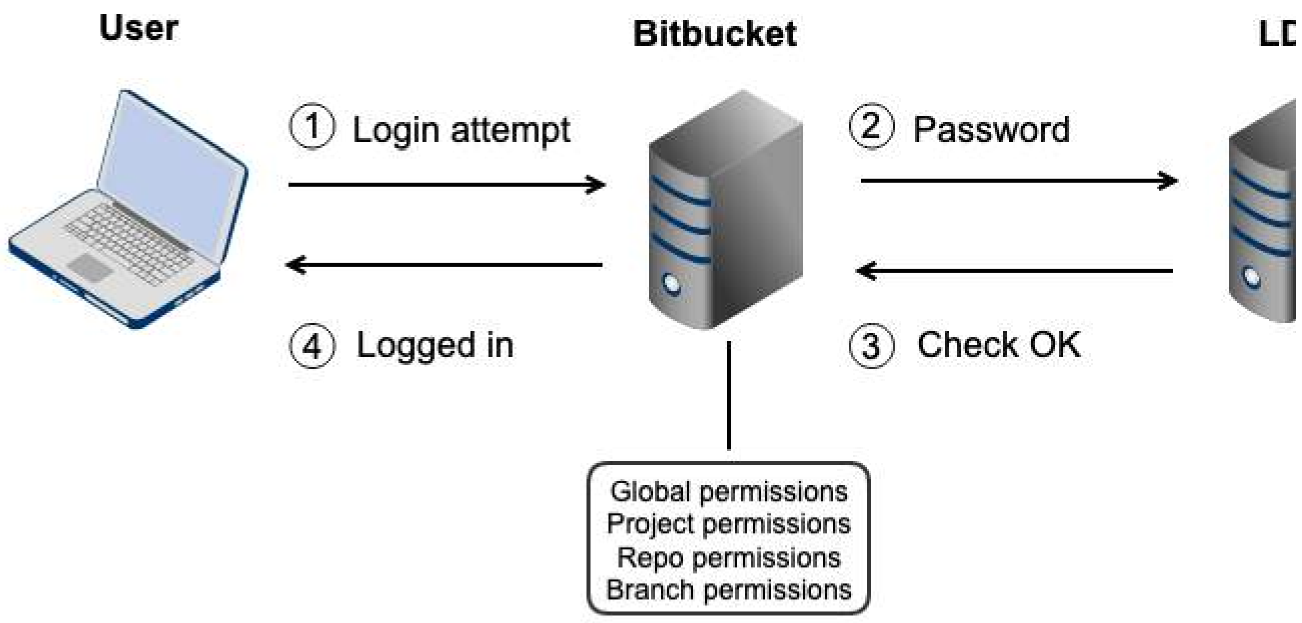
For example, to limit synchronization to just the groups named "bitbucket_user" or "red_team", enter the following into the **Group Object Filter** field (see Group Schema Settings below):

```
(&(objectClass=group)(|(cn=bitbucket_user)(cn=red_team)))
```

For further discussion about filters, with examples, please see How to write LDAP search filters. Note that you need to know the names for the various containers, attributes and object classes in your particular directory tree, rather than simply copying these examples. You can discover these container names by using a tool such as Apache Directory Studio.

Authentication when a user attempts to log in

When a user attempts to log in to Bitbucket, once synchronization has completed, Bitbucket confirms that the user exists in it's internal directory and then passes the user's password to the LDAP directory for confirmation. If the password matches that stored for the user, LDAP passes a confirmation back to Bitbucket, and Bitbucket logs in the user. During the user's session, all authorizations (i.e. access to Bitbucket resources such as repositories, pull requests and administration screens) are handled by Bitbucket, based on permissions maintained byBitbucket in its internal directory.



Connecting Bitbucket

To connect Bitbucket to an LDAP directory:

1. Log in as a user with 'Admin' permission.
2. In the Bitbucket administration area, click **User Directories** (under 'Accounts').
3. Click **Add Directory** and select either **Microsoft Active Directory** or **LDAP** as the directory type.
4. Configure the directory settings, as described in the tables below.
5. Save the directory settings.
6. Define the directory order by clicking the arrows next to each directory on the 'User Directories' screen. The directory order has the following effects:
    - The order of the directories is the order in which they will be searched for users and groups.
    - Changes to users and groups will be made only in the first directory where the application has permission to make changes.

Server settings

Setting	Description
Name	Enter a meaningful name to help you identify the LDAP directory server. Examples: • `Example Company Staff Directory` • `Example Company Corporate LDAP`
Directory type	Select the type of LDAP directory that you will connect to. If you are adding a new LDAP connection, the value you select here will determine the default values for many of the options on the rest of screen. Examples: • `Microsoft Active Directory` • `OpenDS` • And more
Hostname	The host name of your directory server. Examples: • `ad.example.com` • `ldap.example.com` • `opends.example.com`
Port	The port on which your directory server is listening. Examples: • `389` • `10389` • `636` (for example, for SSL)
Use SSL	Check this if the connection to the directory server is an SSL (Secure Sockets Layer) connection. Note that you will need to configure an SSL certificate to use this setting.
Username	The distinguished name of the user that the application will use when connecting to the directory server. Examples: • `cn=administrator,cn=users,dc=ad,dc=example,dc=com` • `cn=user,dc=domain,dc=name` • `user@domain.name` By default, all users can read the uSNChanged attribute; however, only administrators or users with relevant permissions can access the Deleted Objects container. The specific privileges required by the user to connect to LDAP are "Bind" and "Read" (user info, group info, group membership, update sequence number, deleted objects), which the user can obtain by being a member of the Active Directory's built-in administrators group. Note that the incremental sync will fail silently if the Active Directory is accessed by a user without these privileges. This has been reported as CWD-3093.
Password	The password of the user specified above. **Note:** Connecting to an LDAP server requires that this application log in to the server with the username and password configured here. As a result, this password cannot be one-way hashed - it must be recoverable in the context of this application. The password is currently stored in the database in plain text without obfuscation. To guarantee its security, you need to ensure that other processes do not have OS-level read permissions for this application's database or configuration files.

LDAP schema

Setting	Description
Base DN	The root distinguished name (DN) to use when running queries against the directory server. Examples: • `o=example,c=com` • `cn=users,dc=ad,dc=example,dc=com` • For Microsoft Active Directory, specify the base DN in the following format: `dc=domain1,dc=local`. You will need to replace the `domain1` and `local` for your specific configuration. Microsoft Server provides a tool called `ldp.exe` which is useful for finding out and configuring the the LDAP structure of your server.
Additional User DN	This value is used in addition to the base DN when searching and loading users. If no value is supplied, the subtree search will start from the base DN. Example: • `ou=Users`
Additional Group DN	This value is used in addition to the base DN when searching and loading groups. If no value is supplied, the subtree search will start from the base DN. Example: • `ou=Groups`

⚠ If no value is supplied for ***Additional User DN*** or ***Additional Group DN*** this will cause the subtree search to start from the base DN and, in case of a huge directory structure, could cause performance issues for login and operations that rely on login to be performed.

LDAP permission

Setting	Description
Read Only	LDAP users, groups and memberships are retrieved from your directory server and can only be modified via your directory server. You cannot modify LDAP users, groups or memberships via the application administration screens.
Read Only, with Local Groups	LDAP users, groups and memberships are retrieved from your directory server and can only be modified via your directory server. You cannot modify LDAP users, groups or memberships via the application administration screens. However, you can add groups to the internal directory and add LDAP users to those groups.

Advanced settings

⚠ The **Manage User Status Locally** option, described below, will not work within Bitbucket. Do not enable this option.

BSERV-5129 - Disable "Manage User Status Locally" in Bitbucket Server GATHERING IMPACT

Setting	Description
Enable Nested Groups	Enable or disable support for nested groups. Some directory servers allow you to define a group as a member of another group. Groups in such a structure are called *nested groups*. Nested groups simplify permissions by allowing sub-groups to inherit permissions from a parent group.

Manage User Status Locally	If true, you can activate and deactivate users in Crowd independent of their status in the directory server.
Filter out expired users	If true, user accounts marked as expired in Active Directory will be automatically removed. For cached directories, the removal of a user will occur during the first synchronization after the account's expiration date. **Note**: This is available in Embedded Crowd 2.0.0 and above, but not available in the 2.0.0 m04 release.
Use Paged Results	Enable or disable the use of the LDAP control extension for simple paging of search results. If paging is enabled, the search will retrieve sets of data rather than all of the search results at once. Enter the desired page size – that is, the maximum number of search results to be returned per page when paged results are enabled. The default is 1000 results.
Follow Referrals	Choose whether to allow the directory server to redirect requests to other servers. This option uses the node referral (JNDI lookup `java.naming.referral`) configuration setting. It is generally needed for Active Directory servers configured without proper DNS, to prevent a 'javax.naming.PartialResultException: Unprocessed Continuation Reference(s)' error.
Naive DN Matching	If your directory server will always return a consistent string representation of a DN, you can enable naive DN matching. Using naive DN matching will result in a significant performance improvement, so we recommend enabling it where possible. This setting determines how your application will compare DNs to determine if they are equal. • If this checkbox is selected, the application will do a direct, case-insensitive, string comparison. This is the default and recommended setting for Active Directory, because Active Directory guarantees the format of DNs. • If this checkbox is not selected, the application will parse the DN and then check the parsed version.
Enable Incremental Synchronization	Enable incremental synchronization if you only want changes since the last synchronization to be queried when synchronizing a directory. ⚠ Be aware that when using this option, the user account configured for synchronization must have read access to: • The `uSNChanged` attribute of all users and groups in the directory that need to be synchronized. • The objects and attributes in the Active Directory deleted objects container. If at least one of these conditions is not met, you may end up with users who are added to (or deleted from) the Active Directory not being respectively added (or deleted) in the application. This setting is only available if the directory type is set to "Microsoft Active Directory".

Update group memberships when logging in	This setting enables updating group memberships during authentication and can be set to the following options: • **Every time the user logs in**: during the authentication, the user's **direct** group memberships will be updated to match what's in the remote directory: ○ Remove the user from all groups that the user no longer belongs to in the remote directory. ○ Add the user to all the groups that the user belongs to in the remote directory. New groups with matching names and descriptions will be created locally if needed. The group will only contain the current user and other memberships will be populated when users who belong to the same group log in or when the synchronization happens. • **For newly added users only**: when a new user logs in for the first time, the user's **direct** group memberships will be updated to match what's in the remote directory. Consider that the user's group memberships will be updated only if the user was created during the authentication. • **Never**: during the authentication, the user's group memberships won't change, even if the local state doesn't match what's in the remote.
Synchronization Interval (minutes)	Synchronization is the process by which the application updates its internal store of user data to agree with the data on the directory server. The application will send a request to your directory server every x minutes, where 'x' is the number specified here. The default value is 60 minutes.
Read Timeout (seconds)	The time, in seconds, to wait for a response to be received. If there is no response within the specified time period, the read attempt will be aborted. A value of 0 (zero) means there is no limit. The default value is 120 seconds.
Search Timeout (seconds)	The time, in seconds, to wait for a response from a search operation. A value of 0 (zero) means there is no limit. The default value is 60 seconds.
Connection Timeout (seconds)	This setting affects two actions. The default value is 10. • The time to wait when getting a connection from the connection pool. A value of 0 (zero) means there is no limit, so wait indefinitely. • The time, in seconds, to wait when opening new server connections. A value of 0 (zero) means that the TCP network timeout will be used, which may be several minutes.

User schema settings

Setting	Description
User Object Class	This is the name of the class used for the LDAP user object. Example: • `user`
User Object Filter	The filter to use when searching user objects. Example: • `(&(objectCategory=Person)(sAMAccountName=*))` More examples can be found in our knowledge base. See How to write LDAP search filters.

User Name Attribute	The attribute field to use when loading the username. Examples: • `cn` • `sAMAccountName` NB: In Active Directory, the 'sAMAccountName' is the 'User Logon Name (pre-Windows 2000)' field. The User Logon Name field is referenced by 'cn'.
User Name RDN Attribute	The RDN (relative distinguished name) to use when loading the username. The DN for each LDAP entry is composed of two parts: the RDN and the location within the LDAP directory where the record resides. The RDN is the portion of your DN that is not related to the directory tree structure. Example: • `cn`
User First Name Attribute	The attribute field to use when loading the user's first name. Example: • `givenName`
User Last Name Attribute	The attribute field to use when loading the user's last name. Example: • `sn`
User Display Name Attribute	The attribute field to use when loading the user's full name. Example: • `displayName`
User Email Attribute	The attribute field to use when loading the user's email address. Example: • `mail`
User Password Attribute	The attribute field to use when loading a user's password. Example: • `unicodePwd`
User Unique ID Attribute	The attribute used as a unique immutable identifier for user objects. This is used to track username changes and is optional. If this attribute is not set (or is set to an invalid value), user renames will not be detected — they will be interpreted as a user deletion then a new user addition. This should normally point to a UUID value. Standards-compliant LDAP servers will implement this as 'entryUUID' according to RFC 4530. This setting exists because it is known under different names on some servers, e.g. 'objectGUID' in Microsoft Active Directory.

Group schema settings

Setting	Description

Group Object Class	This is the name of the class used for the LDAP group object. Examples: • `groupOfUniqueNames` • `group`
Group Object Filter	The filter to use when searching group objects. Example: • `(&(objectClass=group)(cn=*))`
Group Name Attribute	The attribute field to use when loading the group's name. Example: • `cn`
Group Description Attribute	The attribute field to use when loading the group's description. Example: • `description`

Membership schema settings

Setting	Description
Group Members Attribute	The attribute field to use when loading the group's members. Example: • `member`
User Membership Attribute	The attribute field to use when loading the user's groups. Example: • `memberOf`
Use the User Membership Attribute, when finding the user's group membership	Check this if your directory server supports the group membership attribute on the user. (By default, this is the '`memberOf`' attribute.) • If this checkbox is selected, your application will use the group membership attribute on the user when **retrieving the list of groups to which a given user belongs**. This will result in a more efficient retrieval. • If this checkbox is not selected, your application will use the members attribute on the group ('`member`' by default) for the search. • If the **Enable Nested Groups** checkbox is selected, your application will ignore the **Use the User Membership Attribute** option and will use the members attribute on the group for the search.
Use the User Membership Attribute, when finding the members of a group	Check this if your directory server supports the user membership attribute on the group. (By default, this is the '`member`' attribute.) • If this checkbox is selected, your application will use the group membership attribute on the user when **retrieving the members of a given group**. This will result in a more efficient search. • If this checkbox is not selected, your application will use the members attribute on the group ('`member`' by default) for the search.

Delegate user management to Jira

⚠ *This page does not apply to Jira Software Cloud; you can't use Jira Software Cloud to manage your Bitbucket Data Center users.*

You can connect Bitbucket to an existing Atlassian Jira Data Center instance to delegate Bitbucket user and group management, and authentication. Bitbucket provides a "read-only" connection to Jira for user management. This means that users and groups, fetched from Jira, can only be modified or updated in that Jira server, rather than in Bitbucket.

Choose this option, as an alternative to Atlassian Crowd, for simple configurations with a limited number of users. Note that Bitbucket can only connect to an instance running Jira 4.3 or later.

Connecting Bitbucket and Jira is a 3-step process:

1. Set up Jira to allow connections from Bitbucket

2. Set up Bitbucket to connect to Jira

3. Set up Bitbucket users and groups in Jira

Also on this page:

- Server settings
- Jira server permissions
- Advanced settings

⚠ You need to be an administrator in Jira and a system administrator in Bitbucket to perform the following tasks.

ⓘ Managing 500+ users across Atlassian products?
Find out how easy, scalable, and effective it can be with Crowd!
See centralized user management.

1. Setup Jira to allow connections from Bitbucket

1. Log in as a user with the 'Jira Software Administrators' global permission.
2. For Jira 4.3.x, select **Other Application** from the 'Users, Groups & Roles' section of the 'Administration' menu.

   For later versions, choose ⚙ > **User management** > **Jira User Server.**
3. Click **Add Application**.
4. Enter the **application name** (case-sensitive) and **password** that Bitbucket will use when accessing Jira.
5. Enter the **IP address** of your Bitbucket instance. Valid values are:
   - A full IP address, e.g. `192.168.10.12`.
   - A wildcard IP range, using CIDR notation, e.g. `192.168.10.1/16`. For more information, see the introduction to CIDR notation on Wikipedia and RFC 4632.
6. Click **Save**.
7. Define the directory order, on the 'User Directories' screen, by clicking the blue up- and down-arrows next to each directory. The directory order has the following effects:
   - The order of the directories is the order in which they will be searched for users and groups.
   - Changes to users and groups will be made only in the first directory where the application has permission to make changes.

2. Setup Bitbucket to connect to Jira

1. Log in to Bitbucket as a user with 'Admin' permission.
2. In the Bitbucket administration area click **User Directories** (under 'Accounts').
3. Click **Add Directory** and select **Atlassian Jira**.

4. Enter settings, as described below.
5. Test and save the directory settings.
6. Define the directory order, on the 'User Directories' screen, by clicking the arrows for each directory. The directory order has the following effects:
    - The order of the directories is the order in which they will be searched for users and groups.
    - Changes to users and groups will be made only in the first directory where the application has permission to make changes.

3. Set up Bitbucket users and groups in Jira

In order to use Bitbucket, users must be a member of the `bitbucket-users` group or have Bitbucket global permissions. Follow these steps to configure your Bitbucket groups in Jira:

1. Add the `bitbucket-users` and `bitbucket-administrators` groups in Jira.
2. Add your own username as a member of both of the above groups.
3. Choose one of the following methods to give your existing Jira users access to Bitbucket:
    - Option 1: In Jira, find the groups that the relevant users belong to. Add those groups as members of one or both of the above Bitbucket groups.
    - Option 2: Log in to Bitbucket using your Jira account and go to the administration area. Click **Global permissions** (under 'Accounts'). Assign the appropriate permissions to the relevant Jira groups. See Global permissions.

Connecting Atlassian Bitbucket to Jira for user management is not sufficient, by itself, to allow your users to log in to Bitbucket. You must also grant them access to Bitbucket by using one of the above 2 options.

We recommend that you use groups instead of individual accounts when granting permissions. However, be careful not to add more users to those groups that your Bitbucket license allows. If the license limit is exceeded, your developers will not be able to push commits to repositories, and Bitbucket will display a warning banner. See this FAQ.

See also this information about deleting users and groups in Bitbucket.

Server settings

Setting	Description
Name	A meaningful name that will help you to identify this Jira server in the list of directory servers. Examples: • `Jira Software` • `My Company Jira`
Server URL	The web address of your Jira server. Examples: • `http://www.example.com:8080` • `http://jira.example.com`
Application Name	The name used by your application when accessing the Jira server that acts as user manager. Note that you will also need to define your application to that Jira server, via the '**Other Applications**' option in the 'Users, Groups & Roles' section of the 'Administration' menu.
Application Password	The password used by your application when accessing the Jira server that acts as user manager.

Jira server permissions

Setting	Description
Read Only	The users, groups and memberships in this directory are retrieved from the Jira server that is acting as user manager. They can only be modified via that JIRA server.

Advanced settings

Setting	Description
Enable Nested Groups	Enable or disable support for nested groups. Before enabling nested groups, please check to see if nested groups are enabled on the JIRA server that is acting as user manager. When nested groups are enabled, you can define a group as a member of another group. If you are using groups to manage permissions, you can create nested groups to allow inheritance of permissions from one group to its sub-groups.
Enable Incremental Synchronization	Enable or disable incremental synchronization. Only changes since the last synchronization will be retrieved when synchronizing a directory.
Synchronization Interval (minutes)	Synchronization is the process by which the application updates its internal store of user data to agree with the data on the directory server. The application will send a request to your directory server every x minutes, where 'x' is the number specified here. The default value is 60 minutes.

Delegate authentication to an LDAP directory

You can configure Bitbucket Data Center to use an LDAP directory for delegated user authentication while still using Bitbucket for user and group management.

You can either create new user accounts manually in the LDAP directory or use the option to automatically create a user account when the user attempts to log in, as described in the Copy users on login section below.

See also this information about deleting users and groups in Bitbucket.

To connect Bitbucket to an LDAP directory for delegated authentication:

1. Log in to Bitbucket as a user with 'Admin' permission.
2. Go to the Bitbucket administration area and click **User Directories** (under 'Accounts').
3. Click **Add Directory** and select **Internal with LDAP Authentication** as the directory type.
4. Configure the directory settings, as described in the tables below.
5. Save the directory settings.
6. Define the directory order by clicking the arrows for each directory on the 'User Directories' screen. The directory order has the following effects:
    - The order of the directories is the order in which they will be searched for users and groups.
    - Changes to users and groups will be made only in the first directory where the application has permission to make changes.

Connecting Atlassian Bitbucket to your external directory is not sufficient to allow your users to log in. You must explicitly grant them access to Bitbucket in the global permission screen.

We recommend that you use groups instead of individual accounts when granting permissions. However, be careful not to add more users to those groups that your Bitbucket license allows. If the license limit is exceeded, your developers will not be able to push commits to repositories, and Bitbucket will display a warning banner. See this FAQ.

On this page:

Server settings

Setting	Description
Name	A descriptive name that will help you to identify the directory. Examples: • `Internal directory with LDAP Authentication` • `Corporate LDAP for Authentication Only`

Directory Type	Select the type of LDAP directory that you will connect to. If you are adding a new LDAP connection, the value you select here will determine the default values for some of the options on the rest of screen. Examples: • `Microsoft Active Directory` • `OpenDS` • And more.
Hostname	The host name of your directory server. Examples: • `ad.example.com` • `ldap.example.com` • `opends.example.com`
Port	The port on which your directory server is listening. Examples: • `389` • `10389` • `636` (for example, for SSL)
Use SSL	Check this box if the connection to the directory server is an SSL (Secure Sockets Layer) connection. Note that you will need to configure an SSL certificate in order to use this setting.
Username	The distinguished name of the user that the application will use when connecting to the directory server. Examples: • `cn=administrator,cn=users,dc=ad,dc=example,dc=com` • `cn=user,dc=domain,dc=name` • `user@domain.name`
Password	The password of the user specified above.

Manually creating users

Move the delegated authentication directory to the top of the User Directories list and create the user manually (go to **Administration** > **Users** > **Create user**). Using this manual method you must currently create a temporary password when creating users. There is an improvement request to address this:

~~BSERV-3424~~ - Disable "Change password" field from admin and user page when delegated authentication is used CLOSED

If you intend to *change* the authentication directory of your users from `Bitbucket Internal Directory` to `Delegated LDAP Authentication` you must select the option to "Copy User on Login" since you can't create a new user that has the same username as another user in another directory.

Copying users on login

The settings described in the table below relate to when a user attempts to authenticate with Bitbucket. This authentication attempt can occur either:

- when using the Bitbucket login screen.
- when issuing a Git clone or push command at the command line, for a repository managed by Bitbucket.

Setting	Description

Copy User on Login	This option affects what will happen when a user attempts to log in. If this box is checked, the user will be created automatically in the internal directory that is using LDAP for authentication when the user first logs in and their details will be synchronized on each subsequent log in. If this box is not checked, the user's login will fail if the user wasn't already manually created in the directory. If you check this box the following additional fields will appear on the screen, which are described in more detail below: • Default Group Memberships • Synchronize Group Memberships • User Schema Settings (described in a separate section below)
Update User attributes on Login	Whenever your users authenticate to the application, their attributes will be automatically updated from the LDAP server into the application. After you select this option, you won't be able to modify or delete your users directly in the application. • If you need to modify a user, do it on the LDAP server; it will be updated in the application after authenticating. • If you need to delete a user, do it on the LDAP server, but also in the application. If you delete the user only on the LDAP server, it will be rejected from logging in to the application, but it won't be set as inactive, which will affect your license. You'll need to disable the **Update User attributes on Login** option to delete the user, and then enable it again.
Default Group Memberships	This field appears if you check the **Copy User on Login** box. If you would like users to be automatically added to a group or groups, enter the group name(s) here. To specify more than one group, separate the group names with commas. Each time a user logs in, their group memberships will be checked. If the user does not belong to the specified group(s), their username will be added to the group(s). If a group does not yet exist, it will be added to the internal directory that is using LDAP for authentication. Please note that there is no validation of the group names. If you mis-type the group name, authorization failures will result – users will not be able to access the applications or functionality based on the intended group name. Examples: • `confluence-users` • `bamboo-users,jira-administrators,jira-core-users`
Synchronize Group Memberships	This field appears if you select the **Copy User on Login** checkbox. If this box is checked, group memberships specified on your LDAP server will be synchronized with the internal directory each time the user logs in. If you check this box the following additional fields will appear on the screen, both described in more detail below: • Group Schema Settings (described in a separate section below) • Membership Schema Settings (described in a separate section below)

LDAP schema

Setting	Description

Base DN	The root distinguished name (DN) to use when running queries against the directory server. Examples: • `o=example,c=com` • `cn=users,dc=ad,dc=example,dc=com` • For Microsoft Active Directory, specify the base DN in the following format: `dc=domain1,dc=local`. You will need to replace the `domain1` and `local` for your specific configuration. Microsoft Server provides a tool called `ldp.exe` which is useful for finding out and configuring the the LDAP structure of your server.
User Name Attribute	The attribute field to use when loading the username. Examples: • `cn` • `sAMAccountName`

Advanced settings

Setting	**Description**
Enable Nested Groups	Enable or disable support for nested groups. Some directory servers allow you to define a group as a member of another group. Groups in such a structure are called *nested groups*. Nested groups simplify permissions by allowing sub-groups to inherit permissions from a parent group.
Use Paged Results	Enable or disable the use of the LDAP control extension for simple paging of search results. If paging is enabled, the search will retrieve sets of data rather than all of the search results at once. Enter the desired page size – that is, the maximum number of search results to be returned per page when paged results are enabled. The default is 1000 results.
Follow Referrals	Choose whether to allow the directory server to redirect requests to other servers. This option uses the node referral (JNDI lookup `java.naming.referral`) configuration setting. It is generally needed for Active Directory servers configured without proper DNS, to prevent a 'javax.naming.PartialResultException: Unprocessed Continuation Reference(s)' error.

User schema settings

Note: this section is only visible when **Copy User on Login** is enabled.

Setting	**Description**
Additional User DN	This value is used in addition to the base DN when searching and loading users. If no value is supplied, the subtree search will start from the base DN. Example: • `ou=Users`
User Object Class	This is the name of the class used for the LDAP user object. Example: • `user`
User Object Filter	The filter to use when searching user objects. Example: • `(&(objectCategory=Person)(sAMAccountName=*))`

User Name RDN Attribute	The RDN (relative distinguished name) to use when loading the username. The DN for each LDAP entry is composed of two parts: the RDN and the location within the LDAP directory where the record resides. The RDN is the portion of your DN that is not related to the directory tree structure. Example: • `cn`
User First Name Attribute	The attribute field to use when loading the user's first name. Example: • `givenName`
User Last Name Attribute	The attribute field to use when loading the user's last name. Example: • `sn`
User Display Name Attribute	The attribute field to use when loading the user's full name. Example: • `displayName`
User Email Attribute	The attribute field to use when loading the user's email address. Example: • `mail`

Group schema settings

Note: this section is only visible when both **Copy User on Login** and **Synchronize Group Memberships** are enabled.

Setting	Description
Additional Group DN	This value is used in addition to the base DN when searching and loading groups. If no value is supplied, the subtree search will start from the base DN. Example: • `ou=Groups`
Group Object Class	This is the name of the class used for the LDAP group object. Examples: • `groupOfUniqueNames` • `group`
Group Object Filter	The filter to use when searching group objects. Example: • `(objectCategory=Group)`
Group Name Attribute	The attribute field to use when loading the group's name. Example: • `cn`
Group Description Attribute	The attribute field to use when loading the group's description. Example: • `description`

Membership schema settings

Note: this section is only visible when both **Copy User on Login** and **Synchronize Group Memberships** are enabled.

Setting	Description
Group Members Attribute	The attribute field to use when loading the group's members. Example: • `member`
User Membership Attribute	The attribute field to use when loading the user's groups. Example: • `memberOf`
Use the User Membership Attribute, when finding the user's group membership	Check this box if your directory server supports the group membership attribute on the user. (By default, this is the 'memberOf' attribute.) • If this box is checked, your application will use the group membership attribute on the user when **retrieving the members of a given group**. This will result in a more efficient retrieval. • If this box is not checked, your application will use the members attribute on the group ('member' by default) for the search.

Connect Bitbucket to Crowd

You can configure Bitbucket Data Center to use Atlassian Crowd for user and group management, and for authentication and authorization.

Atlassian Crowd is an application security framework that handles authentication and authorization for your web-based applications. With Crowd you can integrate multiple web applications and user directories, with support for single sign-on (SSO) and centralized identity management. See the Crowd Administration Guide.

Connect to Crowd if you want to use Crowd to manage existing users and groups in multiple directory types, or if you have users of other web-based applications.

See also this information about deleting users and groups in Bitbucket.

Connecting Atlassian Bitbucket to your external directory is not sufficient to allow your users to log in to Bitbucket. You must explicitly grant them access to Bitbucket in the global permission screen.

We recommend that you use groups instead of individual accounts when granting permissions. However , be careful not to add more users to those groups that your Bitbucket license allows. If the license limit is exceeded, your developers will not be able to push commits to repositories, and Bitbucket will display a warning banner. See this FAQ.

On this page:

Managing 500+ users across Atlassian products?
Find out how easy, scalable and effective it can be with Crowd Data Center!
See centralized user management.

To connect Bitbucket to Crowd:

1. Log in as a user with 'Admin' permission.
2. In the Bitbucket administration area, click **User Directories** (under 'Accounts').
3. Click **Add Directory** and select **Atlassian Crowd**.
4. Enter settings, as described below.
5. Test and save the directory settings.
6. Define the directory order, on the **Directories** tab, by clicking the blue up- and down-arrows next to each directory. The directory order has the following effects:
    - The order of the directories is the order in which they will be searched for users and groups.
    - Changes to users and groups will be made only in the first directory where the application has permission to make changes.
7. (Optional) To allow Crowd users to login via SSO:
    a. Navigate to **Applications** and select the Bitbucket application that was added.
    b. In the **Options** tab, select **Allow to generate user tokens**.

Server settings

Setting	Description

Name	A meaningful name that will help you to identify this Crowd server amongst your list of directory servers. Examples: • `Crowd Data Center` • `Example Company Crowd`
Server URL	The web address of your Crowd console server. Examples: • `http://www.example.com:8095/crowd/` • `http://crowd.example.com`
Application Name	The name of your application, as recognized by your Crowd server. Note that you will need to define the application in Crowd too, using the Crowd administration Console. See the Crowd documentation on adding an application.
Application Password	The password which the application will use when it authenticates against the Crowd framework as a client. This must be the same as the password you have registered in Crowd for this application. See the Crowd documentation on adding an application.

Crowd permissions

Bitbucket offers **Read Only** permissions for Crowd directories. The users, groups and memberships in Crowd directories are retrieved from Crowd and can only be modified from Crowd. You cannot modify Crowd users, groups or memberships using the Bitbucket administration screens.

For local Bitbucket directories, **Read Only** and **Read/Write** permissions are available.

Advanced settings

Setting	Description
Enable Nested Groups	Enable or disable support for nested groups. Before enabling nested groups, please check to see if the user directory or directories in Crowd support nested groups. When nested groups are enabled, you can define a group as a member of another group. If you are using groups to manage permissions, you can create nested groups to allow inheritance of permissions from one group to its sub-groups.
Enable Incremental Synchronization	Enable or disable incremental synchronization. Only changes since the last synchronization will be retrieved when synchronizing a directory. Note that full synchronization is always executed when restarting the application.
Synchronization Interval (minutes)	Synchronization is the process by which the application updates its internal store of user data to agree with the data on the directory server. The application will send a request to your directory server every x minutes, where 'x' is the number specified here. The default value is 60 minutes.

Single sign-on (SSO) with Crowd

Once the Crowd directory has been set up, you can enable Crowd SSO integration by adding the following setting to `shared/bitbucket.properties` in the home directory (create this file if it doesn't exist yet):

bitbucket.properties

```
# Whether SSO support should be enabled or not. Regardless of this setting SSO authentication
# will only be activated when a Crowd directory is configured in Bitbucket that is configured
# for SSO.
plugin.auth-crowd.sso.enabled=true
```

You'll also need to configure the Bitbucket application in Crowd to allow authentication with user tokens. In Crowd, navigate to **Applications** and select the linked Bitbucket application. From the **Options** tab, select the **A llow to generate user tokens** checkbox.

Please note that you will need to correctly set up the domains of the applications involved in SSO. See Crowd SSO Domain examples.

In addition to this property, Crowd SSO integration can be tuned using the system properties described on Bitbu cket config properties.

Using multiple directories

When Bitbucket is connected to Crowd you can map Bitbucket to multiple user directories in Crowd.

For Crowd 2.8, and later versions, there are two different membership schemes that Crowd can use when multiple directories are mapped to an integrated application, and duplicate user names and group names are used across those directories. The schemes are called 'aggregating membership' and 'non-aggregating membership' and are used to determine the effective group memberships that Bitbucket uses for *authorization*. See Effective memberships with multiple directories for more information about these two schemes in Crowd.

Note that:

- *Authentication*, for when Bitbucket is mapped to multiple directories in Crowd, only depends on the mapped groups in those directories – the aggregation scheme is not involved at all.
- For inactive users, Bitbucket only checks if the user is active in the first (highest priority) directory in which they are found to determine *authentication*. The membership schemes described above are not used when Crowd determines if a user should have access to Bitbucket.
- When a user is added to a group, they are only added to the first writeable directory available, in priority order.
- When a user is removed from a group, they are only removed from the group in the first directory the user appears in, when non-aggregating membership is used. With aggregating membership, they are removed from the group in *all* directories the user exists in.

An administrator can set the aggregation scheme that Bitbucket uses when integrated with Crowd. Go to the **Dir ectories** tab for the Bitbucket instance in Crowd, and check **Aggregate group memberships across directories** to use the 'aggregating membership' scheme. When the checkbox is clear 'non-aggregating membership' is used.

Note that changing the aggregation scheme can affect the authorization permissions for your users, and how directory update operations are performed.

Global permissions

User and group access

Bitbucket Data Center use four levels of account permissions to control user and group access to Bitbucket projects and to the Bitbucket instance configuration.

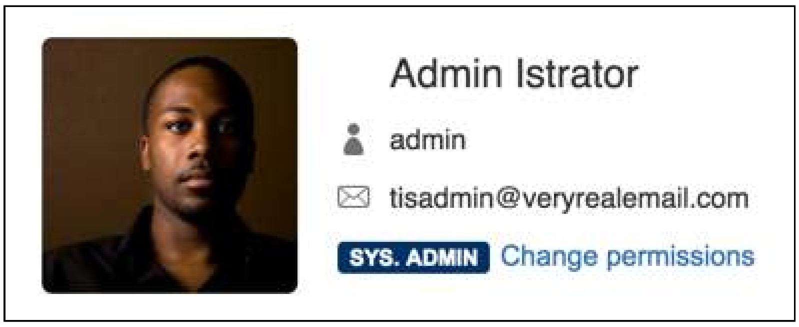
Related pages:

- Users and groups
- Using project permission

User accounts that have not been assigned "Bitbucket User" permission or higher, either directly or through group membership, will not be able to log in to Bitbucket. These users are considered unlicensed and do not count towards your Bitbucket license limit.

You can also apply access permissions to projects.

A user's permission level is displayed on the user's page seen from the admin area.



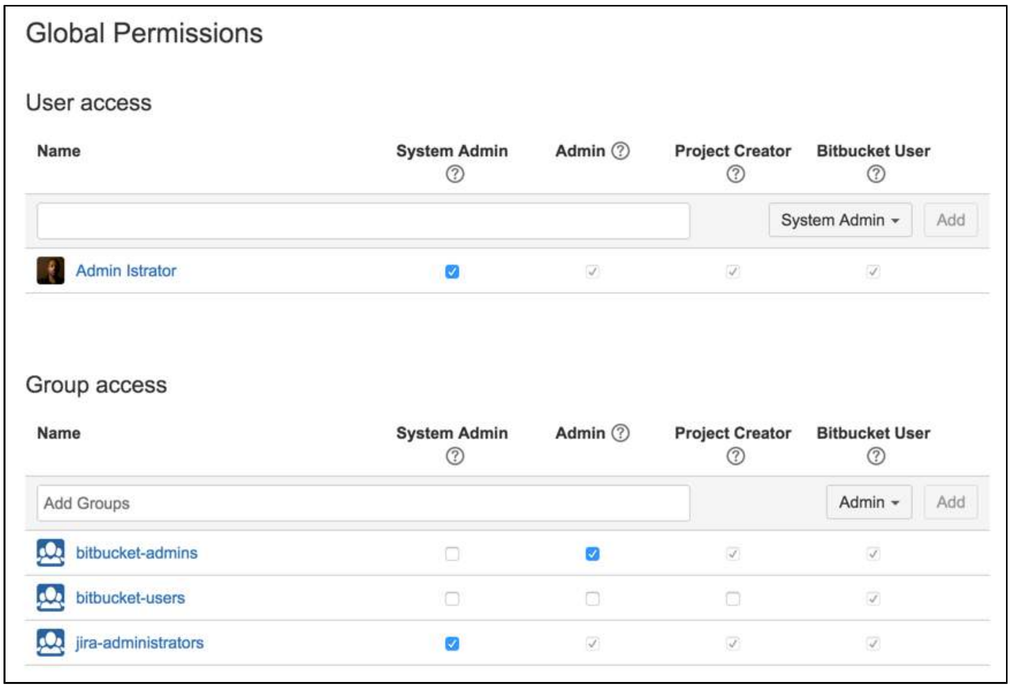
	Login / Browse	Create projects	Manage users / groups	Manage global permissions	Edit application settings	Edit infrastructure config
Bitbucket User	✓	✗	✗	✗	✗	✗
Project Creator	✓	✓	✗	✗	✗	✗
Admin	✓	✓	✓	✓	✓	✗
System Admin	✓	✓	✓	✓	✓	✓

Learn more about the levels of permissions in Bitbucket.

To edit the account permissions for an existing Bitbucket user or group:

1. Navigate to **Administration**
2. Select **Global permissions** (under 'Accounts').
3. Select, or clear, the permission checkboxes as required.
4. Select in the **Add Users** or **Add Groups** field to set permissions for additional users or groups.

You can remove all permissions for a user or group by clicking the X at the right-hand end of the row (when you hover there). This will remove that user or group.



Global Permissions

User access

Name	System Admin	Admin	Project Creator	Bitbucket User
			System Admin	Add
Admin Istrator	☑	✓	✓	✓

Group access

Name	System Admin	Admin	Project Creator	Bitbucket User
Add Groups			Admin	Add
bitbucket-admins	☐	☑	✓	✓
bitbucket-users	☐	☐	☐	✓
jira-administrators	☑	✓	✓	✓

Policies

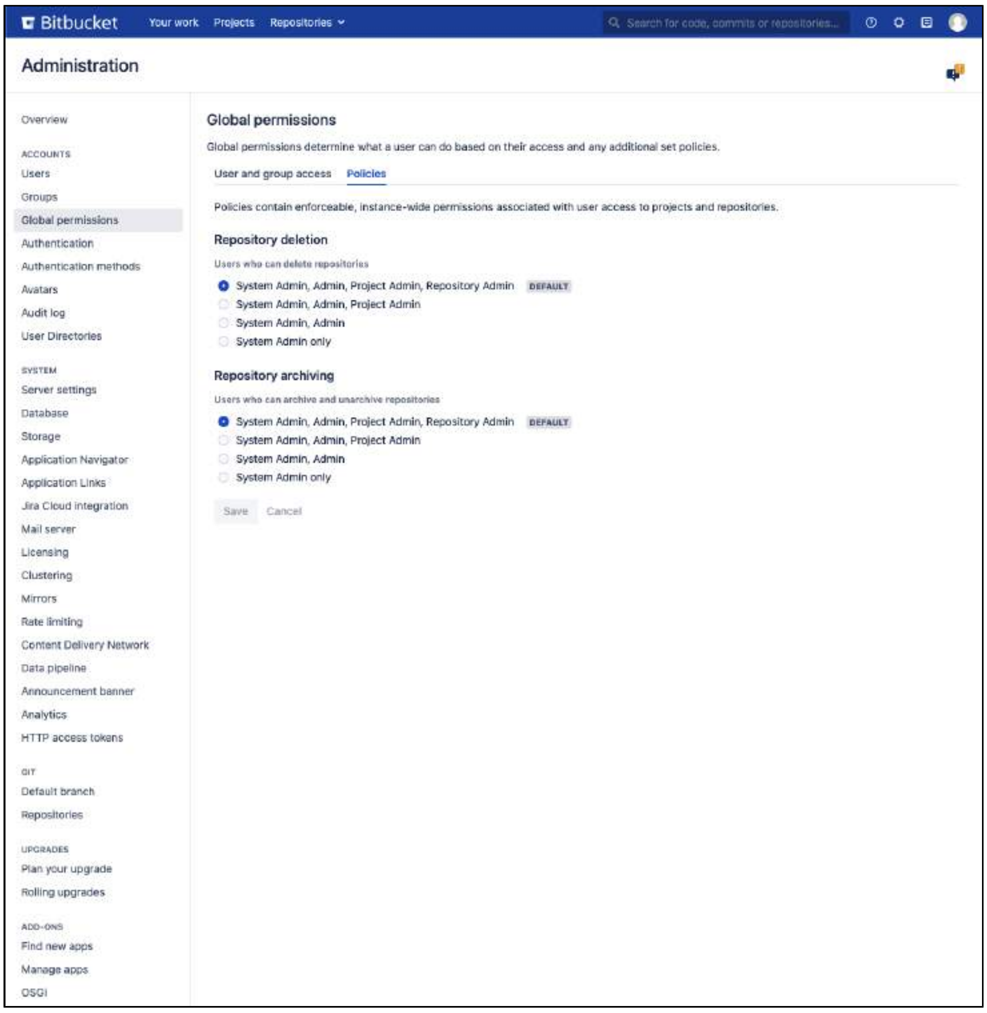
Policies in Bitbucket Data Center are also set in Global Permissions and contain instance-wide permissions associated with user access to projects and repositories. Control who can delete and archive/unarchive a repository based on what level of permissions a user has including System Admin, Admin, Project Admin, and Repository Admin. By default, a user with Repository Admin access and higher can delete and archive /unarchive repositories.

To set the delete repository policy:

1. In **Global Permissions**, select the **Policies** tab.
2. Select from the options of permissions, who can delete repositories.
3. Select **Save**.

To set the archiving policy:

1. In **Global Permissions**, select the **Policies** tab.
2. Select from the options of permissions, who can archive and unarchive repositories.
3. Select **Save**.



Global permissions

Global permissions determine what a user can do based on their access and any additional set policies.

Policies contain enforceable, instance-wide permissions associated with user access to projects and repositories.

Repository deletion

Users who can delete repositories

[✓ System Admin, Admin, Project Admin, Repository Admin] DEFAULT
System Admin, Admin, Project Admin
System Admin, Admin
System Admin only

Repository archiving

Users who can archive and unarchive repositories

[✓ System Admin, Admin, Project Admin, Repository Admin] DEFAULT
System Admin, Admin, Project Admin
System Admin, Admin
System Admin only

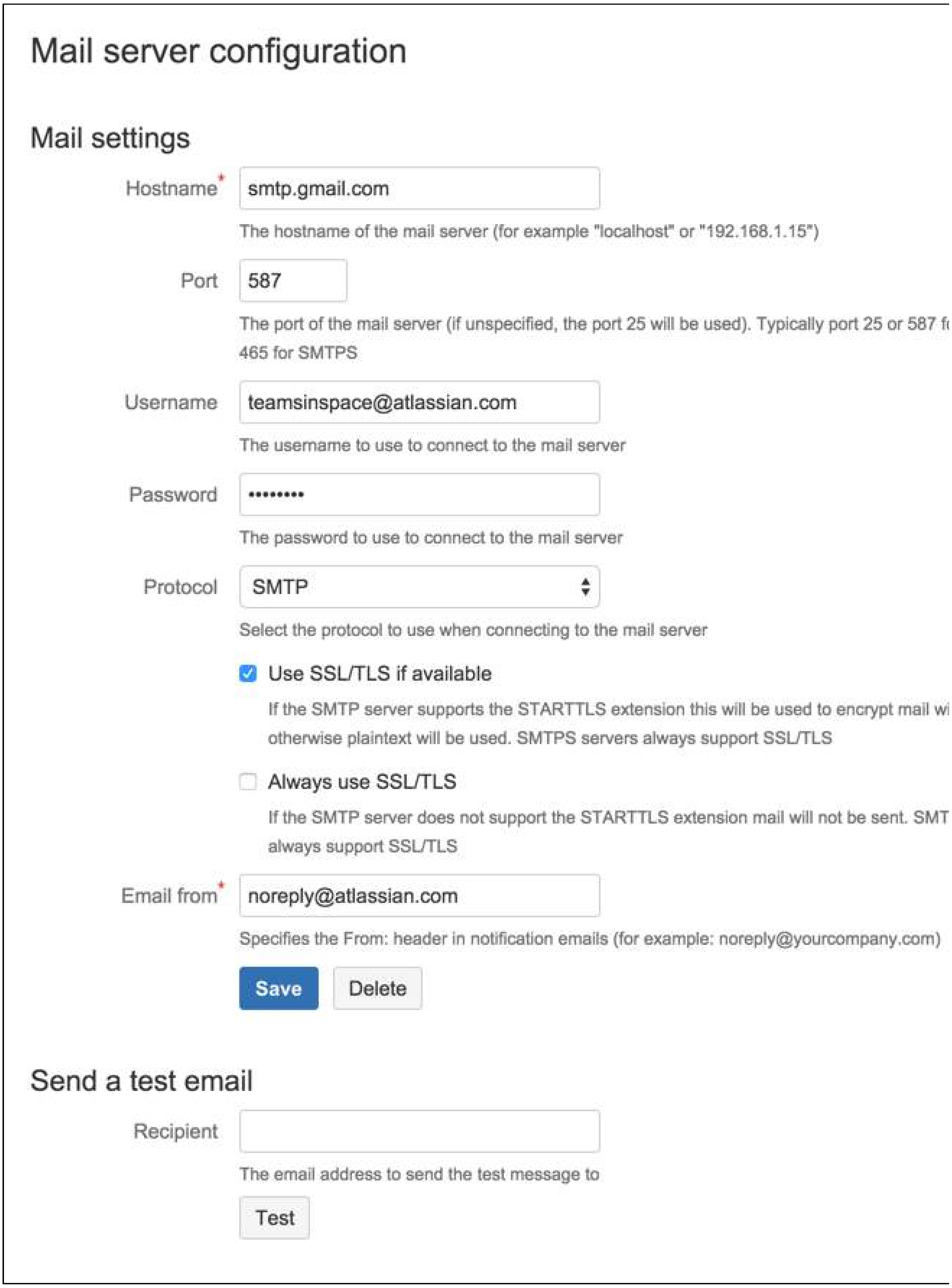
Setting up your mail server

Setting up Bitbucket Data Center to use your SMTP mail server:

- allows Bitbucket to send notifications about events to do with commit discussions, pull requests and repositories. Note that if the mail server fails, notifications will be dropped.
- allows Bitbucket to email a link to a newly created user, which the user can use to generate their own password.
- allows a user to reset their password if they forget it.

See Supported platforms for the mail clients supported by Bitbucket.

Go to the administration area and click **Mail server** (under 'Settings'). Complete and save the form.



Mail server configuration

Mail settings

Hostname* smtp.gmail.com

The hostname of the mail server (for example "localhost" or "192.168.1.15")

Port 587

The port of the mail server (if unspecified, the port 25 will be used). Typically port 25 or 587 f
465 for SMTPS

Username teamsinspace@atlassian.com

The username to use to connect to the mail server

Password •••••••••

The password to use to connect to the mail server

Protocol SMTP

Select the protocol to use when connecting to the mail server

[✓] Use SSL/TLS if available

If the SMTP server supports the STARTTLS extension this will be used to encrypt mail wi
otherwise plaintext will be used. SMTPS servers always support SSL/TLS

[ ] Always use SSL/TLS

If the SMTP server does not support the STARTTLS extension mail will not be sent. SMT
always support SSL/TLS

Email from* noreply@atlassian.com

Specifies the From: header in notification emails (for example: noreply@yourcompany.com)

Send a test email

Recipient

The email address to send the test message to

Hostname
The hostname of the mail server (for example "localhost" or "192.168.1.15").

Port
The port of the mail server (if unspecified, the port 25 will be used).

Username
The username to use to connect to the mail server.

Password
The password to use to connect to the mail server.

Protocol
Use either SMTP or SMTPS when connecting to the mail server.

When using SMTP, you can specify that:

- SSL/TLS is used if supported by the mail server, otherwise mail is sent in plaintext.
- mail should only be sent if the mail server supports SSL/TLS.

See Securing email notifications below.

Use SSL/TLS if available
If the SMTP server supports the STARTTLS extension this will be used to encrypt mail with SSL/TLS otherwise plaintext will be used. SMTPS servers always support SSL/TLS.

Always use SSL/TLS
If the SMTP server does not support the STARTTLS extension mail will not be sent. SMTPS servers always support SSL/TLS.

Email from
Specifies the 'From' header in notification emails (for example: noreply@yourcompany.com).

Send a test email
Enter an email address to send a test email to check that the mail server is configured correctly.

Anonymous user

If you wish to set up the outgoing mail server as an anonymous user, simply leave the username and password fields empty. However, in Chrome, these fields may be auto-populated, leading to an error – as a workaround, try using a different browser.

Securing email notifications

Bitbucket 3.6 and later versions support the following protocols:

- SMTP, where mail is not encrypted.
- SMTP encrypted by SSL/TLS using the STARTTLS extension, where the protocol conversation is upgraded only if SSL/TLS is supported by the mail server, but otherwise remains as plaintext.
- SMTP, where STARTTLS support is required on the mail server, otherwise mail is not sent.
- SMTPS (where the whole protocol conversation uses SSL/TLS).

Note that if you use either SMTP with STARTTLS, or SMTPS, and connect to a self-signed mail server, you may need to import the server's cert ificate and set up a custom cacerts file for Bitbucket (just as you do for any outbound SSL/TLS connection to a self-signed server). See this Bitbucket knowledge base article for information about how to do that.

Configuring the mail server to use Gmail

If you wish to connect to a Gmail account for email notifications in Bitbucket, refer to the Configuring the Mail Server to Use Gmail guide.

In particular, note that Gmail won't show images in the email because of the way that Google loads images on their servers. For Google Apps, a Bitbucket administrator can solve the problem by adding the Bitbucket domain name to a whitelist – see https://support.google.com/a/answer/3299041?hl=en for more information.

Integrate with Atlassian applications

When you integrate Bitbucket Data Center with Atlassian applications, you get the following benefits:

Application	Integration feature	Compatibility	
Jira	Ensure commit messages contain Jira issues	Jira 5.0+	Bitbucket 7.16+
	See your Jira issues on the dashboard	Jira 5.0+	Bitbucket 7.11+
	Link projects between Bitbucket Data Center and Jira	Jira 5.0+	Bitbucket 6.6+
	Create Jira issues directly from a pull request comment	Jira 5.0+	Bitbucket 5.3+
	Using Smart Commits	Jira 7.1+	Bitbucket 4.2+
	Related branches, commits, and pull requests are all summarized in the Development panel in a Jira issue.	Jira 6.2+	Stash 2.10+
	Create Git branches from within Jira and Jira Agile.	Jira 6.1+	Stash 2.8+
	Transition Jira issues from within Bitbucket	Jira 5.0+	Stash 2.7+
	See the Jira issues related to Bitbucket commits and pull requests	Jira 5.0+	Stash 2.1+
	See all the code changes commited for the issue (on the Jira Source tab). Click through to see a changed file or the full commit in Bitbucket.	Jira 5.0.4+	Plugin version bundled in Jira
Bamboo	Optimized builds page and tab	Bamboo 7.1+	Bitbucket 7.5+

	Bamboo responds to repository events published by Bitbucket to: • Trigger a plan build when a developer pushes to the connected repository. • Create or delete plan branches when a developer creates or removes a branch in the connected repository. When you link a build plan to a Bitbucket repository, build notifications are automatically enabled. See Bamboo integration.	Bamboo 5.6+	Stash 3.1+
	See the latest build status for a commit when viewing Bitbucket commits and pull requests.	Bamboo 4.4+	Stash 2.1+
Sourcetree	When you have Sourcetree installed, you can: • clone a Bitbucket repository using Sourcetree. • check out a branch in Sourcetree, when viewing files, commits, or branches in a Bitbucket repository.	Sourcetree 1.7+	Stash 2.7+
Crowd	When Bitbucket is integrated with Crowd, you can: • use Crowd for user and group management, and for authentication.		

Jira integration

Integrating Bitbucket Data Center with Jira Software makes it easy to keep everyone up to date on code changes and helps to minimize switching between tools. Once they're integrated, you can link a Bitbucket commit, branch, or pull request to a Jira issue by including the issue key.

In Jira you can then:

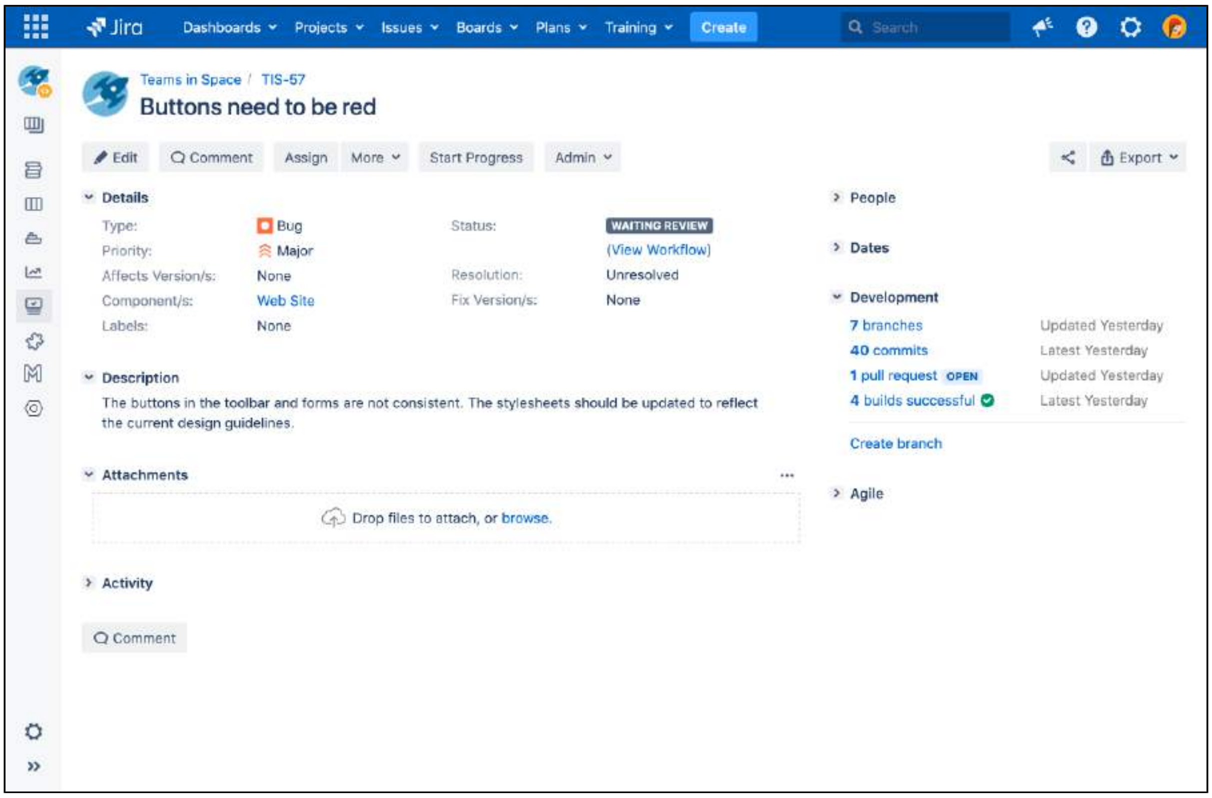
- see real-time development status updates within issues
- trigger issue transitions using Bitbucket events
- check development progress for a version
- see development information in Jira Software Cloud using OAuth

And in Bitbucket you can:

- see assigned Jira issues on the dashboard
- interact with Jira issues
- create a requirement for checking that Jira issue keys exist in commit messages

You can also use Jira Software for delegated management of your Bitbucket users. To learn more, see External user directories.

See real-time development status updates within Jira issues



Teams in Space / TIS-57

Buttons need to be red

Type:	Bug	Status:	WAITING REVIEW (View Workflow)
Priority:	Major		
Affects Version/s:	None	Resolution:	Unresolved
Component/s:	Web Site	Fix Version/s:	None
Labels:	None		

The buttons in the toolbar and forms are not consistent. The stylesheets should be updated to reflect the current design guidelines.

7 branches	Updated Yesterday
40 commits	Latest Yesterday
1 pull request OPEN	Updated Yesterday
4 builds successful ✓	Latest Yesterday

Get visibility into development status from within the context of an issue. The development panel shows a summary of related branches, commits, pull requests, and builds. You can also select the links within this panel to see more information.

When it's time to pick up a new task, you can then create a branch directly from an issue. Using the issue type and summary, Jira will suggest the branch type and branch name, helping you get to work faster.

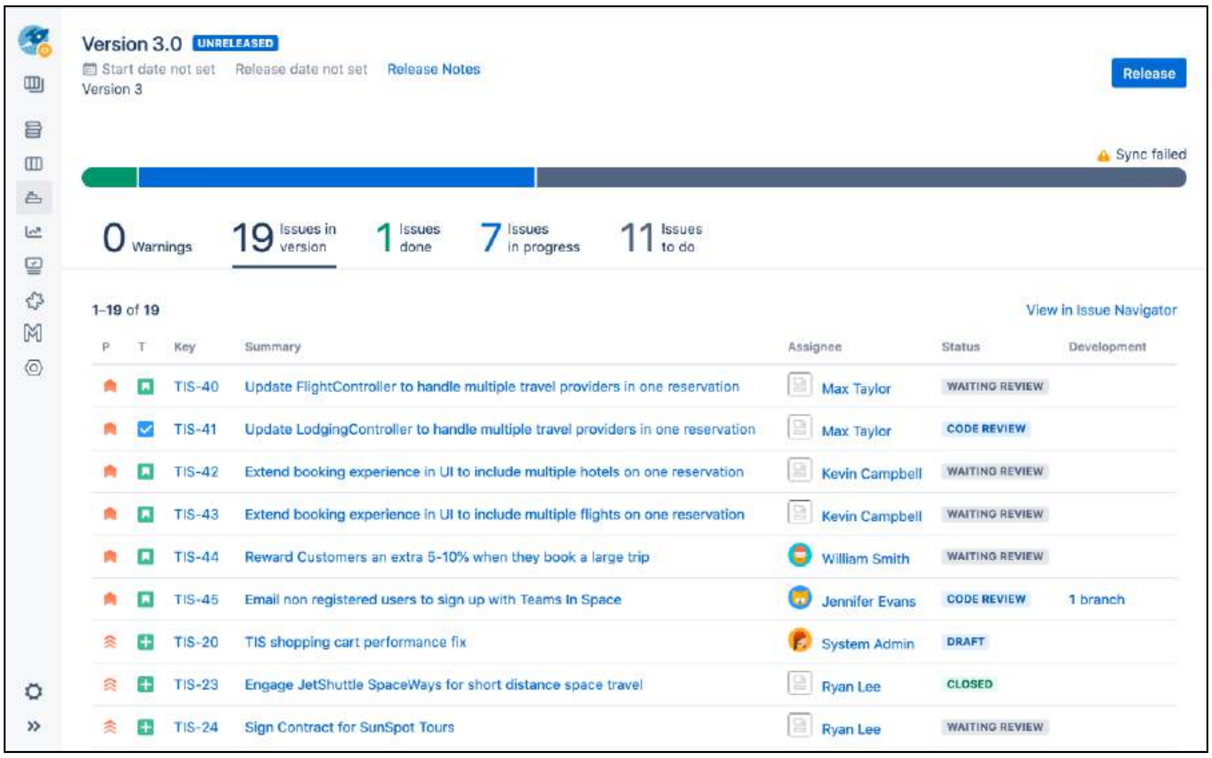
Trigger Jira issue transitions using Bitbucket events

With just a few clicks, you can configure your Jira workflow to respond to events in Bitbucket. For example, when a pull request is created, Jira can automatically transition the status of a linked issue. The events available in Bitbucket are:

- Branch created
- Commit created
- Pull request created
- Pull request merged
- Pull request declined

Learn more about advanced workflow configuration in the Jira Software documentation.

Check development progress for a version in Jira


Version 3.0 UNRELEASED

Start date not set Release date not set Release Notes

Version 3

Release

Sync failed

0 Warnings 19 Issues in version 1 Issues done 7 Issues in progress 11 Issues to do

1–19 of 19

View in Issue Navigator

P	T	Key	Summary	Assignee	Status	Development
		TIS-40	Update FlightController to handle multiple travel providers in one reservation	Max Taylor	WAITING REVIEW	
		TIS-41	Update LodgingController to handle multiple travel providers in one reservation	Max Taylor	CODE REVIEW	
		TIS-42	Extend booking experience in UI to include multiple hotels on one reservation	Kevin Campbell	WAITING REVIEW	
		TIS-43	Extend booking experience in UI to include multiple flights on one reservation	Kevin Campbell	WAITING REVIEW	
		TIS-44	Reward Customers an extra 5-10% when they book a large trip	William Smith	WAITING REVIEW	
		TIS-45	Email non registered users to sign up with Teams In Space	Jennifer Evans	CODE REVIEW	1 branch
		TIS-20	TIS shopping cart performance fix	System Admin	DRAFT	
		TIS-23	Engage JetShuttle SpaceWays for short distance space travel	Ryan Lee	CLOSED	
		TIS-24	Sign Contract for SunSpot Tours	Ryan Lee	WAITING REVIEW	

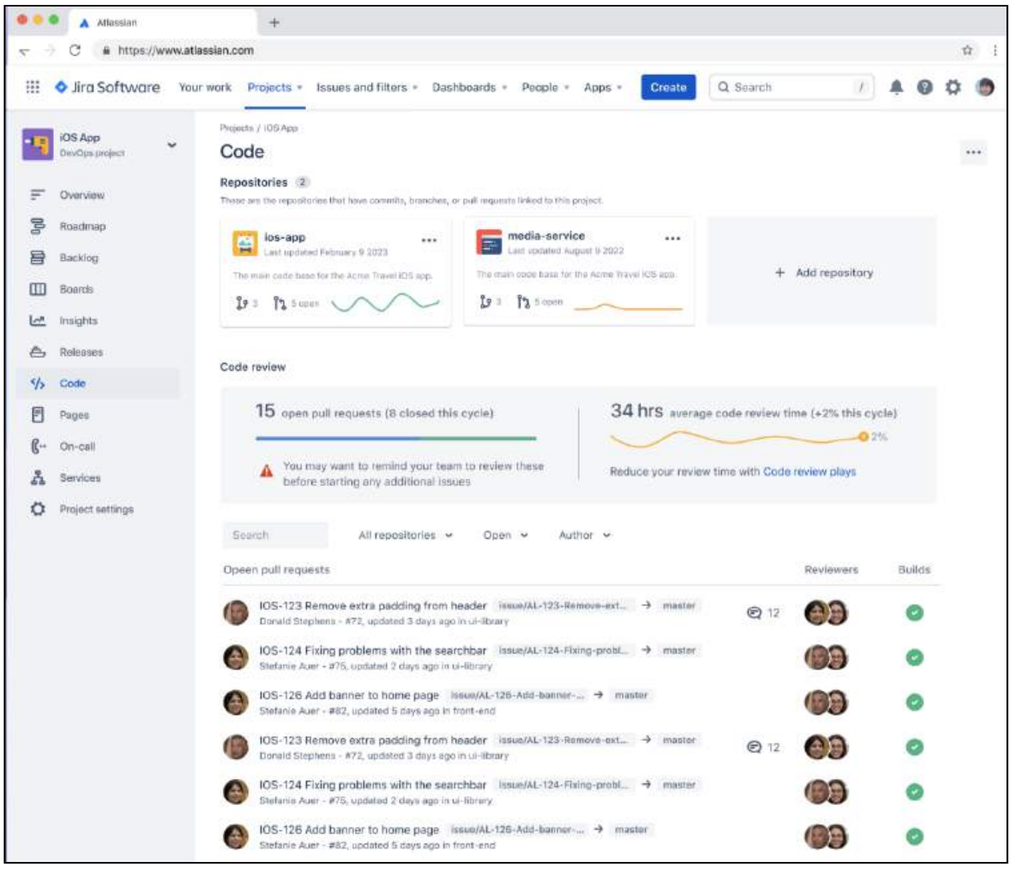
From the Jira release hub, you can see the progress of a version and determine which issues are going to ship at a glance. You can also see the commits related to each issue, helping you spot potential development issues that could cause problems.

Learn more about checking the progress of a version in the Jira Software documentation.

See development information in Jira Software Cloud using OAuth

Integrating with Jira Software Cloud enables Bitbucket Data Center to send its development information using OAuth credentials. Integration not only sends development information such as branches, commits, and pull requests, but also give access to new automation and reporting features in Jira Software Cloud such as:

- calculating Cycle time metrics - the time that you take work to get from the first commit on a branch to production.
- linked Bitbucket repositories are displayed in the Jira Software Cloud's code tab for quick and easy access.
- triggering Automation for Jira events - these include Branch created, Commit created, Pull request created, Pull request declined, and Pull request merged. If you haven't linked your Jira and Bitbucket accounts, you'll be prompted to do so the first time you use these triggers.
- deployment and build information - the status of build and deployment information from your integrated CI/CD tools.



These are the repositories that have commits, branches, or pull requests linked to this project.

ios-app — Last updated February 9 2023 — The main code base for the Acme Travel iOS app. — 3 — 5 open

media-service — Last updated August 9 2022 — The main code base for the Acme Travel iOS app. — 3 — 5 open

15 open pull requests (8 closed this cycle)

You may want to remind your team to review these before starting any additional issues

34 hrs average code review time (+2% this cycle) — 2%

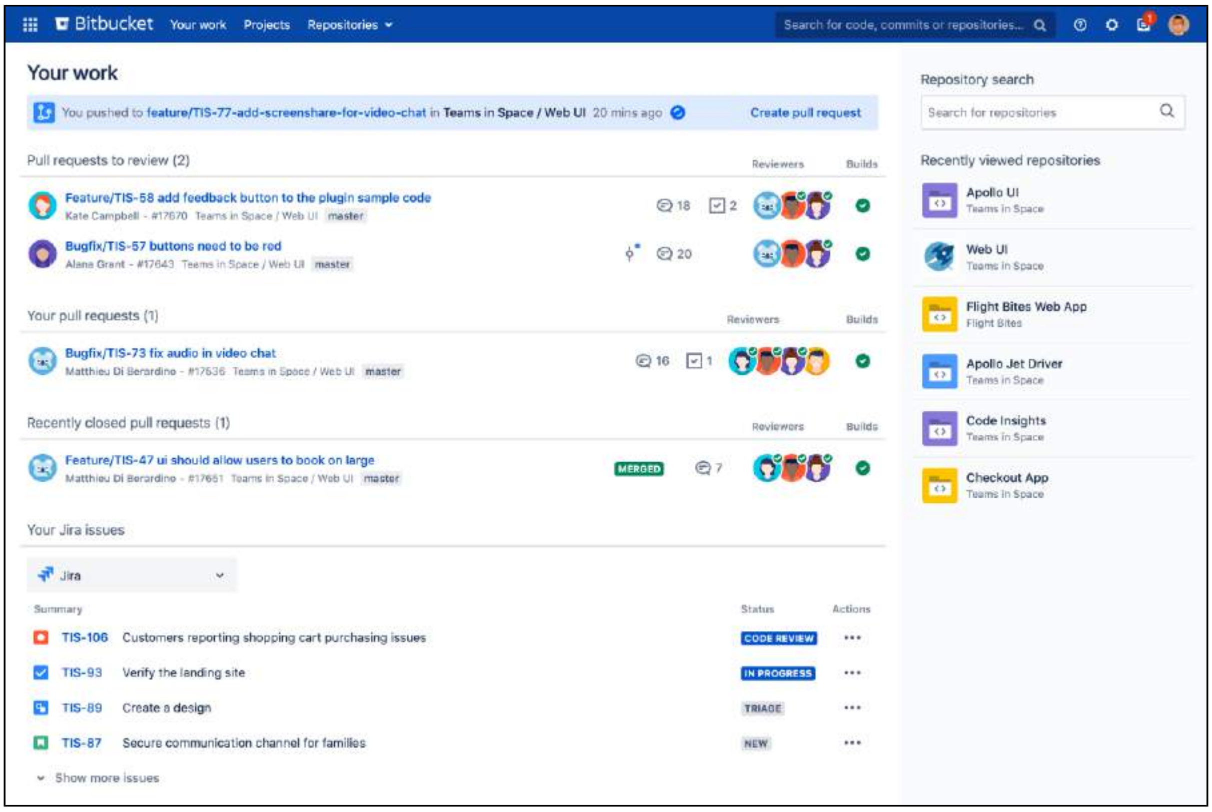
Reduce your review time with Code review plays

Opeen pull requests				Reviewers	Builds
IOS-123 Remove extra padding from header Donald Stephens - #72, updated 3 days ago in ui-library	issue/AL-123-Remove-ext...	→ master	12		✓
IOS-124 Fixing problems with the searchbar Stefanie Auer - #75, updated 2 days ago in ui-library	issue/AL-124-Fixing-probl...	→ master			✓
IOS-126 Add banner to home page Stefanie Auer - #82, updated 5 days ago in front-end	issue/AL-126-Add-banner-...	→ master			✓
IOS-123 Remove extra padding from header Donald Stephens - #72, updated 3 days ago in ui-library	issue/AL-123-Remove-ext...	→ master	12		✓
IOS-124 Fixing problems with the searchbar Stefanie Auer - #75, updated 2 days ago in ui-library	issue/AL-124-Fixing-probl...	→ master			✓
IOS-126 Add banner to home page Stefanie Auer - #82, updated 5 days ago in front-end	issue/AL-126-Add-banner-...	→ master			✓

Learn more about integrating with Jira Software Cloud using OAuth

See assigned Jira issues on the Bitbucket dashboard

⚠ A Data Center license is required to use this feature. Get an evaluation license to try it out, or purchase a license now.



You pushed to feature/TIS-77-add-screenshare-for-video-chat in Teams in Space / Web UI 20 mins ago

Pull requests to review (2)

Feature/TIS-58 add feedback button to the plugin sample code
Kate Campbell - #17670 Teams in Space / Web UI master

Bugfix/TIS-57 buttons need to be red
Alana Grant - #17643 Teams in Space / Web UI master

Your pull requests (1)

Bugfix/TIS-73 fix audio in video chat
Matthieu Di Berardino - #17636 Teams in Space / Web UI master

Recently closed pull requests (1)

Feature/TIS-47 ui should allow users to book on large
Matthieu Di Berardino - #17661 Teams in Space / Web UI master MERGED

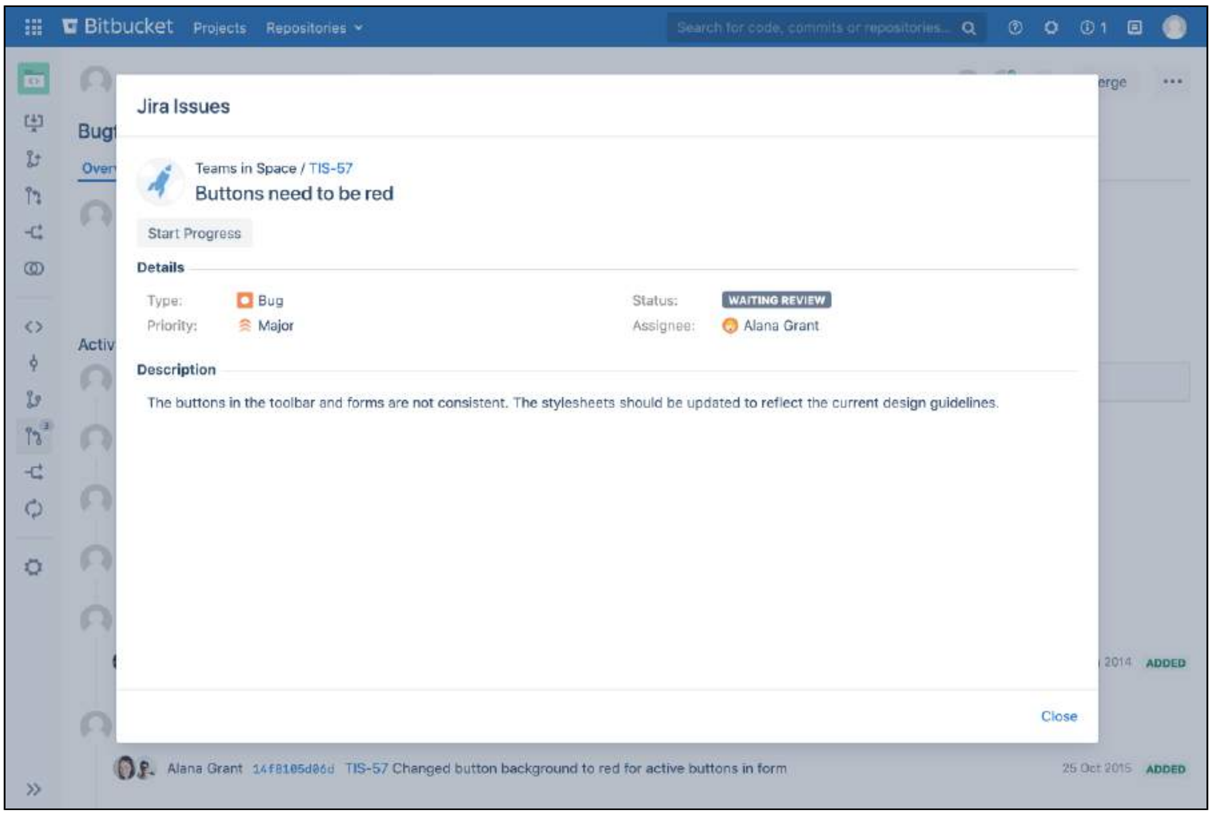
Your Jira issues

Summary		Status	Actions
TIS-106	Customers reporting shopping cart purchasing issues	CODE REVIEW	•••
TIS-93	Verify the landing site	IN PROGRESS	•••
TIS-89	Create a design	TRIAGE	•••
TIS-87	Secure communication channel for families	NEW	•••

Recently viewed repositories	
Apollo UI	Teams in Space
Web UI	Teams in Space
Flight Bites Web App	Flight Bites
Apollo Jet Driver	Teams in Space
Code Insights	Teams in Space
Checkout App	Teams in Space

On the Bitbucket **Your work** dashboard, you can see open Jira issues assigned to you. This makes it easy to see what's coming up at a glance without jumping between tools. When it's time to start a new task, you can then select the issue key to open the issue summary modal, or you can create a branch from the **Actions** menu and get started.

Interact with Jira issues in Bitbucket



Jira Issues

Teams in Space / TIS-57
Buttons need to be red

Details

Type:	Bug	Status:	WAITING REVIEW
Priority:	Major	Assignee:	Alana Grant

Description

The buttons in the toolbar and forms are not consistent. The stylesheets should be updated to reflect the current design guidelines.

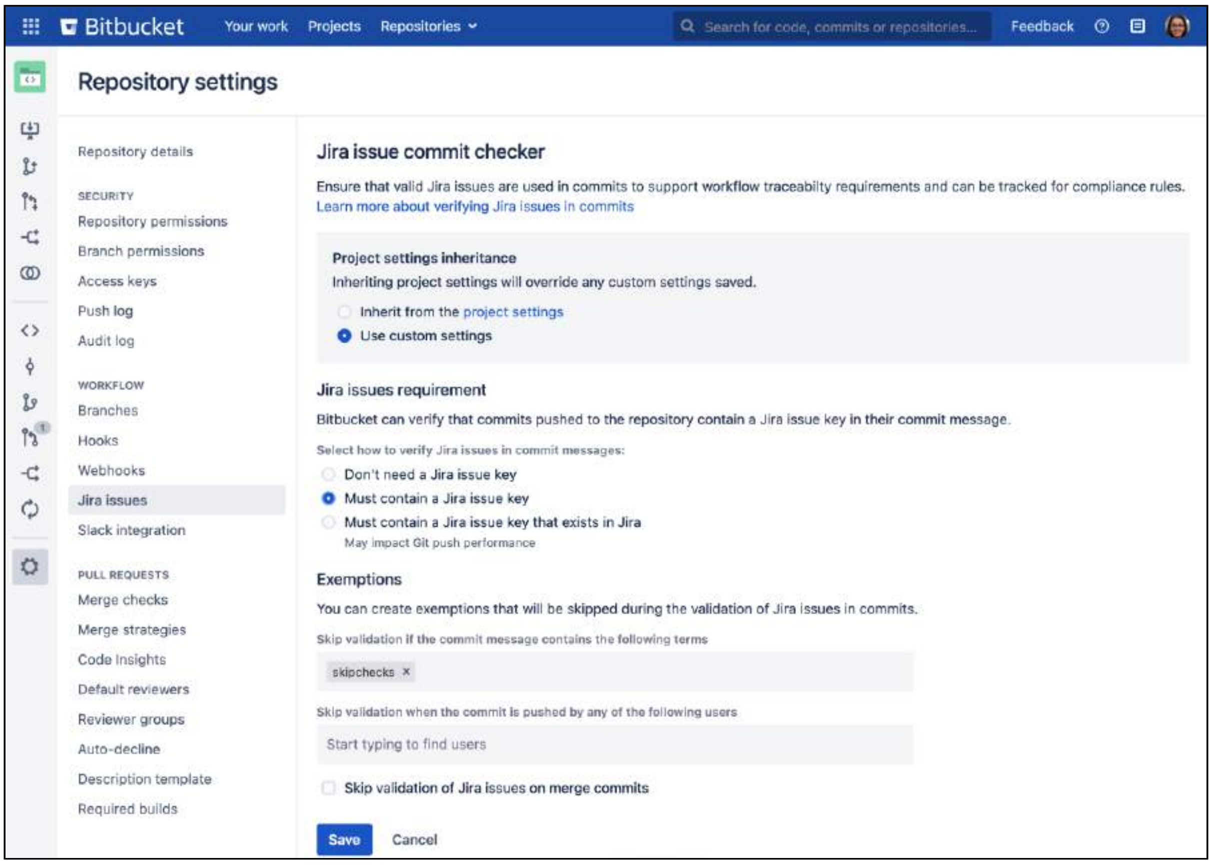
Alana Grant 14f8105d06d TIS-57 Changed button background to red for active buttons in form 25 Oct 2015 ADDED

When you mention a Jira issue key in a Bitbucket commit, branch, or pull request, the two are automatically linked. In Bitbucket you can then select the issue key to see more information or interact with the issue. Selecting the issue key in the modal will also take you straight to the issue in Jira.

To learn how to integrate them now, see Linking Bitbucket with Jira.

Validation of Jira issues in commit messages

A Data Center license is required to use this feature. Get an evaluation license to try it out, or purchase a license now.



Repository settings

Jira issue commit checker

Ensure that valid Jira issues are used in commits to support workflow traceabilty requirements and can be tracked for compliance rules.
Learn more about verifying Jira issues in commits

Project settings inheritance
Inheriting project settings will override any custom settings saved.
Inherit from the project settings
[✓ Use custom settings]

Jira issues requirement
Bitbucket can verify that commits pushed to the repository contain a Jira issue key in their commit message.
Select how to verify Jira issues in commit messages:
Don't need a Jira issue key
[✓ Must contain a Jira issue key]
Must contain a Jira issue key that exists in Jira
May impact Git push performance

Exemptions
You can create exemptions that will be skipped during the validation of Jira issues in commits.
Skip validation if the commit message contains the following terms
skipchecks ×
Skip validation when the commit is pushed by any of the following users
Start typing to find users
Skip validation of Jira issues on merge commits

Save Cancel

In Bitbucket Data Center, create a requirement to validate whether Jira issues exist in commit messages. When a user pushes a commit without a valid Jira issue key, they will be alerted as to why they cannot commit the file.

To learn more about setting up these requirements, see Commit checker for Jira issues.

Link Bitbucket with Jira

See Jira integration for a description of all the integrations you get when Bitbucket Data Center is linked with Jira.

You can also use Jira Software for delegated user management. See External user directories.

This page describes how to link Bitbucket to Jira Data Center and Cloud using Application Links as well as connecting Bitbucket Data Center with Jira Software Cloud using OAuth.

On this page

Link Bitbucket with Jira

You can integrate Bitbucket with one or more instances of Jira by means of 'application links'. You set up application links either:

- during the Bitbucket install process, using the Setup Wizard, or
- at any time after installation, as described below.

To link Bitbucket to a Jira server:

1. Click **Application Links** (under 'Settings') in the Bitbucket admin area.
2. Enter the URL for the Jira site you want to link to and click **Create link**.
3. Complete the application link wizard to connect Bitbucket to your Jira. You *must* make use of the automatic link-back from Jira to Bitbucket to get full integration (you'll need System Admin global permission for that).

Note that:

- Bitbucket only begins scanning commit messages for issue keys on the first push after you created the application link to Jira – the scan may take a short time.
- Jira permissions are respected, so a user who is not permitted to transition an issue will not see the transition buttons in Bitbucket.
- If Bitbucket is linked with multiple Jira sites and the projects happen to have the same key, you can view issues from all linked Jira sites, To do this, select the issue key in Bitbucket. The relevant issues will display in the issue dialog.
    - If you configure project links, the first issue in the dialog will be the one from a selected Jira instance. Learn how to configure project links across your applications.
- If Bitbucket is linked with multiple Jira sites and the projects happen to have the same key, only the issue from the instance marked as PRIMARY will be displayed. See Making a primary link for links to the same application type.
- The following system plugins must be enabled in Bitbucket. These are bundled and enabled by default in Bitbucket:
    - Atlassian Navigation Links Plugin (com.atlassian.plugins.atlassian-nav-links-plugin)
    - Bitbucket Dev Summary Plugin (bitbucket-jira-development-integration-plugin).

See Link Atlassian applications to work together and OAuth security for application links for more details.

Link Bitbucket with Jira Software Cloud

If your Bitbucket instance is behind a firewall, we recommend that you use an application tunnel to link Bitbucket with Jira Software Cloud. Application tunnels are available for Bitbucket 6.9 and later. Learn more about application tunnels

If you're unable to use an application tunnel:

- your local server must use a valid SSL certificate, and it must be accessible on port 80 or 443. For more information, see this Atlassian Cloud documentation.
- if you have an internet-facing firewall, make sure to allow the IP range used by Atlassian to reach your internal network. For up-to-date information on that, see Atlassian cloud IP ranges and domains.

Application Links and OAuth connections

To fully benefit from how data is shared between Jira Software Cloud and Bitbucket, it’s helpful to configure both an Application Link and OAuth credential. Bitbucket requests data from Jira using AppLinks. Adding an OAuth connection brings more Bitbucket into Jira.

Application link is recommended

An additional application link brings more benefit to Bitbucket and enables the features listed below. In this case, you only need to allow incoming connections to your network while creating the application link. Once the link is authorized, you can close these connections on your firewall and the link will still work.

Features you get with an Applink

- Viewing issue information in pull requests.
- Viewing issues on the Bitbucket home page.
- Mentioning issues in pull request comments.
- Creating issues from pull request comments.

Features you get with OAuth

- Transitioning issues to different statuses from Bitbucket.
- Viewing deployment information (related smart commits, branches, commits, pull requests) in Jira.

Integrate with Jira Software Cloud using OAuth

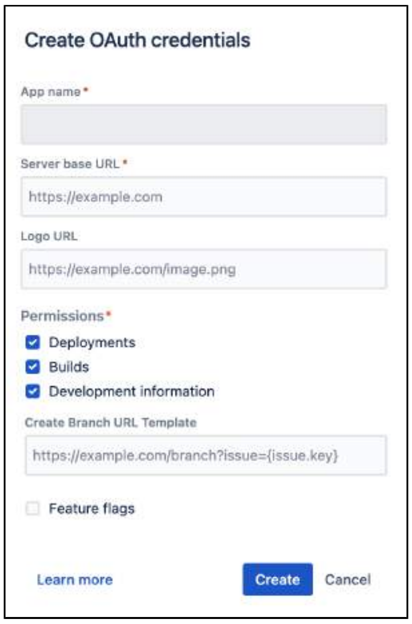
Integrate with Jira Software Cloud to enable Bitbucket Data Center to send it development info such as branches, commits, and pull requests, as well as to gain access to automation and reporting features in Jira Software Cloud, like:

- calculating Cycle time metrics - the time that you take work to get from the first commit on a branch to production.
- linked Bitbucket repositories are displayed in the Jira Software Cloud's code tab for quick and easy access.
- triggering Automation for Jira events - these include Branch created, Commit created, Pull request created, Pull request declined, and Pull request merged. If you haven't linked your Jira and Bitbucket accounts, you'll be prompted to do so the first time you use these triggers.
- deployment and build information - the status of build and deployment information from your integrated CI/CD tools.

To begin, you must be a system admin for Bitbucket as well as a site admin for Jira Software Cloud. To integrate, first, create OAuth credentials in Jira Software Cloud and then use them to register your Bitbucket instance.

Step 1: Create OAuth credentials in Jira Software Cloud

1. Navigate to **Jira home** > **Jira settings** > **Apps**.
2. Select **OAuth credentials** (under **Atlassian Marketplace** in the side navigator).
3. Select **Create new credentials**.
4. Provide the following details:


Create OAuth credentials

App name *

Server base URL *
https://example.com

Logo URL
https://example.com/image.png

Permissions *
- [x] Deployments
- [x] Builds
- [x] Development information

Create Branch URL Template
https://example.com/branch?issue={issue.key}

- [ ] Feature flags

Field	Description
App name	Any name that describes your Bitbucket instance. This could be "Bitbucket" if your company has a single instance. If your company has multiple instances of Bitbucket, we suggest using the hostname of the server. **Example**: bitbucket.mycompany.com
Server base URL	Your specified Bitbucket base URL. (Value used from the previous line) **Example**: `https://bitbucket.mycompany.com/`
Logo URL	A URL to the Bitbucket logo, which will be used as an icon in the list of credentials: `BASE_URL/plugins/servlet/create-branch/icon.png` **Example**: `https://bitbucket.mycompany.com/plugins/servlet/create-branch/icon.png`
Permissions (required)	Allows creation of a key for development information. **Example**: Select "Deployments", "Builds", and "Development information".
Create Branch URL Template	This URL allows the **Create branch** action shortcut. The template contains information that you provide while creating a branch between your Jira issue and the dev tool by inserting an issue key. **Example**: `https://bitbucket.mycompany.com/plugins/servlet/create-branch?issueKey={issue.key}&issueSummary={issue.summary}`

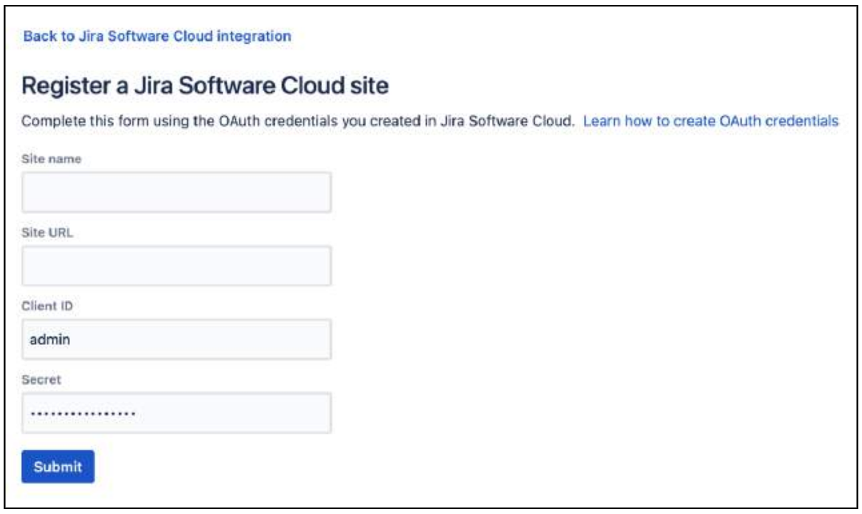
5. Select **Create**.

For more information on OAuth credentials in Jira Software Cloud, see their Integrate with self-hosted tools using OAuth documentation.

Step 2: Register a Jira Software Cloud site in Bitbucket

To register a Jira Software Cloud site:

1. In the Bitbucket Data Center Administration area, select **Jira Cloud Integration** (under System).
2. Select **Register site**.
3. Complete the form using the OAuth credentials you created in Jira Software Cloud by providing the following details:



Register a Jira Software Cloud site

Complete this form using the OAuth credentials you created in Jira Software Cloud. Learn how to create OAuth credentials

Site name	
Site URL	
Client ID	admin
Secret	....

Field	Description
Site name	Any name that describes your Jira Software Cloud site to users. This could be “Jira” if your company only uses a single site. If your company has multiple Jira sites, we suggest using the hostname of the site. **Example**: `mycompany.atlassian.net`
Site URL	The site URL of your Jira Software Cloud site. **Example**: `https://mycompany.atlassian.net/`
Client ID	Copied from Jira Software Cloud OAuth credentials page.
Secret	Copied from Jira Software Cloud OAuth credentials page.

4. Select **Submit**.

Step 3: Remove duplicate development info

To eliminate duplicate development information from both the application link and OAuth:

1. In Jira Cloud, navigate to **Administration** (Settings cog) > **Products** > **Application links** tab.
2. Select **More actions** ... next to your Bitbucket application link.
3. Select **Smart Commits** and toggle off **View development tool data**.

Troubleshoot integration with Jira Software

There are a few situations where the integration of Bitbucket with Jira can produce an error or may not function as expected:

Unable to see the Development panel within an issue

You must have the 'View Development Tools' permission in Jira to see the Development panel. See Managin g Global Permissions.

You don't have permission to access the project

If you don't have permission to access the project within Jira then Bitbucket will be unable to display issues.

The issue key is invalid

Bitbucket doesn't check for invalid issue keys, such as 'UTF-8'. An error will result if Bitbucket tries to connect to an issue that doesn't exist. See this issue:

~~BSERV-2470~~ - JIRA Integration: Check for issue validity before linking issues CLOSED

The issue keys are of a custom format

Bitbucket assumes that issue keys are of the default format (that is, two or more uppercase letters (`[A-Z][A-Z]+`), followed by a hyphen and the issue number, for example TEST-123). By default, Bitbucket will not recognize custom issue key formats. See Using custom Jira issue keys for details.

Having trouble integrating your Atlassian products with application links?

We've developed a guide to troubleshooting application links, to help you out. Take a look at it if you need a hand getting around any errors or roadblocks with setting up application links.

Troubleshoot integration with Jira Software Cloud

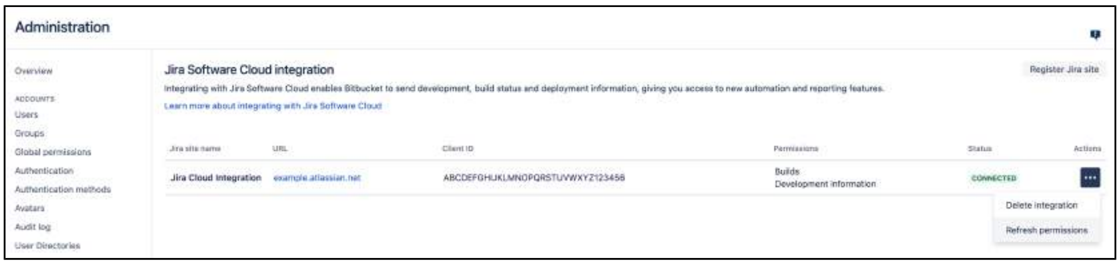
Remove duplicate development info

If you're seeing duplicate development information, make sure you've toggled off **View development tool data** in **Smart Commits**.

Your build status or deployment information is not being sent

Make sure that the OAuth credential you've used to connect Bitbucket Data Center and Jira Cloud have permissions to send both build status and deployment information.

And if you've recently updated permissions for a credential on the Jira Cloud side, it can take a while to propagate to Bitbucket Data Center. To view the updated permissions list in Bitbucket, navigate to **Settings** > **Jira Cloud Integration** and select **Refresh Permissions** for the relevant integration. It might take up to 10 minutes for this information to appear on Jira tickets.



Jira Software Cloud integration

Integrating with Jira Software Cloud enables Bitbucket to send development, build status and deployment information, giving you access to new automation and reporting features.

Learn more about integrating with Jira Software Cloud

Jira site name	URL	Client ID	Permissions	Status	Actions
Jira Cloud Integration	example.atlassian.net	ABCDEFGHIJKLMNOPQRSTUVWXYZ123456	Builds Development information	CONNECTED	···

Disable sending deployment or build status information to Jira Cloud

If you have any other integrations that send build status and deployment data to Jira Cloud (for example, the Jira Cloud Jenkins Plugin), you might see duplicate build statuses in the UI as there are now two sources of data.

To disable sending build status or deployment information from Bitbucket, you can set one or both of the following properties to `false` in the bitbucket.properties file:

```
# Controls whether build status information received from 3rd party CI tools are sent to jira cloud.
plugin.jira-development-integration.cloud.build-status.send.enabled=true

# Controls whether deployment information received from 3rd party deployment tools are sent to jira
cloud.
plugin.jira-development-integration.cloud.deployment.send.enabled=true
```

Configuring Jira integration in the Setup Wizard

This page describes the 'Jira Software integration' screen of the Setup Wizard that runs automatically when you launch Bitbucket Data Center for the first time.

The Setup Wizard guides you in configuring the Bitbucket connection with Jira Software using the most common options. You can also configure Jira Software integration from the Bitbucket administration screens at any time after completing the Setup Wizard.

There are two aspects to integrating Bitbucket with Jira Software:

- linking Jira Software and Bitbucket to enable the integration features. See Jira integration.
- delegating Bitbucket user and group management to your Jira Software server. See Delegate user management to Jira.

Connecting to Jira Software in the Setup Wizard

To configure Jira Software integration while running the Bitbucket Setup Wizard:

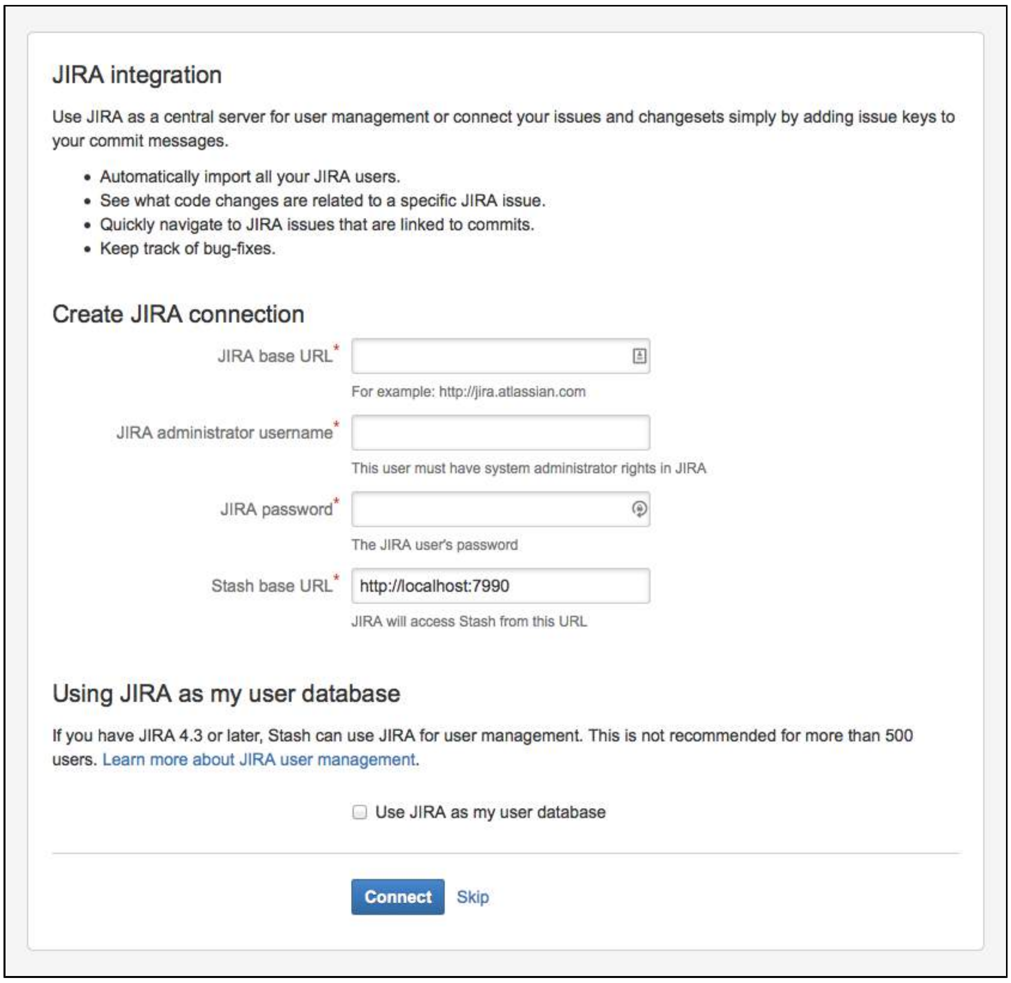
1. Configure the following setting in Jira Software: Configuring Jira Software application options**.**
2. Click **Integrate with Jira** and enter the following information when you get to the 'Connect to Jira' step of the setup wizard:

   Jira base URL
   The web address of your Jira server. Examples are:
   `http://www.example.com:8080/jira/`
   `http://jira.example.com`

   Jira admin username
   The credentials for a user with the 'Jira System Administrators' global permission in Jira.

   Jira password
   The credentials for a user with the 'Jira System Administrators' global permission in Jira.

   Bitbucket Data Center base URL
   Jira will use this URL to access your Bitbucket instance. The URL you give here will override the base URL specified in your Bitbucket administration console, for the purposes of the Jira connection.
3. Click **Connect**.
4. Finish the setup process.



JIRA integration

Use JIRA as a central server for user management or connect your issues and changesets simply by adding issue keys to your commit messages.

- Automatically import all your JIRA users.
- See what code changes are related to a specific JIRA issue.
- Quickly navigate to JIRA issues that are linked to commits.
- Keep track of bug-fixes.

Create JIRA connection

JIRA base URL*

For example: http://jira.atlassian.com

JIRA administrator username*

This user must have system administrator rights in JIRA

JIRA password*

The JIRA user's password

Stash base URL* http://localhost:7990

JIRA will access Stash from this URL

Using JIRA as my user database

If you have JIRA 4.3 or later, Stash can use JIRA for user management. This is not recommended for more than 500 users. Learn more about JIRA user management.

☐ Use JIRA as my user database

Troubleshooting

This section describes the possible problems that may occur when integrating your application with JIRA via the setup wizard, and the solutions for each problem.

Symptom	Cause	Solution

The setup wizard displays one of the following error messages: • Failed to create application link from JIRA server at <URL> to this <application> server at <URL>. • Failed to create application link from this <application> server at <URL> to JIRA server at <URL>. • Failed to authenticate application link from JIRA server at <URL> to this <application> server at <URL>. • Failed to authenticate application link from <application> server at <URL> to this JIRA server at <URL>.	The setup wizard failed to complete registration of the peer-to-peer application link with JIRA. JIRA integration is only partially configured.	Remove the partial configuration if it exists, try the 'Connect to JIRA' step again, and then continue with the setup. Detailed instructions are below.
The setup wizard displays one of the following error messages: • Failed to register <application> configuration in JIRA for shared user management. Received invalid response from JIRA: <response> • Failed to register <application> configuration in JIRA for shared user management. Received: <response>	The setup wizard failed to complete registration of the client-server link with JIRA for user management. The peer-to-peer link was successfully created, but integration is only partially configured.	Remove the partial configuration if it exists, try the 'Connect to JIRA' step again, and then continue with the setup. Detailed instructions are below.

The setup wizard displays the following error message: • Error setting Crowd authentication	The setup wizard successfully established the peer-to-peer link with JIRA, but could not persist the client-server link for user management in your `config.xml` file. This may be caused by a problem in your environment, such as a full disk.	Please investigate and fix the problem that prevented the application from saving the configuration file to disk. Then remove the partial configuration if it exists, try the 'Connect to JIRA' step again, and then continue with the setup. Detailed instructions are below.
The setup wizard displays the following error message: • Error reloading Crowd authentication	The setup wizard has completed the integration of your application with JIRA, but is unable to start synchronizing the JIRA users with your application.	Restart your application. You should then be able to continue with the setup wizard. If this solution does not work, please contact Atlassian Support.
The setup wizard displays the following error message: • An error occurred: java.lang. IllegalStateException: Could not create the application in JIRA /Crowd (code: 500). Please refer to the logs for details.	The setup wizard has not completed the integration of your application with JIRA. The links are only partially configured. The problem occurred because there is already a user management configuration in JIRA for this <application> URL.	Remove the partial configuration if it exists, try the 'Connect to JIRA' step again, and then continue with the setup. Detailed instructions are below.
No users can log in after you have set up the application with JIRA integration.	Possible causes: • There are no users in the group that you specified on the 'Connect to JIRA' screen. • For FishEye: There are no groups specified in the 'groups to synchronize' section of your administration console. • For Stash: You may not have granted any JIRA groups or users permissions to log in to Stash.	Go to JIRA and add some usernames to the group. • For FishEye: Go to the FishEye administration screens and specify at least one group to synchronize. The default is '**jira-users**'. • For Stash: Grant the **Stash User** permission to the relevant JIRA groups on the Stash Global permissions page. If this solution does not work, please contact Atlassian Support.

Solution 1: Removing a Partial Configuration – The Easiest Way

If the application's setup wizard fails part-way through setting up the JIRA integration, you may need to remove the partial configuration from JIRA before continuing with your application setup. Please follow the steps below.

Remove the partial configuration if it exists, try the 'Connect to JIRA' step again, and then continue with the setup wizard:

1. Log in to JIRA as a user with the '**JIRA System Administrators**' global permission.
2. Click the '**Administration**' link on the JIRA top navigation bar.
3. Remove the application link from JIRA, if it exists:
    a. Click **Application Links** in the JIRA administration menu. The 'Configure Application Links' page will appear, showing the application links that have been set up.

   b. Look for a link to your application. It will have a base URL of the application linked to JIRA. For example:
      - If you want to remove a link between JIRA and FishEye, look for the one where the **Applicat ion URL** matches the base URL of your FishEye server.
      - If you want to remove a link between JIRA and Confluence, look for the one where the **Appli cation URL** matches the base URL of your Confluence server.
      - If you want to remove a link between JIRA and Stash, look for the one where the **Applicatio n URL** matches the base URL of your Stash server.
   c. Click **Delete** next to the application link that you want to delete.
   d. A confirmation screen will appear. Click **Confirm** to delete the application link.
4. Remove the user management configuration from JIRA, if it exists:
   a. Go to the JIRA administration screen for configuring the applications that have been set up to use JIRA for user management:
      - In JIRA 4.3: Click '**Other Applications**' in the '**Users, Groups & Roles**' section of the JIRA administration screen.
      - In JIRA 4.4: Select **'Administration' > 'Users' > 'JIRA User Server'**.
   b. Look for a link to your application. It will have a name matching this format:
      ```
      <Type> - <HostName> - <Application ID>
      ```
      For example:
      ```
      FishEye / Crucible - localhost - 92004b08-5657-3048-b5dc-f886e662ba15
      ```
      Or:
      ```
      Confluence - localhost - 92004b08-5657-3048-b5dc-f886e662ba15
      ```
      If you have multiple servers of the same type running on the same host, you will need to match the application ID of your application with the one shown in JIRA. To find the application ID:
      - Go to the following URL in your browser:
        ```
        <baseUrl>/rest/applinks/1.0/manifest
        ```
        Replace `<baseUrl>` with the base URL of your application.
        For example:
        ```
        http://localhost:8060/rest/applinks/1.0/manifest
        ```
      - The application links manifest will appear. Check the application ID in the `<id>` element.
   c. In JIRA, click '**Delete**' next to the application that you want to remove.
5. Go back to the setup wizard and try the 'Connect to JIRA' step again.

Solution 2: Removing a Partial Configuration – The Longer Way

If solution 1 above does not work, you may need to remove the partial configruration and then add the full integration manually. Please follow these steps:

1. Skip the 'Connect to JIRA' step and continue with the setup wizard, to complete the initial configuration of the application.
2. Log in to JIRA as a user with the '**JIRA System Administrators**' global permission.
3. Click the '**Administration**' link on the JIRA top navigation bar.
4. Remove the application link from JIRA, if it exists:
   a. Click **Application Links** in the JIRA administration menu. The 'Configure Application Links' page will appear, showing the application links that have been set up.
   b. Look for a link to your application. It will have a base URL of the application linked to JIRA. For example:
      - If you want to remove a link between JIRA and FishEye, look for the one where the **Applicat ion URL** matches the base URL of your FishEye server.
      - If you want to remove a link between JIRA and Confluence, look for the one where the **Appli cation URL** matches the base URL of your Confluence server.

        - If you want to remove a link between JIRA and Stash, look for the one where the **Application URL** matches the base URL of your Stash server.
    c. Click **Delete** next to the application link that you want to delete.
    d. A confirmation screen will appear. Click **Confirm** to delete the application link.
5. Remove the user management configuration from JIRA, if it exists:
    a. Go to the JIRA administration screen for configuring the applications that have been set up to use JIRA for user management:
        - In JIRA 4.3: Click '**Other Applications**' in the '**Users, Groups & Roles**' section of the JIRA administration screen.
        - In JIRA 4.4: Select **'Administration' > 'Users' > 'JIRA User Server'**.
    b. Look for a link to your application. It will have a name matching this format:

    ```
    <Type> - <HostName> - <Application ID>
    ```

    For example:

    ```
    FishEye / Crucible - localhost - 92004b08-5657-3048-b5dc-f886e662ba15
    ```

    Or:

    ```
    Confluence - localhost - 92004b08-5657-3048-b5dc-f886e662ba15
    ```

    If you have multiple servers of the same type running on the same host, you will need to match the application ID of your application with the one shown in JIRA. To find the application ID:
        - Go to the following URL in your browser:

        ```
        <baseUrl>/rest/applinks/1.0/manifest
        ```

        Replace `<baseUrl>` with the base URL of your application.
        For example:

        ```
        http://localhost:8060/rest/applinks/1.0/manifest
        ```

        - The application links manifest will appear. Check the application ID in the `<id>` element.
    c. In JIRA, click '**Delete**' next to the application that you want to remove.
6. Add the application link in JIRA again, so that you now have a two-way trusted link between JIRA and your application:
    a. Click **Add Application Link**. Step 1 of the link wizard will appear.
    b. Enter the **server URL** of the application that you want to link to (the 'remote application').
    c. Click **Next**.
    d. Enter the following information:
        - **Create a link back to this server** – Check to add a two-way link between the two applications.
        - **Username** and **Password** – Enter the credentials for a username that has administrator access to the remote application.
          Note: These credentials are only used to authenticate you to the remote application, so that Application Links can make the changes required for the new link. The credentials are not saved.
        - **Reciprocal Link URL** – The URL you give here will override the base URL specified in your remote application's administration console, for the purposes of the application links connection. Application Links will use this URL to access the remote application.
    e. Click **Next**.
    f. Enter the information required to configure authentication for your application link:
        - **The servers have the same set of users** – Check this box, because the users are the same in both applications.
        - **These servers fully trust each other** – Check this box, because you trust the code in both applications and are sure both applications will maintain the security of their private keys.
          For more information about configuring authentication, see Configuring authentication for an application link.
    g. Click **Create**.
7. Configure a new connection for user management in JIRA:

   a. Go to the JIRA administration screen for configuring the applications that have been set up to use JIRA for user management:
      - In JIRA 4.3: Click '**Other Applications**' in the '**Users, Groups & Roles**' section of the JIRA administration screen.
      - In JIRA 4.4: Select **'Administration' > 'Users' > 'JIRA User Server'**.
   b. **Add** an application.
   c. Enter the **application name** and **password** that your application will use when accessing JIRA.
   d. Enter the **IP address** or addresses of your application. Valid values are:
      - A full IP address, e.g. `192.168.10.12`.
      - A wildcard IP range, using CIDR notation, e.g. `192.168.10.1/16`. For more information, see the introduction to CIDR notation on Wikipedia and RFC 4632.
      - **Save** the new application.

8. Set up the JIRA user directory in the application.
   - For Confluence:
      a. Go to the **Confluence Administration Console**.
      b. Click '**User Directories**' in the left-hand panel.
      c. **Add** a directory and select type '**Atlassian JIRA**'.
      d. Enter the following information:
         - **Name** – Enter the name of your JIRA server.
         - **Server URL** – Enter web address of your JIRA server. Examples:

```
http://www.example.com:8080/jira/
http://jira.example.com
```

         - **Application name** and **Application password** – Enter the values that you defined for Confluence in the settings on JIRA.
      e. Save the directory settings.
      f. Define the **directory order** by clicking the blue up- and down-arrows next to each directory on the '**User Directories**' screen.
      For details see Connecting to Crowd or Jira for User Management.
   - For FishEye/Crucible:
      a. Click **Authentication** (under 'Security Settings').
      b. Click **Setup JIRA/Crowd authentication**. Note, if LDAP authentication has already been set up, you will need to remove that before connecting to JIRA for user management.
      c. Make the following settings:

Authenticate against	Select **a JIRA instance**
Application name and **password**	Enter the values that you defined for your application in the settings on JIRA.

JIRA URL	The web address of your JIRA server. Examples:
	`http://www.example.com:8080/jira/`
	`http://jira.example.com`

Auto-add	Select **Create a FishEye user on successful login** so that your JIRA users will be automatically added as a FishEye user when they first log in.
Periodically synchronise users with JIRA	Select **Yes** to ensure that JIRA will synchronize all changes in the user information on a regular basis. Change the value for **Synchronise Period** if required.
When Synchronisation Happens	Select an option depending on whether you want to allow changes to user attributes from within FishEye.

Single Sign On	Select **Disabled**. SSO is not available when using JIRA for user management and if enabled will make the integration fail.

   d. Click **Next** and select at least one user group to be synchronised from JIRA. If necessary, you could create a new group in JIRA, such as 'fisheye-users', and select this group here.
   e. Click **Save**.

- For Stash:
   a. Go to the Stash administration area.
   b. Click **User Directories** in the left-hand panel.
   c. **Add** a directory and select type **Atlassian JIRA**.
   d. Enter the following information:
      - **Name** – Enter the name of your JIRA server.
      - **Server URL**– Enter web address of your JIRA server. Examples:

        ```
        http://www.example.com:8080/jira/
        http://jira.example.com
        ```

      - **Application name** and **Application password** – Enter the values that you defined for Stash in the settings on JIRA.
   e. Save the directory settings.
   f. Define the directory order by clicking the blue up- and down-arrows next to each directory on the 'User Directories' screen.
      For details see Connecting Stash to JIRA for user management.

Solution 3: Connecting FishEye and JIRA from JIRA instead of from the FishEye wizard

This is a workaround for the "Failed to create application link" errors on the FishEye wizard that connects to the JIRA instance. You can try to set up the link from another side.

1. Remove the partial configuration using Solution 1 or Solution 2
2. In FishEye, after logging in as a nameless administrator, manually create a user (left panel User Settings User Add User); give him administrator rights (left panel Security Settings Administrators move the user to the "Admin Users" column).
3. Go to the JIRA instance; Administration Applications Application links Create link
   a. Enter the FishEye instance URL e.g. http://localhost:8060/
   b. Leave the checkbox saying the applications have the same set of users *unchecked*
   c. When redirected to FishEye, log in as the user created in (2).
4. The link should be created on both sides.

Notes

When you connect to Jira Software in the Setup Wizard, the setup procedure will configure *OAuth authentication* between Bitbucket and Jira Software. See Configuring OAuth authentication for an application link for more information.

Use custom Jira issue keys

Bitbucket Data Center assumes that Jira Software issue keys are of the default format (that is, two or more uppercase letters (`[A-Z][A-Z]+`), followed by a hyphen and the issue number, for example TEST-123). By default, Bitbucket will not recognize custom issue key formats.

You can use custom issue key formats with Bitbucket, however note that integrations with Jira Software can depend on using the default issue key format in both applications. See Integrating using custom Jira Software issue keys for more details.

Configure Bitbucket to recognize custom issue key formats by editing `<Bitbucket installation directory>/bin/_start-webapp.sh` (on Windows, `_start-webapp.bat`).

To override the default issue key format, use the `JVM_SUPPORT_RECOMMENDED_ARGS` property, like this:

```
JVM_SUPPORT_RECOMMENDED_ARGS="-Dintegration.jira.key.pattern=\"(<Some different regex>)\""
```

You'll need to restart Bitbucket.

For example, to use lowercase letters in issue keys, use a regex with the parameter like this:

```
'-Dintegration.jira.key.pattern=(?<=^|[a-z]-|[\s\p{Punct}&&[^-]])([a-z]{1,10}-\d+)(?![^\W_])'
```

See also Reindex Jira Software issue keys.

As always, be sure to back up your home directory (and perhaps the database) before performing any manual operation on Bitbucket. Consider testing this change on another copy of Bitbucket before using it in production.

Use Smart Commits

Smart Commits allow repository committers to process Jira Software issues using special commands in your commit messages.

You can:

- comment on issues
- record time tracking information against issues
- transition issues to any status defined in the Jira Software project's workflow.

A single Smart Commit command cannot span more than one line (you cannot use carriage returns in the commit message), but you can add multiple commands to the same line, or multiple commands on separate lines. See this example below.

Smart Commits work with Bitbucket Data Center 4.2+ and Jira Software 7.1 +.

On this page:

Related pages:

- Enabling DVCS Smart Commits

Smart Commit commands

The basic command line syntax for a Smart Commit message is:

```
<ignored text> <ISSUE_KEY> <ignored text> #<COMMAND> <optional
COMMAND_ARGUMENTS>
```

Any text between the issue key and the Smart Commit command is ignored.

There are three Smart Commit commands you can use in your commit messages:

- `comment`
- `time`
- `transition`

Comment

Description	Adds a comment to a Jira Software issue.
Syntax	`<ignored text> ISSUE_KEY <ignored text> #comment <comment_string>`
Example	`JRA-34 #comment corrected indent issue`
Notes	• The committer's email address must match the email address of a single Jira Software user with permission to comment and view the issues in that particular project.

Time

Description	Records time tracking information against an issue.
Syntax	`<ignored text> ISSUE_KEY <ignored text> #time <value>w <value>d <value>h <value>m <comment_string>`
Example	`JRA-34 #time 1w 2d 4h 30m Total work logged`

Notes	This example records 1 week, 2 days, 4 hours and 30 minutes against the issue, and adds the comment '`Total work logged`' in the **Work Log** tab of the issue. • Each value for `w`, `d`, `h` and `m` can be a decimal number. • The committer's email address must match the email address of a single Jira Software user with permission to log work on an issue. • Your system administrator must have enabled time tracking on your Jira Software instance.

Workflow transitions

Description	Transitions a Jira Software issue to a particular workflow state.
Syntax	`<ignored text> ISSUE_KEY <ignored text> #<transition_name> <comment_string>`
Example	`JRA-090 #close Fixed this today`
Notes	This example executes the close issue workflow transition for the issue and adds the comment '`Fixed this today`' to the issue. Note that the comment is added automatically without needing to use the #comment command. You can see the custom commands available for use with Smart Commits by visiting the Jira Software issue and seeing its available workflow transitions: 1. Open an issue in the project. 2. Click **View Workflow** (near the issue's **Status**). The Smart Commit only considers the part of a transition name before the first space. So, for a transition name such as `finish work`, then specifying `#finish` is sufficient. You must use hyphens to replace spaces when ambiguity can arise over transition names, for example: `#finish-work`. If a workflow has two valid transitions, such as: • `Start Progress` • `Start Review` A Smart Commit with the action `#start` is ambiguous because it could mean either of the two transitions. To specify one of these two transitions, fully qualify the transition you want by using either `#start-review` or `#start-progress`. • When you resolve an issue with the `#resolve` command, you cannot set the **Resolution** field with Smart Commits. • If you want to add a comment during the transition, the transition must have a screen associated with it. • The committer's email address must match the email address of a single Jira Software user with the appropriate project permissions to transition issues.

Advanced examples

Multiple commands over multiple lines on a single issue

Syntax

```
<ISSUE_KEY> #<COMMAND_1> <optional COMMAND_1_ARGUMENTS> #<COMMAND_2> <optional COMMAND_2_ARGUMENTS> ...
#<COMMAND_n> <optional COMMAND_n_ARGUMENTS>
```

Commit message

`JRA-123 #comment Imagine that this is a really, and I mean really, long comment #time 2d 5h`

Result
Adds the comment 'This is a really, and I' (but drops the rest of the comment) and logs 2 days and 5 hours of work against issue JRA-123.

Multiple commands on a single issue

Syntax

```
<ISSUE_KEY> #<COMMAND_1> <optional COMMAND_1_ARGUMENTS> #<COMMAND_2> <optional COMMAND_2_ARGUMENTS> ...
#<COMMAND_n> <optional COMMAND_n_ARGUMENTS>
```

Commit message

`JRA-123 #time 2d 5h #comment Task completed ahead of schedule #resolve`

Result
Logs 2 days and 5 hours of work against issue JRA-123, adds the comment 'Task completed ahead of schedule', and resolves the issue.

A single command on multiple issues

Syntax

```
<ISSUE_KEY1> <ISSUE_KEY2> <ISSUE_KEY3> #<COMMAND> <optional COMMAND_ARGUMENTS> etc
```

Commit message

`JRA-123 JRA-234 JRA-345 #resolve`

Result
Resolves issues JRA-123, JRA-234 and JRA-345. Multiple issue keys must be separated by whitespace or commas.

Multiple commands on multiple issues

Syntax

```
<ISSUE_KEY1> <ISSUE_KEY2> ... <ISSUE_KEYn> #<COMMAND_1> <optional COMMAND_1_ARGUMENTS> #<COMMAND_2>
<optional COMMAND_2_ARGUMENTS> ... #<COMMAND_n> <optional COMMAND_n_ARGUMENTS>
```

Commit message

```
JRA-123 JRA-234 JRA-345 #resolve #time 2d 5h #comment Task completed ahead of
schedule
```

Result
Logs 2 days and 5 hours of work against issues JRA-123, JRA-234 and JRA-345, adds the comment 'Task completed ahead of schedule' to all three issues, and resolves all three issues. Multiple issue keys must be separated by whitespace or commas.

Get Smart Commits working

Smart Commits work with Bitbucket 4.2+ and Jira Software 7.1+.

To get Smart Commits working for Jira Software and Bitbucket:

1. Create an application link between Jira Software and Bitbucket. See Linking Bitbucket with Jira.
2. Enable smart commits in Jira Software. See Enabling DVCS Smart Commits.

Some limitations of Smart Commits:

- Smart Commits only support the default Jira Software issue key format (that is, two or more uppercase letters, followed by a hyphen and the issue number, for example BAM-123).
- Smart Commits don't provide for field-level updates in Jira Software issues.
- Note that elevated access rights in Jira Software can result from the way that Git (and Mercurial) allow commits to be attributed to a user other than the user pushing a change to the repository. If this seems like a risk for your situation, then you should consider disabling Smart Commits on the Jira Software instance.

Commit checker for Jira issues

This feature is available with a Bitbucket Data Center license.

On this page:

Ensure Jira issues in Bitbucket Data Center are tracked by creating a requirement that validates whether they exist in commit messages.

The commit checker will make sure that Jira issues exist in:

- every commit that is pushed to a repository
- the commit created when a pull request is merged

Depending on how you set up your requirement, when a user pushes a commit without typing a Jira issue key into the commit message, they will be stopped and alerted as to why they cannot commit the file.

You can create exemptions to skip validation on commits that contain particular terms, or were pushed by specific users.

Getting started

While configuring your requirement, you can run validation on commits that look for Jira issue keys typed into the commit message. You can also choose to validate that the issues placed in commit messages also actually exist in Jira.

In order to validate Jira issues in commits that exist in Jira, Bitbucket Data Center must be linked to Jira. Learn how to link to Jira.

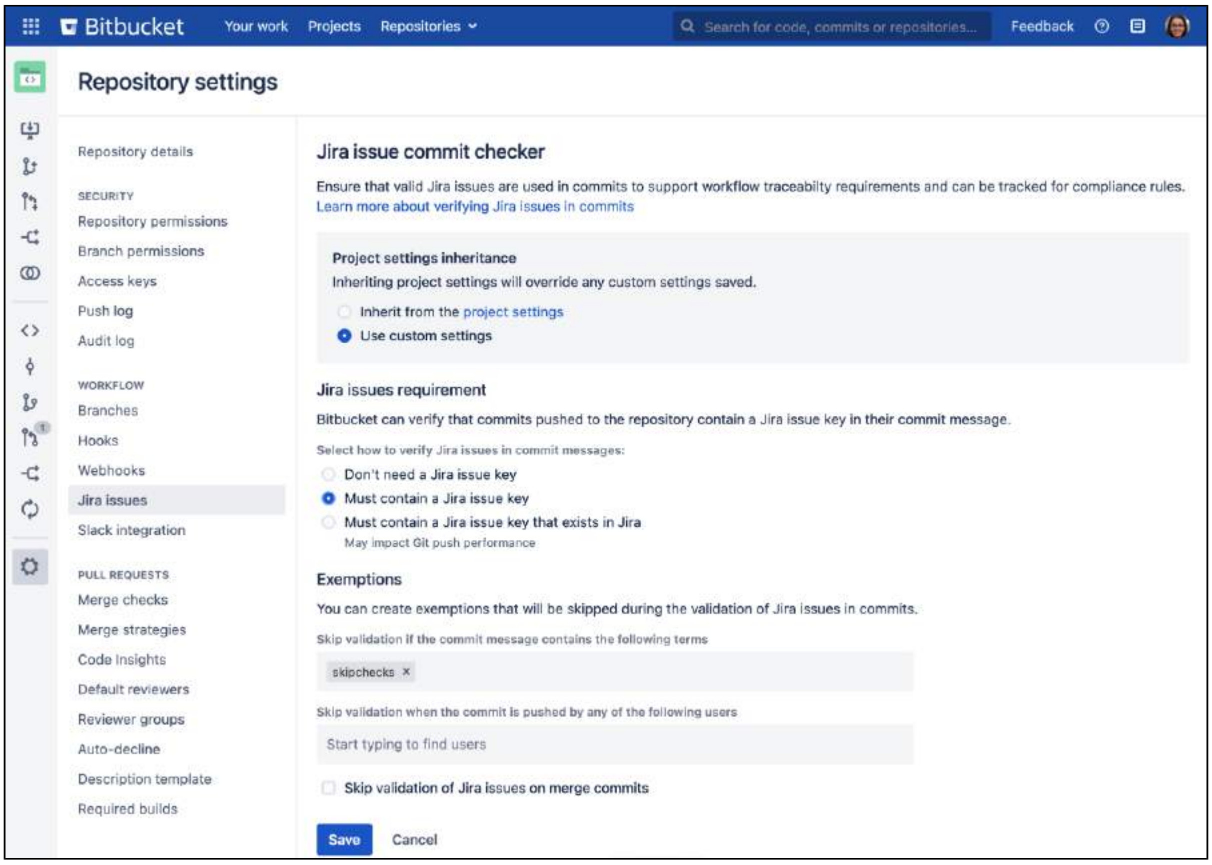
Users can authorize specific Jira sites from **Profile picture** > **Manage account** > **Authorized applications**.

Project links (optional)

You can prioritize checking issues in a specific Jira by linking your Bitbucket project to your Jira project using Project Links. This means that everything in the project will be prioritized for that Jira, reducing the time used for validation. Learn how to create project links across applications.

Configuration

Your requirements can be set up at the project or repository level (requires admin permissions). Any repository can inherit its project settings.



Repository settings

Jira issue commit checker

Ensure that valid Jira issues are used in commits to support workflow traceabilty requirements and can be tracked for compliance rules.
Learn more about verifying Jira issues in commits

Project settings inheritance

Inheriting project settings will override any custom settings saved.

Inherit from the project settings [✓ Use custom settings]

Jira issues requirement

Bitbucket can verify that commits pushed to the repository contain a Jira issue key in their commit message.

Select how to verify Jira issues in commit messages:

Don't need a Jira issue key
[✓ Must contain a Jira issue key]
Must contain a Jira issue key that exists in Jira
May impact Git push performance

Exemptions

You can create exemptions that will be skipped during the validation of Jira issues in commits.

Skip validation if the commit message contains the following terms: skipchecks

Skip validation when the commit is pushed by any of the following users: Start typing to find users

☐ Skip validation of Jira issues on merge commits

To configure and customize the commit checker at the repository level (requires repository admin permissions):

1. Go to **Repository settings** > **Jira issues** (under Workflow)
2. From **Project settings inheritance**, select **Use custom settings**.
3. Select which **Jira issues requirement** to use:
    - **Don't need a Jira issue key** - use this option to skip verifying Jira issues in commit messages for this repository.
    - **Must contain a Jira issue key** - use this option to set a requirement for verifying Jira issues exists in commit messages for this repository.
    - **Must contain a Jira issue key that exists in Jira** - use this to set a requirement for verifying Jira issues exist in commit messages for this repository *and* that they exist in your Jira site.
        - NOTE: Choosing this option may impact Git push performance due to each push requiring a query being made to Jira before the push can be accepted.
4. Set up any exemptions you'd like to use.
5. Select **Save**.

Exemptions

You can set exemptions that will not validate those commit messages that contain specified terms or certain users who push commits.

- **Terms** - type in any terms here to have the check ignore the validation of Jira issues if a commit message uses any of these. NOTE: These terms are case sensitive.
- **Users** - add any users (pushers) to have the check ignore the validation of Jira issues if a commit message is created by any user that has pushed a commit.

Exclude merge commits

Enabled by default, merge commits will be excluded from commit requirements. This includes merge commits pushed through the command line and merges made via the pull request UI (squash merges will always be checked).

To include merge commits in your requirement:

1. Select **Jira issues** (under Workflow) from a project or repository’s settings.
2. Clear the checkbox next to **Skip validation of Jira issues on merge commits**.

Bamboo integration

When you integrate Bitbucket Data Center with Atlassian's Bamboo build and deployment server, commit, branch, build and deployment information is shared for users of both applications.

On this page:

Benefits of integration

When Bamboo and Bitbucket Data Center are integrated, you and your team get all the following advantages:

Bitbucket Data Center tells Bamboo when to build

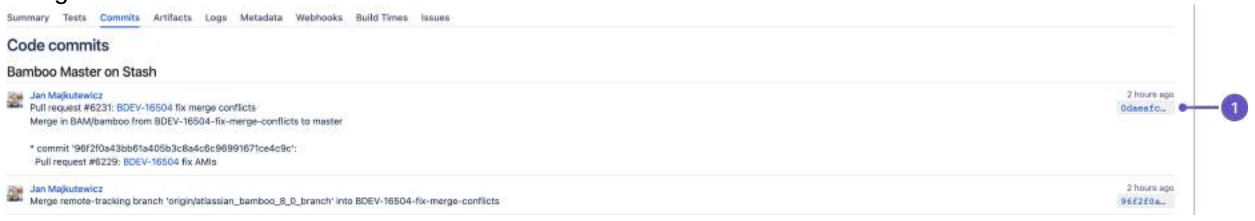
- When a developer pushes to a repository the build is automatically started.

Bitbucket Data Center tells Bamboo when to update plan branches to match changes in repository branches

- When a developer pushes a new branch to a repository a branch plan is automatically created.
- When a developer deletes a branch in a repository, the branch plan is automatically deleted or disabled.

Bitbucket Data Center commits are displayed in the relevant Bamboo builds

- In Bamboo, you can view all of the commits involved in the build, allowing you to accurately track changes.



Code commits

Bamboo Master on Stash

Jan Majkutewicz
Pull request #6231: BDEV-16504 fix merge conflicts
Merge in BAM/bamboo from BDEV-16504-fix-merge-conflicts to master

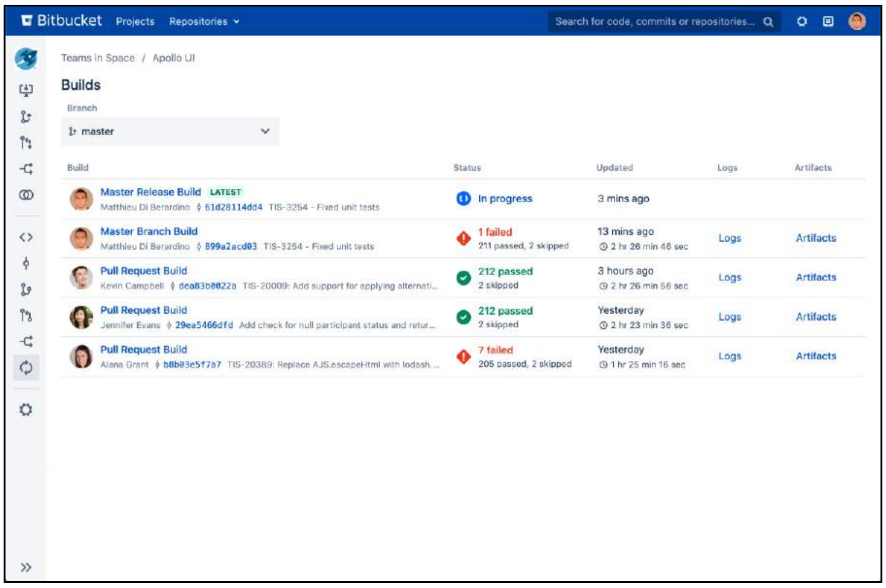
* commit '96f2f0a43bb61a406b3c8a4c6c96991671ce4c9c':
Pull request #6229: BDEV-16504 fix AMIs
2 hours ago
0deeafc...

Jan Majkutewicz
Merge remote-tracking branch 'origin/atlassian_bamboo_8_0_branch' into BDEV-16504-fix-merge-conflicts
2 hours ago
96f2f0a...

1. **Commit changeset**: select a changeset to go to Bitbucket Data Center, where you can see the commit diff for all of the files that are part of the build.

Bamboo notifies Bitbucket Data Center automatically about build results

- Build notifications are automatically enabled when you link a build plan to a Bitbucket Data Center repository.
- Notifications are sent to all linked Bitbucket Data Center servers.
- You can see build results and other related information on the Builds, Pull request, Commits, and Branches pages so you can easily check the build status of a branch when deciding whether to merge change.


Bitbucket
Projects
Repositories
Search for code, commits or repositories...
Teams in Space / Apollo UI

Builds

Branch: master

Build	Status	Updated	Logs	Artifacts
Master Release Build LATEST Matthieu Di Berardino 61d28114dd4 TIS-3254 - Fixed unit tests	In progress	3 mins ago		
Master Branch Build Matthieu Di Berardino 899a2acd03 TIS-3254 - Fixed unit tests	1 failed 211 passed, 2 skipped	13 mins ago 2 hr 26 min 46 sec	Logs	Artifacts
Pull Request Build Kevin Campbell dea83b0022a TIS-20009: Add support for applying alternati...	212 passed 2 skipped	3 hours ago 2 hr 26 min 56 sec	Logs	Artifacts
Pull Request Build Jennifer Evans 29ea5466dfd Add check for null participant status and retur...	212 passed 2 skipped	Yesterday 2 hr 23 min 36 sec	Logs	Artifacts
Pull Request Build Alana Grant b8b03e5f7a7 TIS-20389: Replace AJS.escapeHtml with lodash....	7 failed 205 passed, 2 skipped	Yesterday 1 hr 25 min 16 sec	Logs	Artifacts

Bitbucket Data Center displays the overall status of the build results. The status is *passed* if all the different builds (for example, unit tests, functional tests, deploy to staging) have succeeded, and *failed* if at least one run failed for any of those.

For example, when viewing the Commits tab for a Bitbucket Data Center project, you will see icons that indicate the status of the latest build results. The red fail icon is displayed if there is at least one failed build run for the commit.

Note that the legacy Bitbucket Data Center notification type is deprecated – it is still available in Bamboo 5.6 but will be removed in Bamboo 5.7.

Bamboo provides support for Pull Request

Starting from version 6.0, Bamboo can create plan branches by pull requests. Create a pull request when ready to share your work with teammates and the CI system. Bamboo will detect new pull requests and create plan branch.

Note that Bamboo doesn't provide pull request support for forked repositories yet.

Configuration

There are just a few simple configuration steps to get the integrations described above with Bamboo (versions 5.6 and later) and
Bitbucket Data Center.

Bamboo will be automatically configured to respond to repository events published by Bitbucket Data Center, and to notify Bitbucket Data Center about build results – you don't have to configure repository polling for new commits anymore in Bamboo, or set up dedicated web hooks in your Bitbucket Data Center instance.

1. Create an Application link

You only need to do this once for each pair of Bitbucket Data Center and Bamboo instances.

See Linking to another application.

Once linked, all the Bitbucket Data Center repositories are available to your plans in Bamboo.

2. Choose the Bitbucket Data Center repository for the Bamboo plan
Create a build plan (if necessary) and specify the repository in the plan (or job) configuration. ⚠ To connect to a Bitbucket Data Center repository, select **Bitbucket Data Center/Stash** and provide the Bitbucket Data Center details. You must enable SSH access on Bitbucket Data Center. Otherwise, the integration features won't work and you will have to provide an alternative HTTP repository type to connect to the Bitbucket Data Center repository. **BAM-15464** - Provide HTTP(S) authentication method option for Bitbucket Server type repository GATHERING INTEREST See Bitbucket Data Center for more information about using Bitbucket Data Center source repositories in Bamboo.
3. Build!

You can also use the Bitbucket Rest API to automatically publish build status from Bamboo, Jenkins or any other build tool to Bitbucket. See the Bitbucket developer documentation to do with updating build status.

Connect Bitbucket to an external database

This page provides information about using Bitbucket Data Center with an external database.

Bitbucket ships with an embedded database that it uses straight out-of-the-box, with no configuration required. This is great for evaluation purposes, but for production installations, we recommend that you use one of the sup ported external databases.

Please refer to Supported platforms for the versions of external databases supported by Bitbucket.

If you just want to change the password for the external database, see How do I change the external database password.

Instructions for connecting Bitbucket to the supported external databases:

- Connect Bitbucket to PostgreSQL
- Connect Bitbucket to Oracle
- Connect Bitbucket to SQL Server

Why would I want to use an external database?

Bitbucket ships with an embedded database that is great for evaluation purposes, but for production installations we recommend that you make use of one of the supported external databases, for the following reasons:

- **Improved protection against data loss**: The Bitbucket Data Center built-in database, which runs HSQL DB, is susceptible to data loss during system crashes. External databases are generally more resistant to data loss during a system crash. HSQLDB is not supported in production environments and should only be used for evaluation purposes.
- **Performance and scalability**: If you have a large number of users on your Bitbucket instance, running the database on the same server as Bitbucket may slow it down. We recommend that for large installations, Bitbucket and the DBMS are run on separate machines. When using the embedded database, the database will always be hosted and run on the same server as Bitbucket, which will limit performance.
- **Unified back-up**: Use your existing DBMS tools to back up your Bitbucket database alongside your organization's other databases.
- **Bitbucket Data Center support**: If you want to upgrade your instance to Bitbucket Data Center resources, either now or in the future, to take advantage of the performance-at-scale and high availability benefits of running Bitbucket Data Center in clustered mode, then you **must** use an external database. HSQLDB is not supported in Bitbucket Data Center.

Using the Database Migration Wizard

The Database Migration Wizard is not supported in Bitbucket Data Center instances while more than one cluster node is running. To migrate databases for a Bitbucket Data Center instance, you should perform the migration before starting multiple cluster nodes.

You can use the Database Migration Wizard to migrate the Bitbucket data:

- from the embedded database to a supported external DBMS.
- to another instance of the same DBMS.
- from one DBMS to another supported DBMS.

You need to have created the DBMS (such as PostgreSQL) that you wish to migrate the Bitbucket data to before running the Migration Wizard.

To run the Database Migration Wizard:

1. Log in to Bitbucket.
2. In the administration area, click **Database** (under 'Settings').

3. Click **Migrate database** and follow the instructions for running the migration.

Notes about database migration

- **Back up the database and Bitbucket home directory:**
  Before starting the database migration process you should back up your Set the home directory. If you intend to migrate from one external database to another, you should also back up the existing database before proceeding. See Data recovery and backups for more information.

- **Bitbucket will be unavailable during the migration:**
  Bitbucket will not be available to users during the database migration operation. In addition, running the migration when people are using Bitbucket can sometimes cause the migration to time out waiting for all activity in Bitbucket that uses the database to complete. For these reasons, we recommend that you run the database migration outside of normal usage periods.

- **Migration will usually take less than 30 minutes:**
  The duration of the migration process depends on the amount of data in the Bitbucket database being migrated. For new installations, containing very little data, the migration process typically takes just a few seconds. If you have been using Bitbucket for some time, its database will contain more data, and the migration process will therefore take longer. If Bitbucket has been linked to a JIRA Software instance, and there are hundreds of thousands of commits in Bitbucket with issue keys in the commit messages, the migration may take tens of minutes.

- **We strongly recommend using a new clean database for the new Bitbucket database:**
  In case of a migration failure, Bitbucket may have partially populated the target database. If the target database is new (therefore empty) and set aside for Bitbucket's exclusive use, it's very easy to clean up after a failed migration; just drop the target database and use a clean target database instance for the next attempt.

- **Ensure your** Set the home directory **is secured against unauthorized access**:
  - After the migration, the connection details (including the username and password) for the database are stored in the `bitbucket.properties` file.
  - The migration will create a dump file of the contents of your database in the Bitbucket home `expor` directory. This is used during the migration and is kept for diagnostic purposes in the case of an error. You may remove this after migration but it may reduce Atlassian Support's ability to help you in the case of migration issues.
  - You can edit the database password if needed after migration.

Connect Bitbucket to Oracle

This page describes how to connect Bitbucket Data Center to a Oracle database.

The overall process for using a Oracle database with Bitbucket is:

- Install Oracle where it is accessible to Bitbucket.
- Create a database and user on the Oracle server for Bitbucket to use.
- Install Bitbucket on Windows, or on Linux or Mac. See Getting started.
- Either:
  - at Bitbucket install time, run the Setup Wizard to connect Bitbucket to the Oracle database, or
  - at a later time, migrate Bitbucket to the Oracle database. See Using the Database Migration Wizard.

It is assumed here that you already have Oracle installed and running. For information about installing Oracle and creating Oracle databases, see the Oracle documentation pages. For the versions of Oracle supported by Bitbucket see Supported platforms.

Prerequisites

Backup

If you are migrating your data from the internal Bitbucket database, back up the home directory.

If you are migrating your Bitbucket data from a different external database, back up that database by following the instructions provided by the database vendor before proceeding with these instructions.

See Data recovery and backups.

Create the Bitbucket database

Before you can use Bitbucket with Oracle, you must set up Oracle as follows:

- Ensure that you have a database instance available for Bitbucket (either create a new one or use an existing one)
  The character set of the database must be set to either `AL32UTF8` or `UTF8`, to support storage of Unicode data as per the Oracle documentation.
  Note that it is important to the proper operation of Bitbucket that the database store its data in a case-sensitive manner. By changing the values of the NLS_COMP and/or NLS_SORT variables, it is possible to cause Oracle to perform its searches in a case-insensitive manner. We therefore strongly recommend that those variables be left at their default values.
- Create a user that Bitbucket will connect as (e.g. **`bitbucket`**).
  ✓ Remember the database user name; it will be used to configure Bitbucket's connection to the database in subsequent steps.
  ℹ When you create a user in Oracle, a schema is automatically created.
  It is strongly recommended that you create a new database user for use by Bitbucket rather than sharing one that is used by other applications or people.
- Grant the Bitbucket user `connect` and `resource` roles only. The `connect` role is required to set up a connection, while `resource` role is required to allow the user to create objects in its own schema.
- Note that Bitbucket requires the database to keep idle connections alive for at least 10 minutes. If the database is configured with less than a 10 minute connection timeout, there will be seemingly random connection errors.

The format of the command to create a user in Oracle is:

```
CREATE USER <user>
  IDENTIFIED BY <password>
  DEFAULT TABLESPACE USERS
  QUOTA UNLIMITED ON USERS;
GRANT CONNECT, RESOURCE to <user>;
```

Here is a simple example, using SQL*Plus, of how one might create a user called **`bitbucket`** with password **`jdHyd6Sn21`** in tablespace **`users`**, and grant the user a minimal set of privileges. When you run the command on your machine, remember to replace the username, password and tablespace names with your own values.

```
CREATE USER bitbucket
  IDENTIFIED BY jdHyd6Sn21
  DEFAULT TABLESPACE USERS
  QUOTA UNLIMITED ON USERS;
GRANT CONNECT, RESOURCE to bitbucket;
```

This creates an empty Oracle schema with the name `bitbucket`, and a user that can log in from the host that Bitbucket is running on and who has full access to the newly created schema. In particular, the user is allowed to create sessions and tables.

Bitbucket will generally require about 25–30 connections to the database. The maximum number of connections is a configurable system property – see Database pool.

Download and install the Oracle thin driver

Due to licensing restrictions, we can't bundle an Oracle driver with Bitbucket. To make your database driver is available to Bitbucket:

1. Stop Bitbucket.
2. Delete the bundled Oracle driver .jar file from your `<installation-directory>/app/WEB-INF/lib` directory. The driver file will be called something like `ojdbc8-<version>-atlassian-hosted.jar` where `<version>` is the version of the driver.
3. Head to Oracle Database JDBC driver and Companion Jars Downloads. Download the appropriate driver. The driver file will be called something like `ojdbc8.jar`.
4. Drop the .jar file in your `<installation-directory>/app/WEB-INF/lib` directory.
5. Restart Bitbucket.
6. Go to `http://localhost:>` in your browser to continue the setup process.

Connect Bitbucket to the Oracle database

You can now connect Bitbucket to the Oracle database, either:

- when you run the Setup Wizard at install time
- when you wish to migrate to Oracle either from the embedded Bitbucket database or from another external database

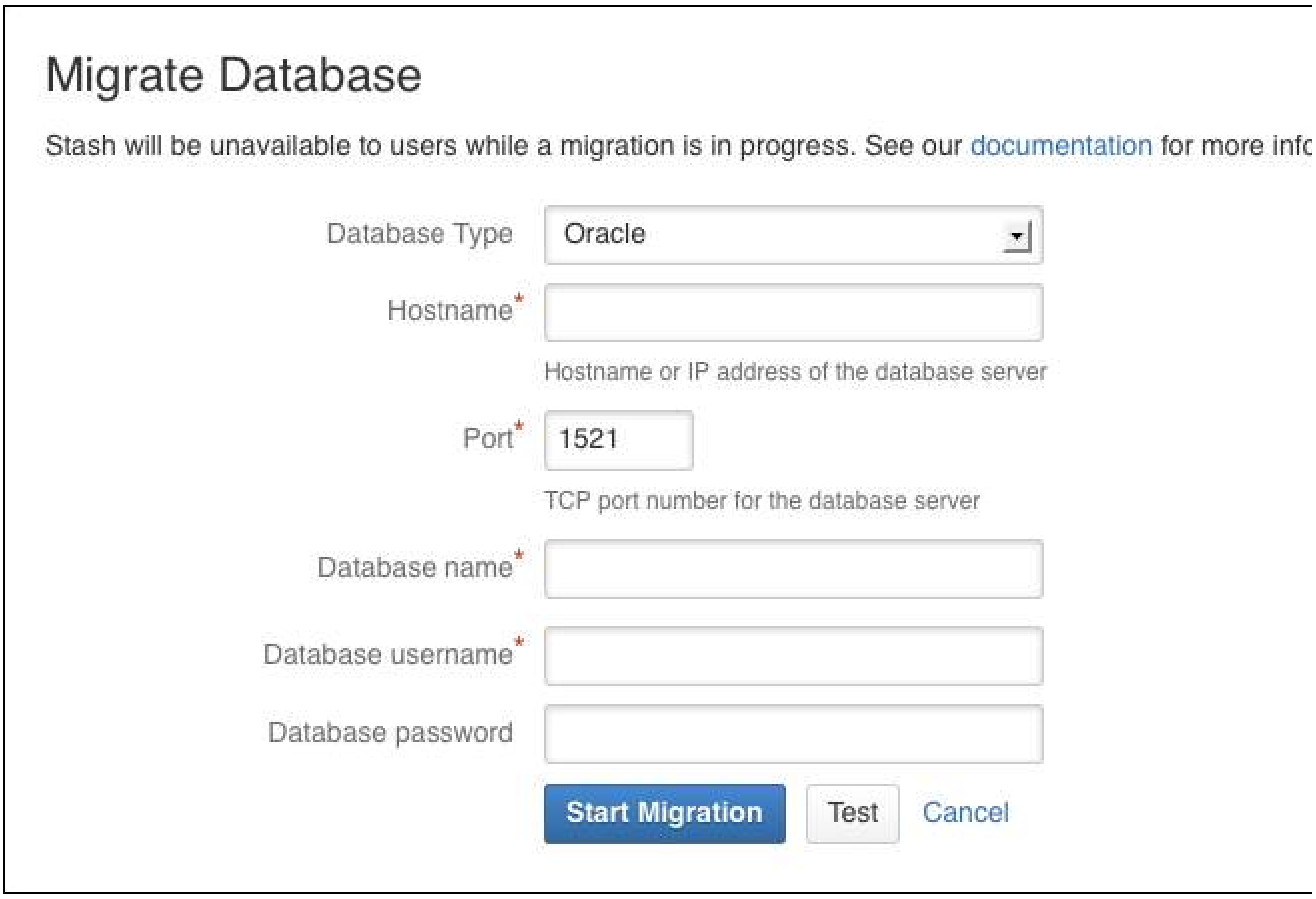
When running the Setup Wizard at install time

1. At the **Database** step, select **External**.
2. For **Database type**, select **Oracle**.
3. Complete the form:
   a. **Hostname** – the hostname or IP address of the computer running the database server.
   b. **Port** – the TCP port with which Bitbucket can connect to the database server. The default value is the default port that Oracle runs against. You can change that if you know the port that your Oracle instance is using.
   c. **Database name** – the name of the database that Bitbucket should connect to.
   d. **Database username** – the username that Bitbucket should use to access the database.
   e. **Database password** – the password that Bitbucket should use to access the database.
4. Select **Next** and follow the instructions in the Bitbucket setup wizard.

When migrating to Oracle

1. Go to **Bitbucket administration** > **Settings** > **Database**.
2. Select **Migrate database**.
3. For **Database Type**, select **Oracle**.
4. Complete the form:

   a. **Hostname** – the hostname or IP address of the computer running the database server.
   b. **Port** – the TCP port with which Bitbucket can connect to the database server. The default value is the default port that Oracle runs against. You can change that if you know the port that your Oracle instance is using.
   c. **Database name** – the name of the database that Bitbucket should connect to.
   d. **Database username** – the username that Bitbucket should use to access the database.
   e. **Database password** – the password that Bitbucket should use to access the database.
5. Select **Start migration**.



Migrate Database

Stash will be unavailable to users while a migration is in progress. See our documentation for more infc

Database Type	Oracle
Hostname*	Hostname or IP address of the database server
Port*	1521 TCP port number for the database server
Database name*	
Database username*	
Database password	

Related pages:

- Connect Bitbucket to an external database
- Connect Bitbucket to PostgreSQL
- Connect Bitbucket to SQL Server

Connect Bitbucket to PostgreSQL

This page describes how to connect Bitbucket Data Center to a PostgreSQL database.

The overall process for using a PostgreSQL database with Bitbucket is:

- install PostgreSQL where it is accessible to Bitbucket
- create a database and user on the PostgreSQL server for Bitbucket to use
- install Bitbucket on Windows, or on Linux or Mac. See Getting started.
- Either:
    - at Bitbucket install time, run the Setup Wizard to connect to the PostgreSQL database, or
    - at a later time, migrate Bitbucket to the PostgreSQL database. See Using the Database Migration Wizard.

It is assumed here that you already have PostgreSQL installed and running. For more information about PostgreSQL installation and operation, refer to the PostgreSQL documentation. For additional information review this page on tuning.

PostgreSQL has the idea of schemas. When you create a PostgreSQL database, a 'public' schema is created and set as the default for that database. It is possible to create a different schema (e.g. 'bitbucket') and set that as the default schema. Bitbucket will use whatever schema is set as the default for the logged-in user. Bitbucket does not provide a way for a user to nominate the schema to use; it uses a schema that is set as the PostgreSQL default.

See Supported platforms for the versions of PostgreSQL supported by Bitbucket.

Prerequisites

Backup

If you are migrating your Bitbucket data from the HSQL internal database, back up the home directory.

If you are migrating your Bitbucket data from another external database, back up that database by following the instructions provided by the database vendor before proceeding with these instructions.

See Data recovery and backups.

Create the Bitbucket database

Before you can use Bitbucket with PostgreSQL, you must:

- Create a role for Bitbucket to use when it connects to the database.
  We strongly recommend that this role be established for Bitbucket's use exclusively; it should not be shared by other applications or people.
- Create a database in which Bitbucket can store its data.
  The database must be configured to use the UTF-8 character set.
  During normal operation, Bitbucket will acquire 25–30 connections to the database. The maximum number of connections is a configurable system property – see Database pool.
- Note that Bitbucket requires the database to keep idle connections alive for at least 10 minutes. If the database is configured with less than a 10-minute connection timeout, there will be seemingly random connection errors.

Here is an example of how to create a user called **`bitbucketuser`** with password **`jellyfish`** , and a database called **`bitbucket`** , which is configured for use by `bitbucketuser`. Using a PostgreSQL client application like psql or pgAdmin, run the following commands, replacing the user name, password, and database name with your own values.

```
CREATE ROLE bitbucketuser WITH LOGIN PASSWORD 'jellyfish' VALID UNTIL 'infinity';

CREATE DATABASE bitbucket WITH ENCODING='UTF8' OWNER=bitbucketuser CONNECTION LIMIT=-1;
```

If the server that is hosting the PostgreSQL database is not the same server as Bitbucket, then please ensure that the Bitbucket server can connect to the database server. Please also refer to the PostgreSQL documentation on how to set up pg_hba.conf. If the `pg_hba.conf` file is not set properly, remote communication to the PostgreSQL server will fail.

Connect Bitbucket to the PostgreSQL database

You can now connect Bitbucket to the PostgreSQL database, either:

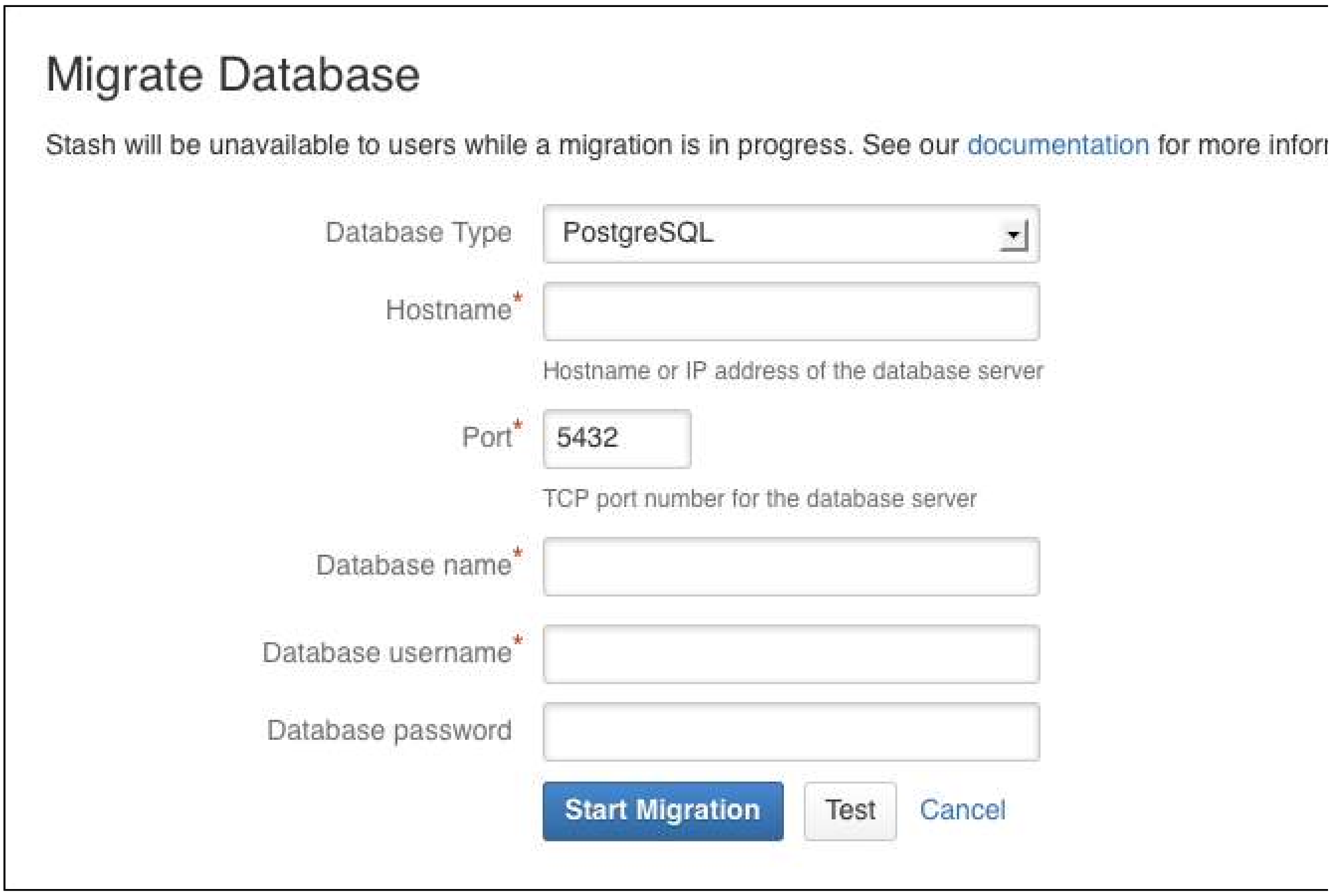
- when you run the Setup Wizard, at install time,
- when you wish to migrate to PostgreSQL, either from the embedded HSQL database or from another external database.

When running the Setup Wizard at install time

1. Select **External** at the 'Database' step.
2. Select **PostgreSQL** for **Database Type**.
3. Complete the form. See the table below for details.
4. Click **Next**, and follow the instructions in the Bitbucket Setup Wizard.

When migrating to PostgreSQL

1. In the Bitbucket administration area, click **Database** (under 'Settings').
2. Click **Migrate database**.
3. Select **PostgreSQL** for **Database Type**.
4. Complete the form. See the table below for details.
5. Click **Start Migration**.



Migrate Database

Stash will be unavailable to users while a migration is in progress. See our documentation for more infor

Database Type	PostgreSQL
Hostname*	
	Hostname or IP address of the database server
Port*	5432
	TCP port number for the database server
Database name*	
Database username*	
Database password	

Hostname
The hostname or IP address of the computer running the database server.

Port
The TCP port with which Bitbucket can connect to the database server. The default value is the default port that PostgreSQL runs against. You can change that if you know the port that your PostgreSQL instance is using.

Database name
The name of the database that Bitbucket should connect to.

Database username
The username that Bitbucket should use to access the database.

Database password
The password that Bitbucket should use to access the database.

Related pages:

- Connect Bitbucket to an external database
- Connect Bitbucket to Oracle
- Connect Bitbucket to SQL Server

Connect Bitbucket to SQL Server

This page describes how to connect Bitbucket Data Center to a Microsoft SQL Server database. You can connect Bitbucket to a SQL server either at install time using the Setup Wizard, or later using the Using the Database Migration Wizard. These instructions assume that you already have SQL Server installed and running.

The overall process for using a SQL Server database with Bitbucket is:

- install SQL Server where it is accessible to Bitbucket
- create a database and user on the SQL Server instance for Bitbucket to use
- install Bitbucket on Windows, or on Linux or Mac. See the Bitbucket installation guide

See Supported platforms for the versions of SQL Server supported by Bitbucket.

On this page:

Related pages:

- Transitioning from jTDS to Microsoft's JDBC driver
- Connect Bitbucket to an external database
- SQL Server documentation
- JDBC documentation
- Supported platforms - External Databases: SQL

Prerequisites

Back up your current database

If you are migrating your data from the internal Bitbucket database, back up the home directory.

If you are migrating your Bitbucket data from a different external database, back up that database by following the instructions provided by the database vendor before proceeding with these instructions.

See Data recovery and backups.

Create the Bitbucket database

Before you can use Bitbucket with SQL Server, you must set up SQL Server as follows:

Step	Notes
Create a database	e.g. `bitbucket`. Remember this database name for the connection step below.
Set the collation type	This should be case-sensitive, for example, 'SQL_Latin1_General_CP1_CS_AS' (CS = Case Sensitive).
Set the isolation level	Configure the database to use the isolation level, Read Committed with Row Versioning.
Create a database user	e.g. `bitbucketuser`. This database user should **not** be the database owner, but **should** be in the `db_owner` role. It needs to be in this role during setup *and* at all points when Bitbucket is running due to the way it interacts with the database. See SQL Server Startup Errors. Remember this database user name for the connection step below.

Set database user permissions	The Bitbucket database user has permission to connect to the database, and to create and drop tables, indexes and other constraints, and insert and delete data, in the newly-created database.
Enable TCP/IP	Ensure that TCP/IP is enabled on SQL Server and that SQL Server is listening on the correct port (which is 1433 for a default SQL Server installation). Remember this port number for the connection step below.
Check the authentication mode	Ensure that SQL Server is operating in the appropriate authentication mode. By default, SQL Server operates in 'Windows Authentication Mode'. However, if your user is not associated with a trusted SQL connection, 'Microsoft SQL Server, Error: 18452' is received during Bitbucket startup, and you will need to change the authentication mode to 'Mixed Authentication Mode'. *Bitbucket instances running on Windows are also able to support SQL Server databases running in 'Windows Authentication Mode'. This is described at the bottom of this page and it has to be manually configured: Use Integrated Authentication (Optional)*
Check that SET NOCOUNT is off	Ensure that the SET NOCOUNT option is turned off. You can do that in SQL Server Management Studio as follows: 1. Navigate to **Tools** > **Options** > **Query Execution** > **SQL Server** > **Advanced**. Ensure that the **SET NOCOUNT** option is cleared. 2. Now, go to the **Server** > **Properties** > **Connections** > **Default Connections** properties box and clear the **no count** option.

Note that Bitbucket will generally require about 25–30 connections to the database.

Note also that Bitbucket requires the database to keep idle connections alive for at least 10 minutes. If the database is configured with less than a 10 minute connection timeout, there will be seemingly random connection errors.

Here is an example of how to create and configure the SQL Server database from the command line. When Bitbucket and SQL Server run on the same physical computer (accessible through `localhost`), run the following commands (replacing `bitbucketuser` and `password` with your own values):

```
SQL Server> CREATE DATABASE bitbucket
SQL Server> GO
SQL Server> USE bitbucket
SQL Server> GO
SQL Server> ALTER DATABASE bitbucket SET ALLOW_SNAPSHOT_ISOLATION ON
SQL Server> GO
SQL Server> ALTER DATABASE bitbucket SET READ_COMMITTED_SNAPSHOT ON
SQL Server> GO
SQL Server> ALTER DATABASE bitbucket COLLATE SQL_Latin1_General_CP1_CS_AS
SQL Server> GO
SQL Server> SET NOCOUNT OFF
SQL Server> GO
SQL Server> USE master
SQL Server> GO
SQL Server> CREATE LOGIN bitbucketuser WITH PASSWORD=N'password', DEFAULT_DATABASE=bitbucket,
CHECK_EXPIRATION=OFF, CHECK_POLICY=OFF
SQL Server> GO
SQL Server> ALTER AUTHORIZATION ON DATABASE::bitbucket TO bitbucketuser
SQL Server> GO
```

This creates an empty SQL Server database with the name `bitbucket`, and a user that can log in from the host that Bitbucket is running on who has full access to the newly created database. In particular, the user should be allowed to create and drop tables, indexes and other constraints.

Connect Bitbucket to the SQL Server database

You can now connect Bitbucket to the SQL Server database, either:

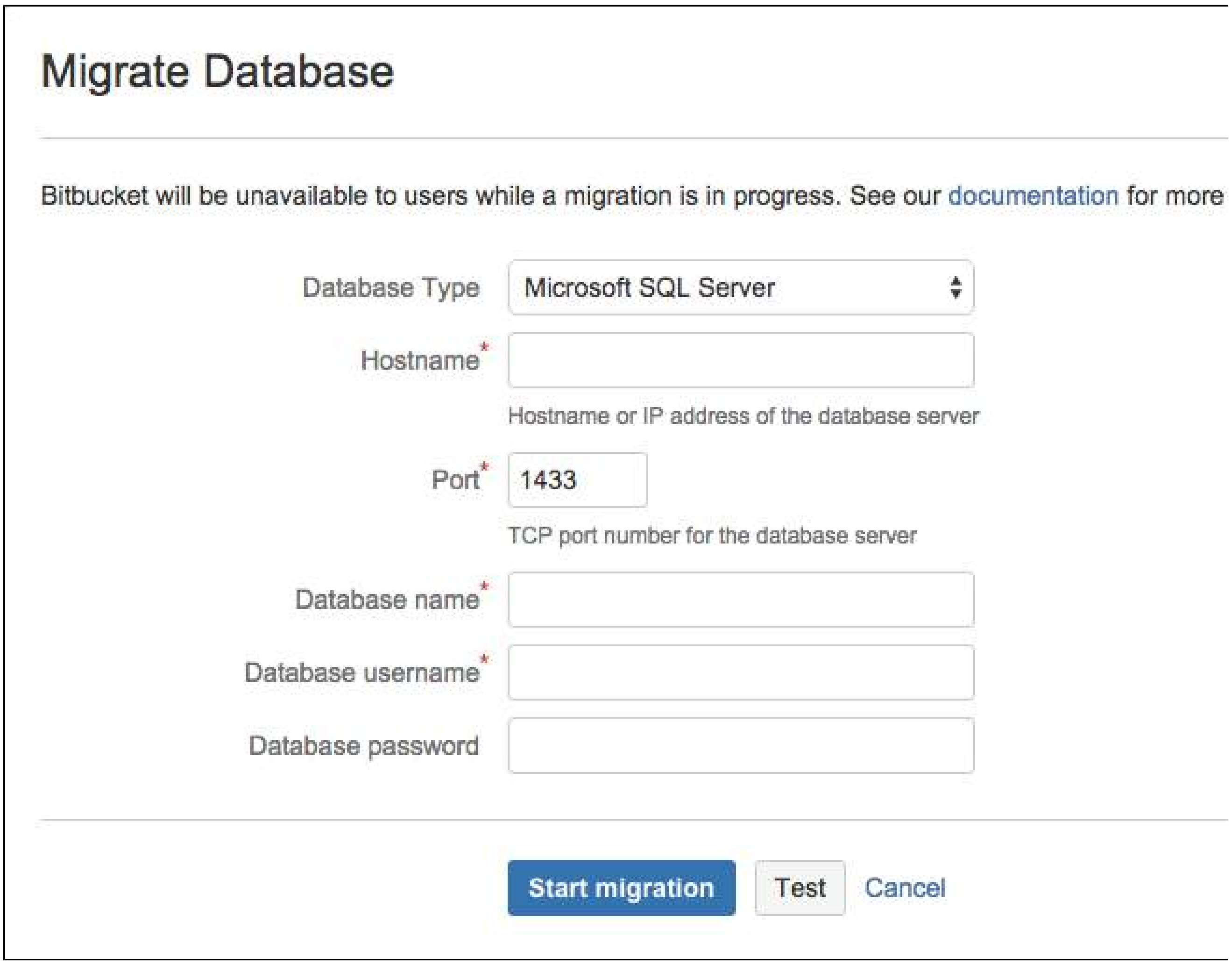
- when you run the Setup Wizard, at install time,
- when you wish to migrate to SQL Server, either from the embedded database or from another external database.

When running the Setup Wizard at install time

1. Select **External** at the 'Database' step.
2. Select **SQL Server** for **Database Type**.
3. Complete the form. See the table below for details.
4. Click **Next**, and follow the instructions in the Bitbucket Setup Wizard.

When migrating to SQL Server

1. In the Bitbucket administration area, click **Database** (under 'Settings').
2. Click **Migrate database**.
3. Select **SQL Server** for **Database Type**.
4. Complete the form. See the table below for details.
5. Click **Start Migration**.


Migrate Database

Bitbucket will be unavailable to users while a migration is in progress. See our documentation for more

Database Type	Microsoft SQL Server
Hostname*	Hostname or IP address of the database server
Port*	1433 — TCP port number for the database server
Database name*	
Database username*	
Database password	

Hostname	The hostname or IP address of the computer running the database server.

Port	The TCP port with which Bitbucket can connect to the database server. The default value of 1433 is the default port that SQL Server runs against. You can change that if you know the port that your SQL Server instance is using.
Database name	The name of the database that Bitbucket should connect to.
Database username	The username that Bitbucket should use to access the database.
Database password	The password that Bitbucket should use to access the database.

Named Instances

If you have a named instance on your server, you will need to manually edit the `bitbucket.properties` file as described on the Connecting to named instances in SQL Server from Bitbucket Server Knowledge Base article.

Use Integrated Authentication or 'Windows Authentication Mode' (Optional)

Windows authentication is only available for Bitbucket instances running on Windows. It cannot be used on Linux because Microsoft does not provide shared objects for it. You will either need to run Bitbucket on Windows, allowing you to use Windows security, or you will need to enable mixed-mode authentication for SQL Server if you are running Bitbucket on Linux. Unfortunately, there are no other options at this time.

Integrated authentication uses a native DLL to access the credentials of the logged-in user to authenticate with SQL Server. The native DLLs for both 32- and 64-bit systems are included in the distribution; there is no need to download the entire package from Microsoft.

Bitbucket does not currently support configuring the system to use integrated authentication from the UI (Vote for it!
BSERV-3035 - Add support for integrated authentication for Microsoft SQL Server GATHERING INTEREST
). This means you can't currently migrate to SQL Server with integrated authentication, nor can you configure Bitbucket to use SQL Server with integrated authentication during initial setup. However, if Bitbucket has already been configured to use SQL Server (for example, when the Setup Wizard was run at first use), you can enable integrated authentication by directly modifying Bitbucket's configuration, as follows:

1. Based on the JVM being used to run Bitbucket, rename either the `x64` or `x86` DLL to `sqljdbc_auth.dll` in `lib/native`. Note that running on Windows x64 does *not* require the use of the `x64` DLL; you should only use the `x64` DLL if you are also using a 64-bit JVM.
2. In `_start-webapp.bat`, a `JVM_LIBRARY_PATH` variable has already been defined. Simply remove the leading `rem` . Note that if you are putting the native DLL in an alternative location, you may need to change the value to point to your own path. The value of the `JVM_LIBRARY_PATH` variable will automatically be included in the command line when Tomcat is run using `start-bitbucket.bat`.
3. Edit the `%BITBUCKET_HOME%\shared\bitbucket.properties` file to include `;integratedSecurity=true` in the `jdbc.url` line. Note that `jdbc.user` and `jdbc.password` will no longer be used to supply credentials *but they must still be defined – Bitbucket* will fail to start if these properties are removed.
4. Ensure the Bitbucket process or service is running as the correct user to access SQL Server. (Note that this user is generally a Windows Domain User Account, but should not be a member of any administrators groups, that is local, domain, or enterprise.)

It is also possible to configure integrated authentication over Kerberos, rather than using the native DLLs. Details for that are included in the JDBC documentation.

Install the JDBC driver

This section is only relevant to some distributions of Bitbucket, for example if you are running Bitbucket via the Atlassian Plugin SDK, or have built Bitbucket from source.

If the SQL Server JDBC driver is *not* bundled with Bitbucket, you will need to download and install the driver yourself.

1. Download the appropriate JDBC driver from the Microsoft download site.
2. Install the driver file to your `<Bitbucket home directory> /lib` directory (for Bitbucket 2.1 or later).
3. Stop, then restart, Bitbucket. See Start and stop Bitbucket.

If Bitbucket was configured to use Microsoft SQL Server by manually entering a JDBC URL, please refer to this guide.

Transitioning from jTDS to Microsoft's JDBC driver

This page describes how to change from using jTDS to using the Microsoft SQL Server JDBC driver to access Microsoft SQL Server.

What do I have to do?

If Bitbucket Data Center was configured to use Microsoft SQL Server by following the steps outlined in Connect Bitbucket to SQL Server, *no change is necessary*. However, if Bitbucket was configured to use Microsoft SQL Server by **manually entering a JDBC URL**, the system will lock on startup if the driver class and URL are not manually updated.

How to proceed

In the home directory, `bitbucket.properties` must be edited to change the JDBC driver and URL. The existing configuration should look similar to this:

```
jdbc.driver=net.sourceforge.jtds.jdbc.Driver
jdbc.url=jdbc:jtds:sqlserver://localhost:1433;databaseName=stash;
jdbc.user=stashuser
jdbc.password=secretpassword
```

⚠ The JDBC URL above is in the format constructed by Bitbucket when connecting Bitbucket to SQL Server and will automatically be updated to a URL compatible with Microsoft's driver, with no change required on the administrator's part. If the URL contains additional properties, such as domain=, it will need to be manually updated.

To use Microsoft's SQL Server driver, the settings above would be updated to this:

```
jdbc.driver=com.microsoft.sqlserver.jdbc.SQLServerDriver
jdbc.url=jdbc:sqlserver://localhost:1433;databaseName=stash;
jdbc.user=stashuser
jdbc.password=secretpassword
```

The exact values to use in the new URL are beyond the scope of this documentation; they must be chosen based on the jTDS settings they are replacing.

Additional Information

The new JDBC driver class is: `com.microsoft.sqlserver.jdbc.SQLServerDriver`

The JDBC URL format for the jTDS driver is documented on SourceForge at http://jtds.sourceforge.net/faq.html#urlFormat.

The JDBC URL format for Microsoft's SQL Server driver is documented on MSDN at http://msdn.microsoft.com/en-us/library/ms378428.aspx, with documentation for additional properties at http://msdn.microsoft.com/en-us/library/ms378988.aspx.

Why change drivers?

Recent releases of Hibernate, which Bitbucket uses to simplify its persistence layer, have introduced a requirement that the JDBC drivers and connection pools used be JDBC4-compliant. JDBC4 was introduced with Java 6.

The jTDS driver used by releases prior to Bitbucket 2.1 is a JDBC3 driver, compatible with Java 1.3, and therefore cannot be used with newer versions of Hibernate. While jTDS 1.3.0 and 1.3.1 *claim* to implement JDBC4, and JDBC4.1, they actually don't. The new methods have been "implemented", but their implementations are all `throw new AbstractMethodError()`, which means they can't actually be *used*. (See an example here, on GitHub.)

Since jTDS 1.3.1 does not provide a functioning JDBC4 implementation, the decision was made to replace jTDS with Microsoft's own SQL Server driver. Microsoft's driver is actively maintained, where jTDS hasn't been updated since 2014 (and prior to the small round of updates done in 2014 it hadn't been updated for multiple years). Microsoft offers a full JDBC4.2 (Java 8) driver and supports all the features of SQL Server, including SQL Server 2016.

Bitbucket attempts to automatically update jTDS JDBC URLs to values compatible with Microsoft's JDBC driver. However, for installations using custom JDBC URLs–for example, to use domain authentication–such automatic updating is not possible; the URL, which was manually entered, must be manually updated.

Configuring Bitbucket Data Center to work with Amazon Aurora

These instructions will help you connect Bitbucket Data Center to an *existing* Amazon Aurora PostgreSQL database.

Amazon Aurora is only supported on a Data Center license

Bitbucket Data Center supports the use of a single-writer, PostgreSQL-compatible Amazon Aurora clustered database. A typical production-grade cluster includes one or more readers in a different availability zone. If the writer fails, Amazon Aurora will automatically promote one of the readers to take its place. For more information, see Amazon Aurora Features: PostgreSQL-Compatible Edition.

The overall process for using a PostgreSQL-compatible Amazon Aurora database with an existing Bitbucket deployment is:

1. Deploy Amazon Aurora (preferably, through the Modular Architecture for Amazon Aurora PostgreSQL Quick Start).
2. Configure PostgreSQL on the Amazon Aurora database.
3. Connect your Bitbucket deployment to the Amazon Aurora database.

See Supported platforms for the versions and configurations of Amazon Aurora supported by Bitbucket Data Center.

Backups (for migrations)

If you are migrating Bitbucket Data Center data from the HSQL internal database, back up the Set the home directory.

If you are migrating Bitbucket Data Center data from another external database, back up that database by following the instructions provided by the database vendor before proceeding with these instructions.

See Data recovery and backups.

1. Deploy Amazon Aurora

Use the Quick Start for new deployments

If you are deploying a new Bitbucket Data Center with Amazon Aurora from scratch, we recommend that you use the AWS Quick Start for Bitbucket. This Quick Start lets you configure a PostgreSQL-compatible Amazon Aurora cluster with one writer and two readers (preferably in separate availability zones). See Deploy Bitbucket Data Center in AWS for more information.

Bitbucket Data Center specifically supports the use of an Amazon Aurora cluster with the following configuration:

- It must have only one writer, replicating to one or more readers.
- Your PostgreSQL engine must be version 9.6 or higher.

See Supported platforms for more details.

AWS documentation

AWS has some helpful guides for setting up an Aurora database and migrating to it:

- Modular Architecture for Amazon Aurora PostgreSQL: a Quick Start that guides you through the deployment of a PostgreSQL-compatible Aurora Database cluster. This cluster has one writer and two readers, preferably in different availability zones.

- Upgrading the PostgreSQL DB Engine for Amazon RDS: shows you how upgrade your database engine to a supported version before migrating it to Amazon Aurora.
- Migrating Data to Amazon Aurora PostgreSQL: contains instructions for migrating from Amazon RDS to a PostgreSQL-compatibleAmazon Aurora cluster.
- Best Practices with Amazon Aurora PostgreSQL: contains additional information about best practices and options for migrating data to a PostgreSQL-compatible Amazon Aurora cluster.

Amazon also offers an AWS Database Migration Service to facilitate a managed migration. This service offers minimal downtime, and supports migrations to Aurora from a wide variety of source databases.

When migrating from a non-clustered PostgreSQL database into an Amazon Aurora database, we recommend you use `pg_dump` and `pg_restore`. For more information, see Backup and Restore (from the PostgreSQL documentation).

2. Connect Bitbucket to the Amazon Aurora database

You can now connect Bitbucket to the PostgreSQL database, when you either:

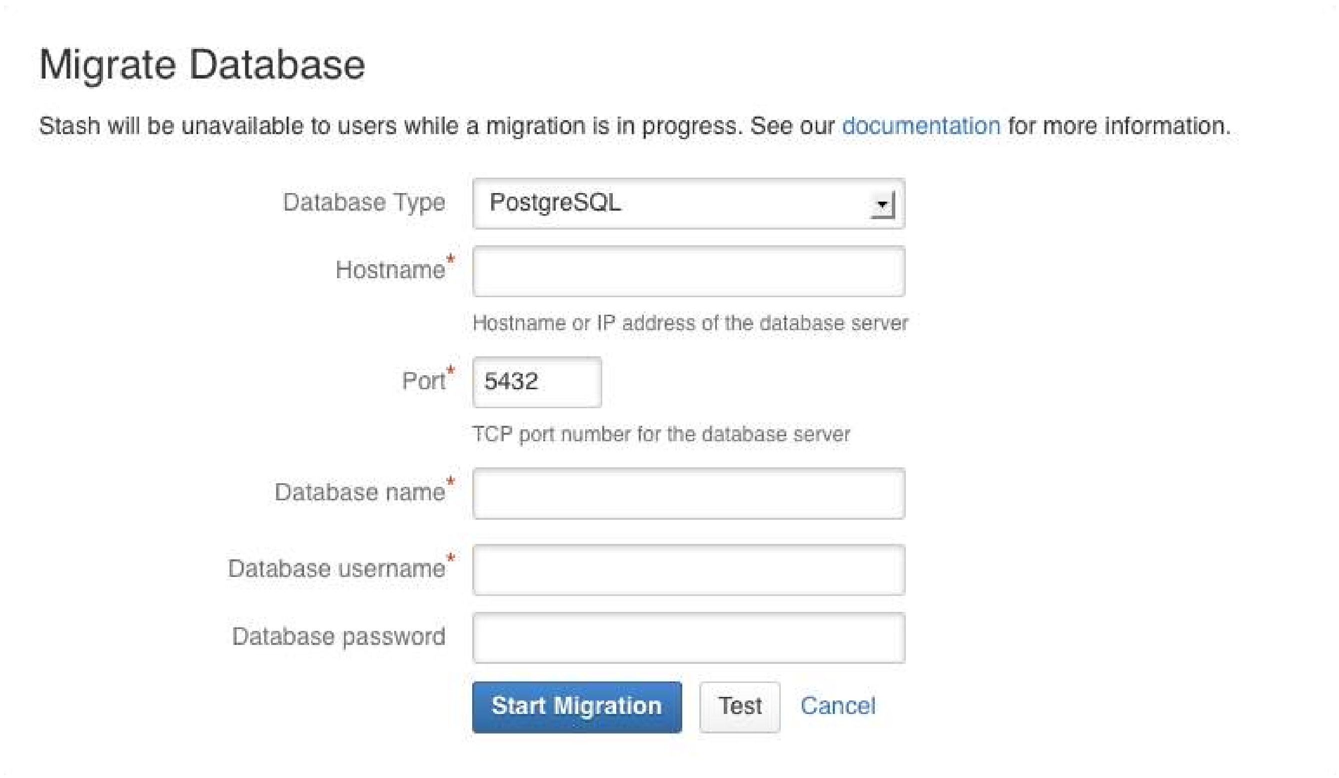
- Run the Setup Wizard (at install time)
- Want to migrate Bitbucket to PostgreSQL (either from the embedded HSQL database or from another external database)

When running the Setup Wizard at install time

1. Select **External** at the 'Database' step.
2. Select **PostgreSQL** for **Database Type**.
3. Complete the form. See the table below for details.
4. Click **Next**, and follow the instructions in the Setup Wizard.

When migrating to Amazon Aurora

1. In the Bitbucket administration area, click **Database** (under 'Settings').
2. Click **Migrate database**.
3. Select **PostgreSQL** for **Database Type**.
4. Complete the form. See the table below for details.
5. Click **Start Migration**.


Migrate Database

Stash will be unavailable to users while a migration is in progress. See our documentation for more information.

Database Type: PostgreSQL

Hostname*:

Hostname or IP address of the database server

Port*: 5432

TCP port number for the database server

Database name*:

Database username*:

Database password:

Hostname

The hostname or IP address of your Amazon Aurora database.

Port
The TCP port with which Bitbucket can connect to the database server.

Database name
The name of your Amazon Aurora database.

Database username
The username that Bitbucket should use to access the database.

Database password
The password that Bitbucket should use to access the database.

Related pages:

- Connect Bitbucket to an external database
- Connect Bitbucket to Oracle
- Connect Bitbucket to SQL Server

Migrating Bitbucket Data Center to another server

This page describes how to move your Bitbucket Data Center installation from one physical machine to a different machine. For most scenarios, the overall procedure involves the following 4 steps, although your situation may not require all of these:

1. Prepare for the migration.
2. Move the Bitbucket Data Center data.
3. Move the Bitbucket Data Center installation to the new location, and update the value of the `BITBUCKET_HOME` environment variable.
4. Update the `bitbucket.properties` file. This will be necessary if you were unable to use the Migration Wizard in Step 2.

See also the upgrade guide. You can upgrade either before or after you migrate. This page *does not* describe any aspect of the upgrade procedure.

On this page:

Related pages:

- Supported platforms
- Connect Bitbucket to an external database
- Bitbucket Server upgrade guide

1. Prepare for the migration

In preparation for migrating Bitbucket Data Center to another server, check that you have done the following:

- Confirm that the operating system, database, other applicable platforms and hardware on the new machine will comply with the requirements for Bitbucket Data Center.
- Check for any known migration issues in the Knowledge Base.
- Alert users to the forthcoming Bitbucket Data Center service outage.
- Ensure that users will not be able to update existing Bitbucket Data Center data during the migration. You can do this by temporarily changing the access permissions for Bitbucket Data Center.
- Make sure you have created a user in Bitbucket Data Center (not in your external user directory) that has System Administrator global permissions so as to avoid being locked out of Bitbucket Data Center in case the new server does not have access to your external user directory.

2. Move the Bitbucket Data Center data to a different machine

This section gives a brief overview of how to move the Bitbucket Data Center data to a different machine. You do not need to do anything in this section if you will continue to use the embedded database. The Bitbucket Data Center data is moved when you move the Bitbucket Data Center installation.

The data includes the data directories (including the Git repositories), log files, installed plugins, temporary files and caches.

You can move the data:

- from the embedded database to a supported external DBMS.
- to another instance of the same DBMS.
- from one DBMS to another supported DBMS (for example, from MySQL to PostgreSQL).

You can also move the actual DBMS. Atlassian recommends that for large installations, Bitbucket Data Center and the DBMS run on separate machines.

There are 2 steps:

1. Create and configure the DBMS in the new location. Please refer to Connect Bitbucket to an external database, and the relevant child page, for more information.
2. Either:
    - If the new location is currently visible to Bitbucket Data Center, use the Bitbucket Database Migration Wizard. Please refer to Connect Bitbucket to an external database, and the relevant child page, for more information.

- If the new location is not currently visible to Bitbucket Data Center (perhaps because you are moving to a new hosting provider), you need to perform a database export and then import the backup to the new DBMS. Please refer to the vendor documentation for your DBMS for detailed information.
  You will also need to update the bitbucket.properties file in the `<Bitbucket home directory>` as described below.

3. Move Bitbucket Data Center to a different machine

This section describes moving the Bitbucket Data Center installation to a different machine.

1. Stop Bitbucket Data Center. See Start and stop Bitbucket.
2. Make an archive (such as a zip file) of the Bitbucket home directory. The home directory contains data directories (including the Git repositories), log files, installed plugins, SSH fingerprints, temporary files and caches.
3. Copy the archive of the Bitbucket home directory to the new machine and unzip it to its new location there.

    - For production environments the home directory should be secured against unauthorized access. See Bitbucket home directory.
    - When moving the home directory from Windows to Linux or Mac, make sure that the files within `<Bitbucket home directory>/git-hooks` and `<Bitbucket home directory>/shared/data/repositories/<repoID>/hooks` directories have the executable file permission set.
4. Set up an instance of Bitbucket Data Center in the new location by doing one of the following:
    - Make an archive of the old installation directory and copy it across to the new machine.
    - Install the same version of Bitbucket Data Center from scratch on the new machine.
5. Redefine the value for `BITBUCKET_HOME`, mentioned in Step 2. above, in the new `<Bitbucket installation directory>`, using the new location for your copied home directory. See Set the home directory for more information.
6. If you are continuing to use the Bitbucket Data Center embedded database, or you used the Migration Wizard to move the data, you should now be able to start Bitbucket Data Center on the new machine and have all your data available. See Start and stop Bitbucket. Once you have confirmed that the new installation of Bitbucket Data Center is working correctly, revert the access permissions for Bitbucket Data Center to their original values.
7. If you moved the data by performing a database export and import, carry on to Step 4. below to update the bitbucket.properties file in the `<Bitbucket home directory>`.

Using rysnc to move your installation

Another way to move your Bitbucket Data Center installation is to use rsync (learn more at ss64.com). This option may be helpful if you want to avoid the system downtime that using an archive file will require.

If you use rsync, make sure to use the `--delete` option. Without it, if you run rsync more than once, files removed from the source machine will not be removed from the target. As a result, the two filesystems will not match, and this can lead to problems with your installation.

4. Update the Bitbucket Data Center configuration

If you moved the Bitbucket Data Center data by performing a database export, you must update the bitbucket.properties file within `<Bitbucket home directory>/shared` with the changed configuration parameters for the database connection.

The configuration parameters are described in Configuration properties.

Once the configuration parameters are updated, you should be able to start Bitbucket Data Center on the new machine and have all your data available. See Start and stop Bitbucket. Once you have confirmed that the new installation of Bitbucket Data Center is working correctly, revert the access permissions for Bitbucket Data Center to their original values.

Migrate Bitbucket Server from Windows to Linux

Starting from 8.15.x, new releases of Bitbucket will be available only to Data Center customers. If you have a Server license, check out your options for upgrading.

On this page

Related pages:

- Supported platforms

This page describes how to migrate your Bitbucket Server instance from Windows to Linux operating system. For most scenarios, the overall procedure involves the following 4 steps:

1. Prepare for Migration
2. Move Bitbucket Server database (optional)
3. Data backup and Migration
4. Troubleshooting

You can upgrade Bitbucket Server after migrating to Linux. See Bitbucket Server upgrade guide for more details. This page does not describe any aspect of the upgrade procedure.

We recommend testing the migration on your staging/test instance before performing it on production. You can refer How to establish staging server environments for Bitbucket Server to set up your staging instance.

Prepare for migration

1. Set up your Linux server.

   Starting Bitbucket Server 7.0+, Linux support requires a 2.6.17+ kernel and glibc 2.7+. That means RHEL 5, which uses glibc 2.5, is no longer supported for Bitbucket Sever 7.0+.

2. Confirm that the operating system, database, other applicable platforms, and hardware on the target environment will comply with the requirements for Bitbucket Server.
3. Plan to migrate to a target server that runs the same version of Bitbucket as the source server.
4. Make sure you have created a user in Bitbucket Server (not in your external user directory) that has System Administrator global permissions. This is to avoid being locked out of Bitbucket Server in case the target server does not have access to your external user directory.
5. Alert users to the forthcoming Bitbucket Server service outage.
6. Ensure that users will not be able to update existing Bitbucket Server data during the migration. You can do this by temporarily changing the access permissions for Bitbucket Server or entering into maintenance mode while taking backup using Bitbucket backup strategies.
7. Perform a **full backup** of Bitbucket home directory and database using one of the backup strategies.

(Optional) Move Bitbucket Server database

This section describes steps to move your database to a different server or different supported database. You can use the existing database or move to a different database for Bitbucket Server on Linux. You do not need to do anything in this section if you are going to continue using the existing database as Windows. Please make sure to shut down Bitbucket Server running on your Windows instance.

If you plan to move your database, you can move the Bitbucket Server data:

1. from the embedded database to a supported external database.
2. to another instance of the same database.
3. from one database to another supported database (for example, from MySQL to PostgreSQL).

You can also move the actual DBMS. Atlassian recommends that for large installations, Bitbucket Server and the DBMS run on separate machines.

There are 2 steps:

1. Create and configure the database in the new location. Please refer to Connect Bitbucket to an external database, and the relevant child page, for more information.
2. Either:
    - If the new location is currently visible to Bitbucket Server, use the Database Migration Wizard. Please refer to Connect Bitbucket to an external database, and the relevant child page, for more information.
    - If the new location is not currently visible to Bitbucket Server (perhaps because you are moving to a new hosting provider), you need to perform a database export and then import the backup to the new DBMS. Please refer to the vendor documentation for detailed information on your DBMS.
      You will also need to update the bitbucket.properties file in the `<Bitbucket home directory>` as described in the section below.

Please note that Using Windows Authentication between a Linux Bitbucket Server installation and SQL server is not supported. Windows authentication is only available for Bitbucket instances running on Windows. It cannot be used on Linux because Microsoft does not provide shared objects for it. You will need to enable mixed-mode authentication for SQL Server if you are running Bitbucket on Linux.

Data backup and migration of Bitbucket Server data from Windows to Linux machine

This section gives a brief overview of how to backup and move the Bitbucket Server data to your Linux machine.

On Windows Server:

1. Perform a *full backup* of the Bitbucket Server instance that includes Bitbucket home directory and database. The home directory contains data directories (including the Git repositories), log files, installed plugins, SSH fingerprints, temporary files, and caches. The database contains Bitbucket specific data such as pull requests, comments, user permissions, etc.
2. To archive `BITBUCKET_HOME` directory manually, refer to Migrate Bitbucket Server to a different machine.
3. Make sure that the home directory and database are backed up at the same time to avoid sync issues.

We recommend creating a backup using one of the available backup strategies. This ensures consistency between filesystem and database data.

4. Shutdown Bitbucket Server. See Start and stop Bitbucket.

5. Move the backup to your Linux Server.

On target Linux Server:

1. Make sure you have installed the dependencies such as JDK/JRE, and Git on your Linux Server.
2. Restore `BITBUCKET_HOME` directory data from the backup onto the new `BITBUCKET_HOME` directory.
3. Download the same version of Bitbucket as your Windows instance from archives.
4. Install Bitbucket Server from scratch using the Bitbucket installation guide for Linux.

a. If you install Bitbucket Server from an archive file:
Update the new `BITBUCKET_HOME` directory path in `set-bitbucket-home.sh` located in installation directory at `$BITBUCKET_INSTALL/bin`

```
$ vi $BITBUCKET_INSTALL/bin/set-bitbucket-home.sh
# One way to set the BITBUCKET_HOME path is here via this variable.  Simply uncomment it
and set a valid path like
# /bitbucket/home.  You can of course set it outside in the command terminal; that will
also work.
#
if [ -z "$BITBUCKET_HOME" ]; then
    BITBUCKET_HOME="<YOUR_NEW_BITBUCKET_HOME where data is restored from Windows>"
fi
```

Make sure the user with which Bitbucket runs has full (read/write/execute) permissions on `BITBUCKET_HOME` and `BITBUCKET_INSTALL` directories. `atlbitbucket` user is created by default during installation.

b. If you install Bitbucket Server through Linux installer:
Specify the new BITBUCKET_HOME directory path during installation.

```
$sudo ./atlassian-bitbucket-X.X.X-x64.bin
Starting Installer ...
.
.
The location for Bitbucket data.
This will be the default location for repositories, plugins, and other data.

Ensure that this location is not used by another Bitbucket installation.
[/var/atlassian/application-data/bitbucket]
<YOUR_NEW_BITBUCKET_HOME where data is restored from Windows>
```

Make sure the user with which Bitbucket runs has full (read/write/execute) permissions on `BITBUCKET_HOME` and `BITBUCKET_INSTALL` directories. The `atlbitbucket` user is created by default during installation.

5. If you moved Bitbucket Server database data by performing a database export, you must update the bitbucket.properties file within `<BITBUCKET_HOME>/shared` with the changed configuration parameters for the database connection.

```
jdbc.driver=<Database driver>
jdbc.url=<JDBC URL that will be used to connect to the database>
jdbc.user=<the JDBC user that will be used to authenticate with the database>
jdbc.password=<JDBC user password>
```

The configuration parameters are described in Configuration properties.

ⓘ You do not need to do anything if you are going to continue using the existing database as Windows.

6. Start Bitbucket Server on Linux. See Start and stop Bitbucket.

7. Once you have confirmed that the new installation of Bitbucket Server is working correctly, revert users' access permissions for Bitbucket Server (if you temporarily changed them at the time of migration).

Troubleshooting

If something is not working correctly after you have completed the steps above to migrate your Bitbucket instance, please check for known issues and try troubleshooting as described below:

- If `$BITBUCKET_HOME` was using a symbolic link in the original instance, you may encounter some issues with forked repositories in the new instance. Check the details in the knowledge base article to resolve error object directory does not exist.

- If you encounter a problem during migration and cannot solve it, please create a support ticket and one of our support engineers will help you.

Run Bitbucket in AWS

The AWS Quick Start template as a method of deployment is nearing its end-of-support date on Februar y 29, 2024. You can still use the template after this date but we won't maintain or update it. Learn more about the AWS deployment template

We recommend deploying your Data Center products on a Kubernetes cluster using our Helm charts for a more efficient and robust infrastructure and operational setup. Learn more about deploying on Kubernetes

AWS now recommends switching launch configurations, which our AWS Quick Start template uses, to la unch templates. We won't do this switch, since we're ending our support for the AWS Quick Start template. You'll still be able to create launch configurations until December 31, 2023.

If you decide to deploy your Data Center instance in a clustered environment, consider using Amazon Web Services (AWS). AWS allows you to scale your deployment elastically by resizing and quickly launching additional nodes, and provides a number of managed services that work with Data Center products. These services make it easier to configure, manage, and maintain your deployment's clustered infrastructure.

We recommend deploying your Data Center instance on a Kubernetes cluster using our Helm charts. This allows you to stay in control of your data and meet your compliance needs while still using a modern infrastructure. Learn more about running Data Center products on Kubernetes

Interested in learning more about what Data Center provides? Check out the Data Center overview

Non-clustered VS clustered environment

A single node is adequate for most Small or Medium size deployments, unless you need high availability or zero-downtime upgrades.

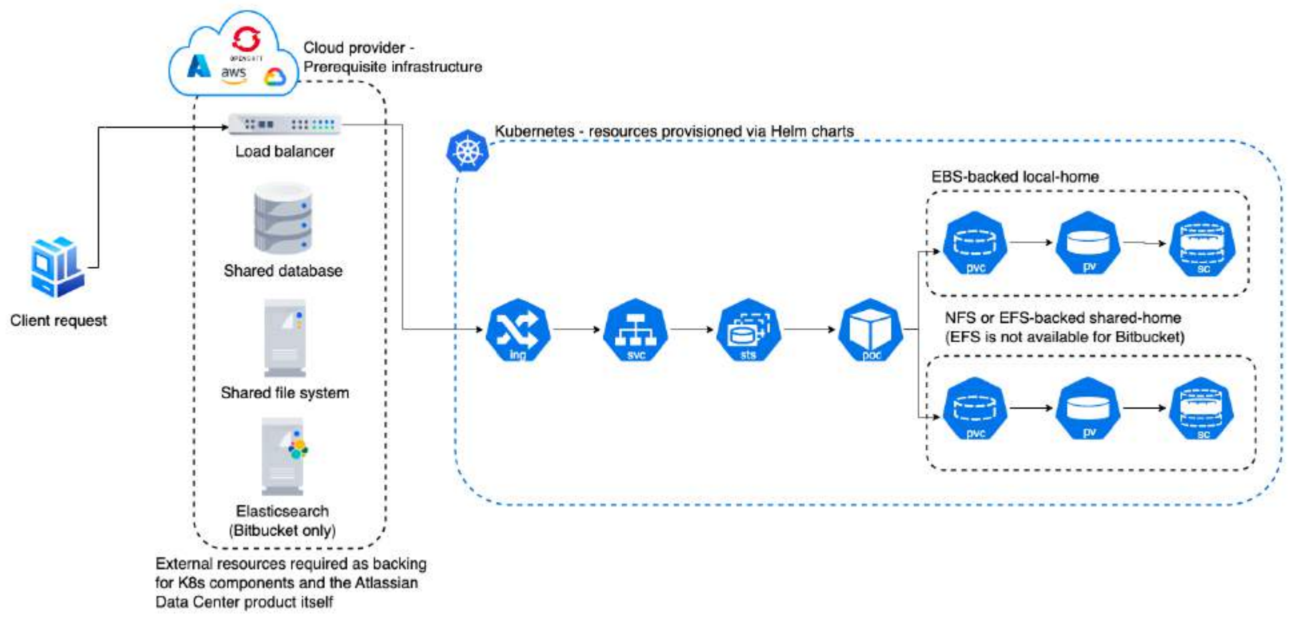
If you have an existing Server installation, you can still use its infrastructure when you upgrade to Data Center. Many features exclusive to Data Center (like SAML single sign-on, self-protection via rate limiting, and CDN support) don't require clustered infrastructure. You can start using these Data Center features by simply upgrading your Server installation's license.

For more information on whether clustering is right for you, check out Atlassian Data Center architecture and infrastructure options

Deploying Data Center products in a cluster using the AWS EKS

You can deploy your Data Center instance using a managed Kubernetes cluster service. Learn how to prepare a Kubernetes cluster using Amazon EKS

Here's an overview of the architecture for a Data Center instance running in Kubernetes:


Cloud provider - Prerequisite infrastructure
aws
Load balancer
Shared database
Shared file system
Elasticsearch (Bitbucket only)
External resources required as backing for K8s components and the Atlassian Data Center product itself
Client request
Kubernetes - resources provisioned via Helm charts
ing
svc
sts
pod
EBS-backed local-home
NFS or EFS-backed shared-home (EFS is not available for Bitbucket)
pvc
pv
sc

For more information, see Atlassian products on AWS.

Even though you can deploy our Data Center products on AWS GovCloud, we don’t test or verify our Helm charts on the AWS GovCloud environment and can’t provide any support.

Deploy your instance with AWS

Create components

Before you deploy your Data Center product with AWS, you need to create the required infrastructure components. These include a database, a Kubernetes cluster, and shared storage. Learn more about the prerequisites

Take advantage of Helm charts

If you decide to deploy your Data Center instance on AWS with Kubernetes, make sure to use our Helm charts. Learn how to install your Data Center product with Helm charts

Launch Bitbucket in AWS manually

This page describes how to launch the Bitbucket Amazon Machine Image (AMI) manually, giving you complete control over the components enabled in the AMI, and over AWS-specific configuration, network and security settings. If you are looking for an automated way to launch Bitbucket we recommend deploying a multi-node Bitbucket Data Center instance, using the AWS Quick Start guide.

You can launch the Atlassian Bitbucket Server AMI directly from the AWS Console, or by running the EC2 launch wizard. See Launching EC2 Instances for detailed instructions.

On this page:

The Bitbucket AMI

The Atlassian Bitbucket Server AMI provides a typical deployment of Bitbucket Server in AWS. It bundles all the components used in a typical Bitbucket Server deployment (reverse proxy, external database, backup tools, data volume, and temporary storage) pre-configured and ready to launch.

You can use the Atlassian Bitbucket Server AMI as a "turnkey" deployment of a Bitbucket Server instance in AWS, or use it as the starting point for customizing your own, more complex Bitbucket Server deployments.

Finding the Atlassian Bitbucket Server AMI

You can find the Atlassian Bitbucket Server AMI by clicking **Community AMIs** and searching for **Atlassian Bitbucket**.

Be sure to use the correct AMI ID for your specific region.

To find the latest AMI using the Amazon CLI you can use the following command:

```
aws ec2 describe-images --owners 098706035825 --filters "Name=name,Values=Atlassian Bitbucket*" --query
'sort_by(Images, &CreationDate)[-1].{ID:ImageId, "AMI Name":Name}' --output table
```

The Bitbucket AMI is not currently available in some regions, such as `govcloud-us` (AWS GovCloud (US)) and `cn-north-1` (China (Beijing)).

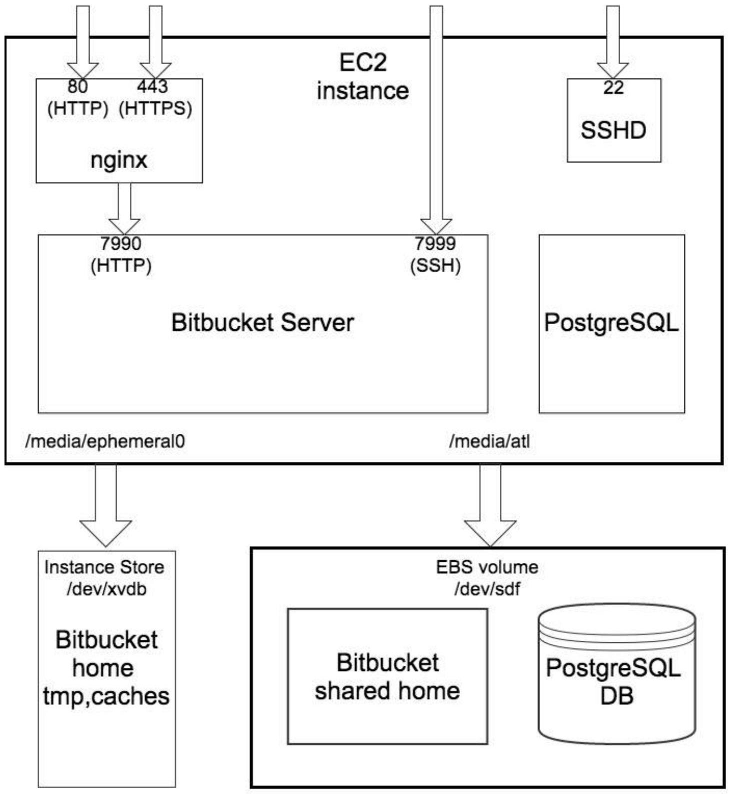
Components of the Bitbucket Server AMI

An instance launched from the Atlassian Bitbucket Server AMI contains the following components:

- Bitbucket Server (either the latest version or a version of your choice),
- an external PostgreSQL database,
- nginx as a reverse proxy,
- the Bitbucket Server DIY Backup utilities pre-configured for native AWS snapshots,
- an EBS Volume and Instance Store to hold the data.

Operating system	Amazon Linux 64-bit, 2016.09.0
Bitbucket Server	Bitbucket Server (latest public version or a version of your choice) is downloaded and installed on launch.
Administrative tools	atlassian-bitbucket-diy-backup pre-installed and configured for AWS native backup, accessible over SSH.

Reverse proxy	nginx, configured as follows: • listens on port 80 and (optionally) 443, • (optionally) terminates SSL (HTTPS) and passes through plain HTTP to Bitbucket Server, • displays a static HTML page when the Bitbucket Server service is not running.
Database	PostgreSQL 9.3
Block devices	1. An EBS volume (`/dev/xvdf`, mounted as `/media/atl`), that stores: • the Bitbucket Server shared home directory, containing all of Bitbucket Server's repository, attachment, and other data, • PostgreSQL's data directory. 2. An EC2 Instance Store (`/dev/xvdb`, mounted on /media/ephemeral0) to store Bitbucket Server's temporary and cache files.



Choosing an instance type

When choosing an EC2 instance type, see Infrastructure recommendations for enterprise Bitbucket instances on AWS for recommended instance sizing.

Minimum hardware requirements

The default t2.micro (Free tier eligible), small, and medium instance types don't meet Bitbucket Server's minimum hardware requirements, and aren't supported for production deployments. See Infrastructure recommendations for enterprise Bitbucket instances on AWS for the EC2 instance types supported by Bitbucket Server.

Configure instance details

When configuring your EC2 instance there are some important details to consider:

Identity and Access Management (IAM) Role

IAM Role must be configured at launch time

An IAM Role can only be configured for your EC2 instance ***during initial launch***. You can't associate an IAM role with a running EC2 instance ***after*** launch. See IAM Roles for more information.

It is recommended to launch your instance with an IAM Role that allows native AWS DIY Backup to run without explicit credentials. See IAM Roles for Amazon EC2 for more information.

While configuring instance details in the EC2 Launch wizard, you can create a new IAM Role by clicking **Crea te new IAM role.** The role should contain at least the following policy:

```
{
    "Statement": [
        {
            "Resource": [
                "*"
            ],
            "Action": [
                "ec2:AttachVolume",
                "ec2:CreateSnapshot",
                "ec2:CreateTags",
                "ec2:CreateVolume",
                "ec2:DescribeSnapshots",
                "ec2:DescribeVolumes",
                "ec2:DetachVolume"
            ],
            "Effect": "Allow"
        }
    ],
    "Version": "2012-10-17"
}
```

Advanced Details

The Atlassian Bitbucket Server AMI can be configured in a number of different ways at launch time:

- The built-in PostgreSQL and Nginx components (enabled by default) can be disabled
- Self-signed SSL certificate generation (disabled by default) can be enabled

You can control these options supplying User Data to your instance under **Advanced Details** in **Step 3: Configure Instance Details** of the EC2 launch wizard. All user-configurable behavior in the Atlassian Bitbucket Server AMI can be controlled by creating a file `/etc/atl` containing shell variable definitions. On first boot, the Atlassian Bitbucket Server AMI will source the file `/etc/atl` (if it exists), allowing its built-in default variable definitions to be overridden.

For example, to enable self-signed SSL certificate generation (and force all Web access to Bitbucket Server to use HTTPS), you can add User Data (**As text**) as follows:

```
#!/bin/bash
echo "ATL_SSL_SELF_CERT_ENABLED=true" >>/etc/atl
```

For a complete list of variables that can be overridden in User Data at launch time, see Administer Bitbucket in AWS.

User Data is flexible and allows you to run arbitrary BASH commands on your instance at launch time, in addition to overriding variables in `/etc/atl`. See Running Commands on Your Linux Instance at Launch for more information.

Security considerations

See Securing Bitbucket in AWS for more details about enabling HTTPS and self-signed certificates in the Atlassian Bitbucket Server AMI.

Add storage

When attaching EBS volumes, use these storage device settings for your instance.

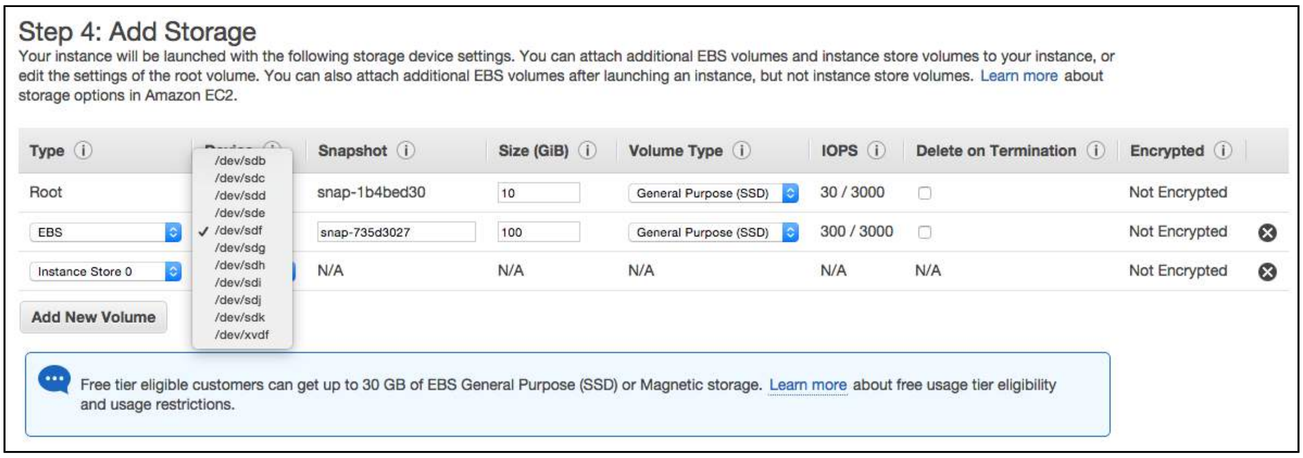
Type	Device	Purpose	Size (GiB)	Volume Type	IOPS	Delete on Termination
Root	`/dev/xvda`	Linux root volume	50	General Purpose (SSD)	N/A	Yes
EBS	`/dev/xvdf`	Bitbucket Server data: repositories, attachments, avatars, etc.	100+	General Purpose (SSD) / Provisioned IOPS *	300+ *	Yes
Instance Store	`/dev/xvdb`	Bitbucket Server temporary files and caches	N/A	N/A	N/A	N/A

* Provisioned IOPS with at least 500 – 1000 IOPS is recommended for instances with more than 500 active users. See Infrastructure recommendations for enterprise Bitbucket instances on AWS for more information.

The Atlassian Bitbucket Server AMI won't use any other block devices attached to the instance. The EBS volume for `/dev/xvdf` will be initialized and formatted at launch time, unless a snapshot id is provided (see the screen capture below), in which case it will only format it if it's not already formatted. See Managing EBS Volumes for more information about storage options in Amazon EC2.

Attach an existing EBS snapshot

You can also attach an existing EBS volume based on a snapshot during launch. To attach an existing EBS volume, within the *Device* field, change the EBS volume device to `/dev/sdf` and enter the Snapshot ID of the snapshot.



Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. Learn more about storage options in Amazon EC2.

Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Delete on Termination	Encrypted
Root		snap-1b4bed30	10	General Purpose (SSD)	30 / 3000	☐	Not Encrypted
EBS	/dev/sdf	snap-735d3027	100	General Purpose (SSD)	300 / 3000	☐	Not Encrypted
Instance Store 0		N/A	N/A	N/A	N/A	N/A	Not Encrypted

Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. Learn more about free usage tier eligibility and usage restrictions.

See Administering Bitbucket Server in AWS - Moving your Bitbucket Server data volume between instances for more details.

Configure your Security Group

When configuring your Security Group, you must allow allow incoming traffic to all the following ports. For more information, see Using Security Groups.

Type	Protocol	Port	Description
SSH	TCP	22	SSH port, allowing access to administrative functions
HTTP	TCP	80	
HTTPS	TCP	443	
Custom TCP Rule	TCP	7999	Bitbucket Server SSH port for Git hosting operations

What's next?

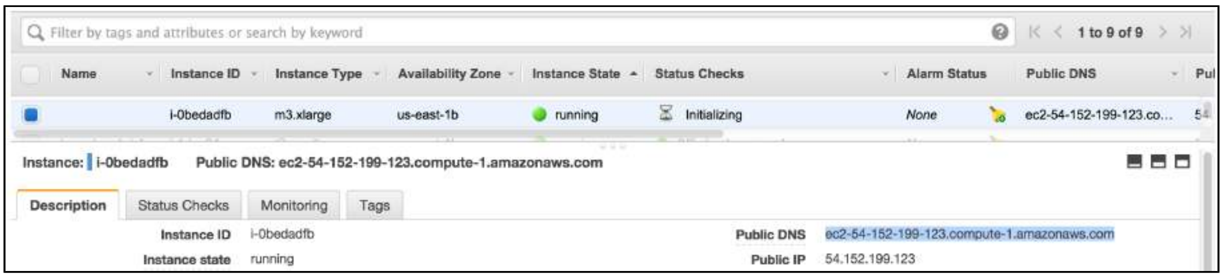
Now you're ready to configure your AWS version of Bitbucket Server.

View your new instance

Once your new EC2 instance has launched, find it within the EC2 console and navigate to the URL provided so you can continue configuring Bitbucket Server.

To find the URL of your new EC2 instance

1. From within the EC2 Console, in the Description tab of your new instance, copy the **Public DNS**.



Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS	Pul
	i-0bedadfb	m3.xlarge	us-east-1b	● running	Initializing	None	ec2-54-152-199-123.co...	54

Instance: i-0bedadfb Public DNS: ec2-54-152-199-123.compute-1.amazonaws.com

Instance ID i-0bedadfb
Instance state running
Public DNS ec2-54-152-199-123.compute-1.amazonaws.com
Public IP 54.152.199.123

2. Paste the URL into a browser window to view start using Bitbucket Server.

Set up your AWS deployment of Bitbucket Server

Once you've followed the URL of the EC2 instance you are presented with the Bitbucket Server Setup Wizard. When you've completed the setup, you can use your instance like any other Bitbucket Server instance. So be sure to check out the rest of the Getting Started with Bitbucket Server documentation.

Administer Bitbucket in AWS

⚠ The AWS Quick Start template as a method of deployment is nearing its end-of-support date on Febr uary 29, 2024. You can still use the template after this date but we won't maintain or update it. Learn more about the AWS deployment template

We recommend deploying your Data Center products on a Kubernetes cluster using our Helm charts for a more efficient and robust infrastructure and operational setup. Learn more about deploying on Kubernetes

AWS now recommends switching launch configurations, which our AWS Quick Start template uses, to launch templates. We won't do this switch, since we're ending our support for the AWS Quick Start template. You'll still be able to create launch configurations until December 31, 2023.

This page describes administering a *single-node* instance of Bitbucket Server on AWS. For a deployment that is better suited to the architectural principles of AWS, we recommend deploying a clustered Bitbucket Data Center instance, which offers greater performance at scale, high availability and elastic scalability.

This page describes the Atlassian Bitbucket Amazon Machine Image (AMI), what's inside it, how to launch it, and how to perform administration tasks in the Amazon Web Services (AWS) environment.

On this page:

The Bitbucket AMI

The Atlassian Bitbucket Server AMI provides a typical deployment of Bitbucket Server in AWS. It bundles all the components used in a typical Bitbucket Server deployment (reverse proxy, external database, backup tools, data volume, and temporary storage) pre-configured and ready to launch.

You can use the Atlassian Bitbucket Server AMI as a "turnkey" deployment of a Bitbucket Server instance in AWS, or use it as the starting point for customizing your own, more complex Bitbucket Server deployments.

Components of the Bitbucket Server AMI

An instance launched from the Atlassian Bitbucket Server AMI contains the following components:

- Bitbucket Server (either the latest version or a version of your choice),
- an external PostgreSQL database,
- nginx as a reverse proxy,
- the Bitbucket Server DIY Backup utilities pre-configured for native AWS snapshots,
- an EBS Volume and Instance Store to hold the data.

Operating system	Amazon Linux 64-bit, 2016.09.0
Bitbucket Server	Bitbucket Server (latest public version or a version of your choice) is downloaded and installed on launch.
Administrative tools	atlassian-bitbucket-diy-backup pre-installed and configured for AWS native backup, accessible over SSH.

Reverse proxy	nginx, configured as follows: • listens on port 80 and (optionally) 443, • (optionally) terminates SSL (HTTPS) and passes through plain HTTP to Bitbucket Server, • displays a static HTML page when the Bitbucket Server service is not running.
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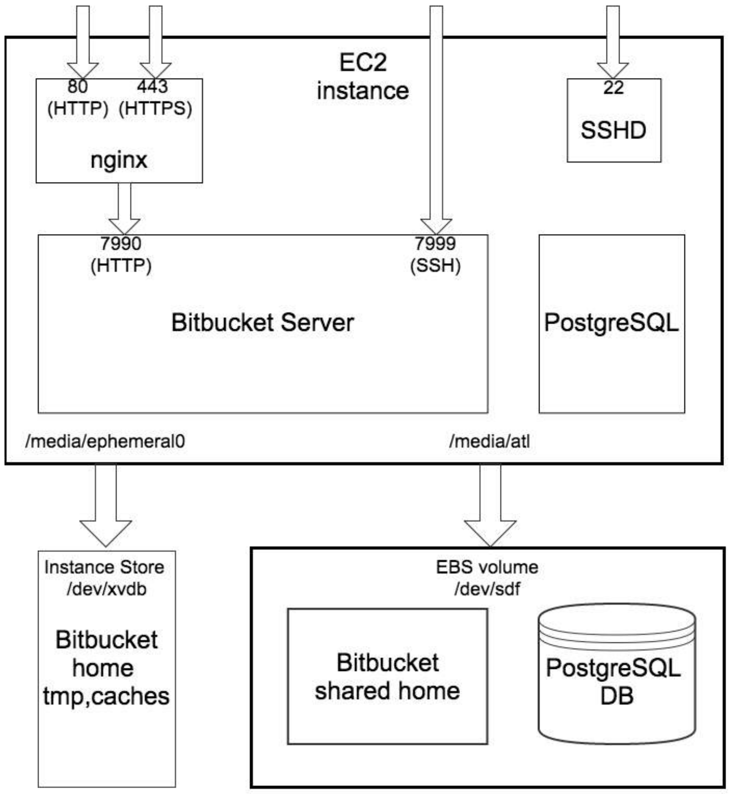
Block devices	1. An EBS volume (`/dev/xvdf`, mounted as `/media/atl`), that stores: • the Bitbucket Server shared home directory, containing all of Bitbucket Server's repository, attachment, and other data, • PostgreSQL's data directory. 2. An EC2 Instance Store (`/dev/xvdb`, mounted on /media/ephemeral0) to store Bitbucket Server's temporary and cache files.



Launching your instance

The Atlassian Bitbucket Server AMI can be launched by either

- using a CloudFormation template which automates creation of the associated Security Group and IAM Role. For more info, see Quick Start with Bitbucket Server and AWS.
- manually using the AWS Console, which gives finer control over the optional components in the instance and AWS-specific network, security, and block device settings. For more info, see Launch Bitbucket in AWS manually.

On first boot, the Atlassian Bitbucket Server AMI reads the file `/etc/atl` (if any), which can override variables that enable each of the installed components. So for example to enable a self-signed SSL certificate, you can supply user data to the instance at launch time like this:

```
#!/bin/bash
echo "ATL_SSL_SELF_CERT_ENABLED=true" >>/etc/atl
```

The following variables can be configured:

Variable name	Default value	Description
ATL_NGINX_ENABLED	`true`	Set to `false` to disable the Nginx reverse proxy, and leave Bitbucket Server's `server.xml` configured to listen on port 7990 with no proxy.
ATL_POSTGRES_ENABLED	`true`	Set to `false` to disable the PostgreSQL service, and leave Bitbucket Server configured with its internal H2 database.
ATL_SSL_SELF_CERT_ENABLED	`false`	Set to `true` to enable a self-signed SSL certificate to be generated at launch time, and for Bitbucket Server's `server.xml` and Nginx's `nginx.conf` to be configured for HTTPS. Requires `ATL_NGINX_ENABLED` also to be `true`.
ATL_BITBUCKET_VERSION	`latest`	Must be a valid Bitbucket version number (for example, `5.5.0`), or `latest` for the latest public release.

See Proxy and secure Bitbucket for more information about Bitbucket Server's `server.xml` configuration file.

Connecting to your instance using SSH

When connecting to your instance over SSH, use `ec2-user` as the user name, for example:

```
ssh -i keyfile.pem ec2-user@ec2-xx-xxx-xxx-xxx.compute-1.amazonaws.com
```

The `ec2-user` has `sudo` access. The Atlassian Bitbucket Server AMI does not allow SSH access by `root`.

Installing an SSL certificate in your Bitbucket Server instance

If launched with a self-signed SSL certificate (you selected **SSLCertificate > Generate a self-signed certificate** in Quick Start with Bitbucket Server and AWS or you set `ATL_SSL_SELF_CERT_ENABLED=true` in Launch Bitbucket in AWS manually), Bitbucket Server will be configured to force HTTPS and redirect all plain HTTP requests to the equivalent `https://` URL.

It's highly recommended to replace this self-signed SSL certificate with a proper one for your domain, obtained from a Certification Authority (CA), at the earliest opportunity. See Secure Bitbucket in AWS. Once you have a true SSL certificate, install it as soon as possible.

To replace the self-signed SSL certificate with a true SSL certificate

1. Place your certificate file at (for example) `/etc/nginx/ssl/my-ssl.crt`
2. Place your *password-less* certificate key file at `/etc/nginx/ssl/my-ssl.key`
3. Edit `/etc/nginx/nginx.conf` as follows:
    a. Replace references to `/etc/nginx/ssl/self-ssl.crt` with `/etc/nginx/ssl/my-ssl.crt`
    b. Replace references to `/etc/nginx/ssl/self-ssl.key` with `/etc/nginx/ssl/my-ssl.key`
4. Append the contents of `/etc/nginx/ssl/my-ssl.crt` to the default system PKI bundle (`/etc/pki/tls/certs/ca-bundle.crt`) to ensure scripts on the instance (such as DIY backup) can `curl` successfully.
5. Restart nginx.

Backing up your instance

The Atlassian Bitbucket Server AMI includes a complete set of Bitbucket Server DIY Backup scripts which has been built specifically for AWS. For instructions on how to backup and restore your instance please refer to Using Bitbucket DIY Backup in AWS.

Upgrading your instance

To upgrade to a later version of Bitbucket Server in AWS you first must connect to your instance using SSH, then follow the steps in the Bitbucket Server upgrade guide.

Stopping and starting your EC2 instance

An EC2 instance launched from the Atlassian Bitbucket Server AMI can be stopped and started just as any machine can be powered off and on again.

When stopping your EC2 instance, it is important to first

1. Stop the `atlbitbucket`, `atlbitbucket_search`, and `postgresql93` services.
2. Unmount the `/media/atl` filesystem.

If your EC2 instance becomes unavailable after stopping and restarting

When starting your EC2 instance back up again, if you rely on Amazon's automatically assigned public IP address (rather than a fixed private IP address or Elastic IP address) to access your instance, your IP address may have changed. When this happens, your instance can become inaccessible and display a "The host name for your Atlassian instance has changed" page. To fix this you need to update the hostname for your Bitbucket Server instance.

To update the hostname for your Bitbucket Server instance

1. Restart the Bitbucket service on all application nodes by running this command, which will update the hostname

```
sudo service atlbitbucket restart
```

2. Wait for Bitbucket Server to restart.
3. If you have also set up Bitbucket Server's Base URL to be the public DNS name or IP address be sure to also update Bitbucket Server's base URL in the administration screen to reflect the change.

Migrating your existing Bitbucket Server or Bitbucket Data Center instance into AWS

Migrating an existing instance to AWS involves moving consistent backups of your `${BITBUCKET_HOME}` a nd your database to the AWS instance.

To migrate your existing instance into AWS

1. Check for any known migration issues in the Bitbucket Data Center and Server Knowledge Base.
2. Alert users to the forthcoming service outage.
3. Create a user in the Bitbucket Server Internal User Directory with `SYSADMIN` permissions to the instance so you don't get locked out if the new server is unable to connect to your User Directory.
4. Take a backup of your instance with the Bitbucket Server DIY Backup (Bitbucket Server or Data Center).
5. Launch Bitbucket Server in AWS using the Quick Start instructions, which uses a CloudFormation template.
6. Connect to your AWS EC2 instance with SSH and upload the backup file.
7. Restore the backup with the same tool used to generate it.
8. If necessary, update the JDBC configuration in the `${BITBUCKET_HOME}/shared/bitbucket.properties` file.

Resizing the data volume in your Bitbucket Server instance

By default, the application data volume in an instance launched from the Atlassian Bitbucket Server AMI is a standard Linux ext4 filesystem, and can be resized using the standard Linux command line tools.

To resize the data volume in your Bitbucket Server instance

1. Stop the `atlbitbucket`, `atlbitbucket_search`, and `postgresql93` services.
2. Unmount the `/media/atl` filesystem.
3. Create a snapshot of the volume to resize.
4. Create a new volume from the snapshot with the desired size, in the same availability zone as your EC2 instance.
5. Detach the old volume and attach the newly resized volume as `/dev/sdf`.
6. Resize `/dev/sdf` using `resize2fs`, verify that its size has changed, and remount it on `/media/atl` .
7. Start the `atlbitbucket`, `atlbitbucket_search`, and `postgresql93` services.

For more information, see Expanding the Storage Space of an EBS Volume on Linux, Expanding a Linux Partition, and the Linux manual pages for `resize2fs` and related commands.

Moving your Bitbucket Server data volume between instances

Occasionally, you may need to move your Bitbucket Server data volume to another instance–for example, when setting up staging or production instances, or when moving to an instance to a different availability zone.

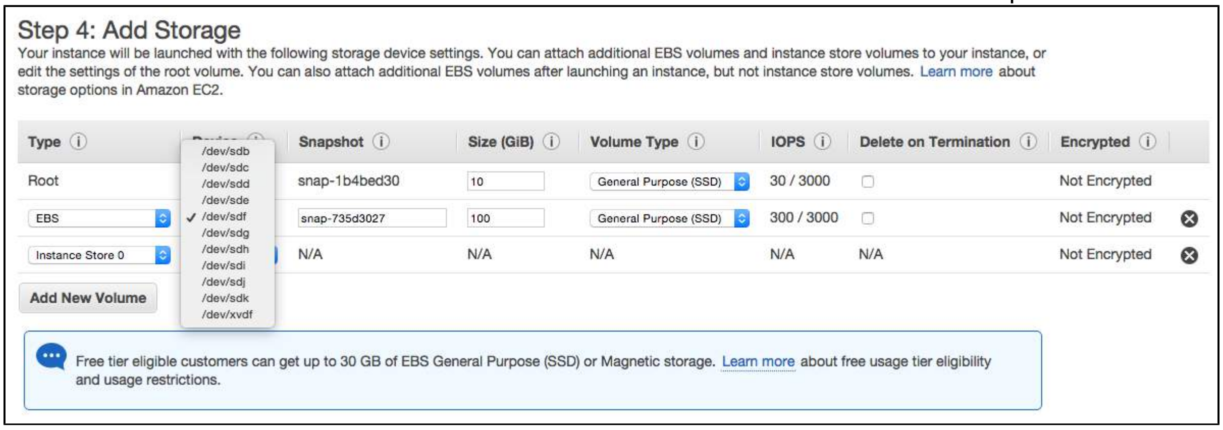
There are two approaches to move your Bitbucket Server data volume to another instance

1. Take a backup of your data volume with Bitbucket Server DIY Backup, and restore it on your new instance. See Using Bitbucket DIY Backup in AWS for this option.
2. Launch a new instance from the Atlassian Bitbucket Server AMI with a snapshot of your existing data volume.

> A Bitbucket Server data volume may only be moved to a Bitbucket Server instance of the same or higher version than the original.

To launch a new instance from the Bitbucket Server AMI using a snapshot of your existing Bitbucket Server data volume

1. Stop the `atlbitbucket`, `atlbitbucket_search`, and `postgresql93` services on your existing Bitbucket Server instance.
2. Unmount the `/media/atl` filesystem.
3. Create a snapshot of the Bitbucket Server data volume (the one attached to the instance as `/dev /sdf`).
4. Once the snapshot generation has completed, launch a new instance from the Atlassian Bitbucket Server AMI as described in Launch Bitbucket in AWS manually. When adding storage, change the EBS volume device to `/dev/sdf` as seen below and enter the id of the created snapshot.



Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. Learn more about storage options in Amazon EC2.

Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Delete on Termination	Encrypted	
Root		snap-1b4bed30	10	General Purpose (SSD)	30 / 3000	☐	Not Encrypted	
EBS	✓ /dev/sdf	snap-735d3027	100	General Purpose (SSD)	300 / 3000	☐	Not Encrypted	⊗
Instance Store 0		N/A	N/A	N/A	N/A	N/A	Not Encrypted	⊗

Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. Learn more about free usage tier eligibility and usage restrictions.

5. If the host name (private or public) that users use to reach your Bitbucket Server instance has changed as a result of moving availability zones (or as a result of stopping an instance and starting a new one) you will need to SSH in and run

`sudo /opt/atlassian/bin/atl-update-host-name.sh` <*newhostname*>
where <*newhostname*> is the new host name.

6. Once Bitbucket Server has restarted your new instance should be fully available.
7. If the host name has changed you should also update the JDBC URL configuration in the `bitbucket.properties` file (typically located in `/var/atlassian/application-data/bitbucket/shared/`), as well as Bitbucket Server's base URL in the administration screen to reflect this.

Recommendations for running Bitbucket in AWS

The AWS Quick Start template as a method of deployment is nearing its end-of-support date on Februar y 29, 2024. You can still use the template after this date but we won't maintain or update it. Learn more about the AWS deployment template

We recommend deploying your Data Center products on a Kubernetes cluster using our Helm charts for a more efficient and robust infrastructure and operational setup. Learn more about deploying on Kubernetes

AWS now recommends switching launch configurations, which our AWS Quick Start template uses, to la unch templates. We won't do this switch, since we're ending our support for the AWS Quick Start template. You'll still be able to create launch configurations until December 31, 2023.

Knowing your load profile is useful for planning your instance's growth, looking for inflated metrics, or simply keeping it at a reasonable size. In Bitbucket Data Center load profiles, we showed you some simple guidelines for finding out if your instance was *Small*, *Medium*, *Large*, or *XLarge*. We based these size profiles on Server and Data Center case studies, covering varying infrastructure sizes and configurations.

A single node can be adequate for most Small or Medium size deployments, especially if you don't require high availability. If you have an existing Server installation, you can still use its infrastructure when you upgrade to Data Center. Many features exclusive to Data Center (like SAML single sign-on, self-protection via rate limiting, and CDN support) don't require clustered infrastructure. You can start using these Data Center features by simply upgrading your Server installation's license.

For more information on whether clustering is right for you, check out Atlassian Data Center architecture and infrastructure options.

As your load grows closer to Large or XLarge, you should routinely evaluate your infrastructure. Once your environment starts to experience performance or stability issues, consider migrating to a clustered (or cluster-ready) infrastructure. When you do, keep in mind that it may not be always clear how to do that effectively – for example, adding more application nodes to a growing Medium-sized instance doesn't always improve performance (in fact, the opposite might happen).

To help you plan your infrastructure set-up or growth, we ran a series of performance tests on typical Medium, Large, and XLarge instances. We designed these tests to get useful, data-driven recommendations for your clustered deployment's application and database nodes. These recommendations can help you plan a suitable clustered environment, one that is adequate for the size of your projected content and traffic.

Note that large repositories might influence performance.

We advise that you monitor performance on a regular basis.

Approach

We ran all tests in AWS. This allowed us to easily define and automate multiple tests, giving us a large (and fairly reliable) sample.

Each part of our test infrastructure was provisioned from a standard AWS component available to all AWS users. This allows for easy deployment of recommended configurations. You can also use AWS Quick Starts for deploying Bitbucket Data Center.

It also means you can look up specifications in AWS documentation. This helps you find equivalent components and configurations if your organization prefers a different cloud platform or bespoke clustered solution.

Some things to consider

To effectively benchmark Bitbucket on a wide range of configurations, we designed tests that could be easily set up and replicated. Accordingly, when referencing our benchmarks for your production environment, consider:

- We didn't install apps on our test instances, as we focused on finding the right configurations for the *core* product. When designing your infrastructure, you need to account for the impact of apps you want to install.
- We used RDS with default settings across all tests. This allowed us to get consistent results with minimal setup and tuning.
- Our test environment used dedicated AWS infrastructure hosted on the same subnet. This helped minimize network latency.
- We used an internal testing tool called Trikit to simulate the influx of git packets. This gave us the ability to measure git request speeds without having to measure client-side git performance. It also meant our tests didn’t unpack git refs, as the tool only receives and decrypts git data.
- The performance (response times) of git operations will be affected largely by repository size. Our test repositories averaged 14.2MB in size. We presume that bigger repositories might require stronger hardware.
- Due to limitations in AWS, we initialized EBS volumes (storage blocks) on the NFS servers before starting the test. Without disk initializations, there is a significant increase in disk latency, and test infrastructure slows for several hours.

  We enabled **analytics** on each test instance to collect usage data. For more information, see Change data collection settings.

Methodology

Each test involved applying the same amount of traffic to a Bitbucket data set, but on a different AWS environment. We ran three series of tests, each designed to find optimal configurations for the following components:

- Bitbucket application node
- Database node
- NFS node

To help ensure benchmark reliability, we initialized the EBS volumes and tested each configuration for three hours. We observed stable response times throughout each test. Large instance tests used **Bitbucket Data Center 5.16** while XLarge used **Bitbucket Data Center 6.4.** We used a custom library (Trikit) running v1 protocol to simulate Git traffic.

Data sets

We created a Large-sized Bitbucket Data Center instance with the following dimensions:

Metric	Value (approximate)
Repositories	52,000
Active users	25,000
Pull requests	850,000
Traffic (git operations per hour)	40,000

Content and traffic profiles are based on Bitbucket Data Center load profiles, which put the instance’s overall load profile at the highest level *of Large* profile. We believe these metrics represent a majority of real-life, Large-sized Bitbucket Data Center instances.

Metric	Value (approximate)
Users	25,000
Groups	50,000
Projects (including personal)	16,700
Comments on pull requests	3,500,000

Metric	Total	Component	Value (approximate)
Total repositories	52,000	Regular repositories	26,000
		Public forks	9,000
		Private repositories	17,000
Total pull requests	859,000	Pull requests open	8,500
		Pull requests merged	850,000
Traffic (git operations per hour)	40,000	Clones	16,000
		Fetches	14,000
		Pushes	10,000

We created an XLarge-sized Bitbucket Data Center instance with the following dimensions:

Metric	Value (approximate)
Repositories	110,000
Active users	50,000
Pull requests	1,790,000
Traffic (git operations per hour)	65,000

Content and traffic profiles are based on Bitbucket Data Center load profiles, which put the instance's overall load profile at the *XLarge* profile. We believe these metrics represent a majority of real-life, XLarge-sized Bitbucket Data Center instances.

Metric	Value (approximate)
Users	25,000
Groups	3,000
Projects (including personal)	52,000
Comments on pull requests	8,700,000

Metric	Total	Component	Value (approximate)
Total repositories	105,000	Regular repositories	52,000
		Public forks	17,000
		Private repositories	35,000
Total pull requests	1,790,000	Pull requests open	130,000
		Pull requests merged	1,660,000
Traffic (git operations per hour)	70,000	Clones	18,700
		Fetches	25,300
		Pushes	26,000

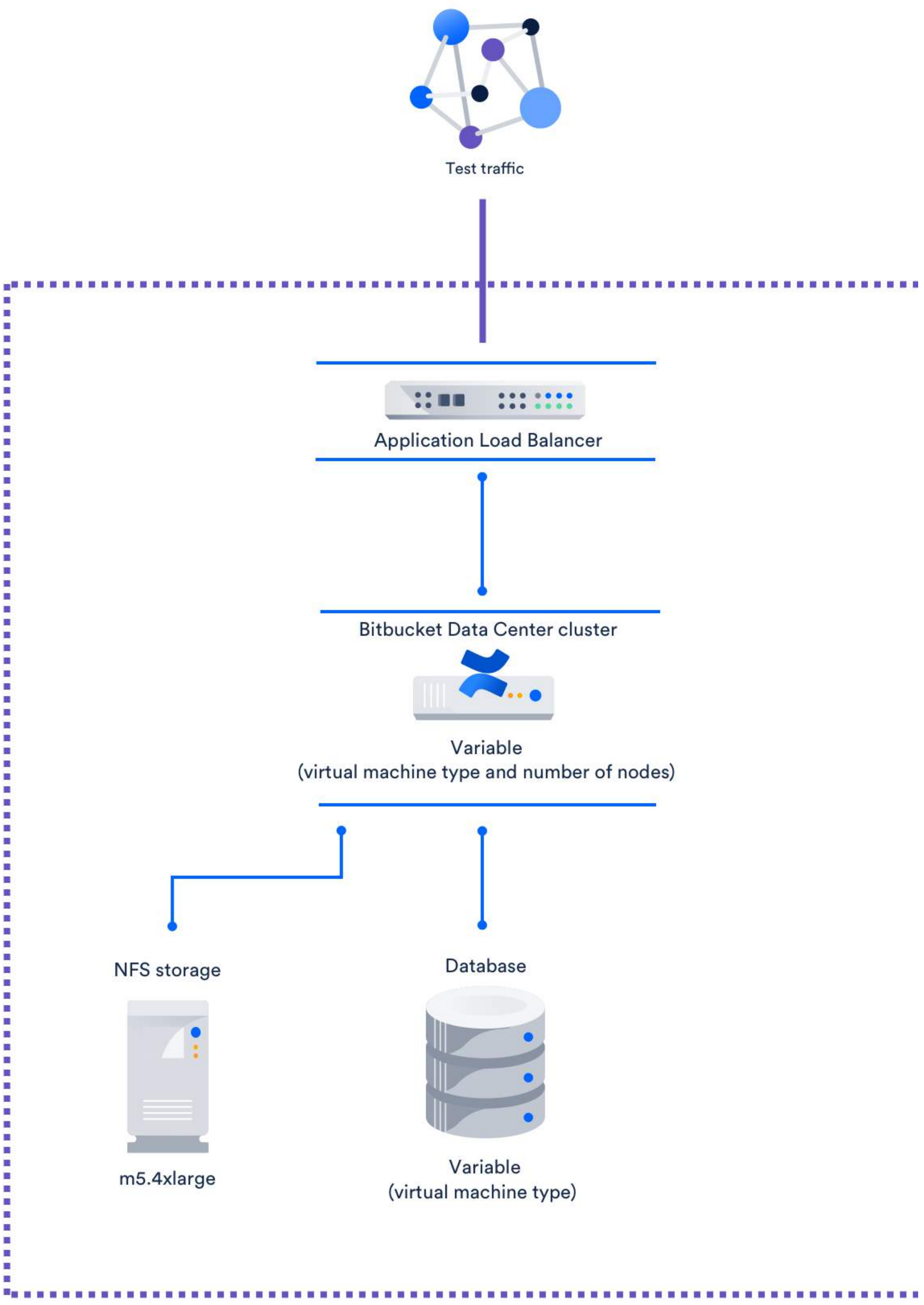
Benchmark

We used the following benchmark metrics for our tests.

Benchmark metric	Threshold	Reason
Git throughput, or the number of git hosting operations (fetch/clone/push) per hour	**32,700 (Minimum) for Large** and **65,400 (Minimum) for XLarge,** the higher the better	These thresholds are the upper limits of traffic defined in Bitbucket Data Center load profiles. We chose them due to the spiky nature of git traffic.
Average CPU utilization (for application nodes)	**75% (Maximum)**, the lower the better	When the application nodes reach an average of CPU usage of 75% and above, Bitbucket's adaptive throttling starts queuing Git hosting operations to ensure the responsiveness of the application for interactive users. This slows down Git operations.
Stability	No nodes go offline	When the infrastructure is inadequate in handling the load it may lead to node crashes.

The test traffic had fixed sleep times to modulate the volume of git hosting operations. This means the benchmarked git throughput doesn’t represent the maximum each configuration can handle.

Architecture


Test traffic
Application Load Balancer
Bitbucket Data Center cluster
Variable
(virtual machine type and number of nodes)
NFS storage
m5.4xlarge
Database
Variable
(virtual machine type)

We tested each configuration on a freshly-deployed Bitbucket Data Center instance on AWS. Every configuration followed the same structure:

Function	Number of nodes	Virtual machine type	Notes
Application node	Variable	m5.xlarge m5.2xlarge m5.4xlarge m5.12xlarge m5.24xlarge	When testing m5.xlarge (16GB of RAM), we used 8GB for JVM heap. For all others, we used 12GB for JVM heap. Minimum heap (Xms) was set to 1G for all the tests. We've observed that using a smaller JVM heap (2-3GB) is enough for most instances. Also note that Git operations are expensive in terms of memory consumption and are executed outside of the Java virtual machine. See more on Scaling Bitbucket Data Center. Each Bitbucket application used 30GB General Purpose SSD (gp2) for local storage. This disk had an attached EBS volume with a baseline of 100 IOPS, burstable to 3,000 IOPS.
Database	1	m5.xlarge m5.2xlarge m5.4xlarge	We used Amazon RDS Postgresql version 9.4.15, with default settings. Each test only featured one node.
NFS storage	1	m5.4xlarge m5.2xlarge m5.xlarge	Our NFS server used a 900GB General Purpose SSD (gp2) for storage. This disk had an attached EBS volume with a baseline of 2700 IOPS, burstable to 3,000 IOPS. As mentioned, we initialized this volume at the start of each test. For more information on setting up Bitbucket Data Center's shared file server, see Step 2. Provision your shared file system (in Install Bitbucket Data Center). This section contains the requirements and recommendations for setting up NFS for Bitbucket Data Center.
Load balancer	1	AWS Application Load Balancer (ELB)	We used AWS Elastic Load Balancer. Application Load Balancer at the time of performance testing doesn't handle SSH traffic.

We ran several case studies of real-life Large and XLarge Bitbucket Data Center instances to find optimal configurations for each component. In particular, we found many used m5 series virtual machine types (General Purpose Instances). As such, for the application node, we focused on benchmarking different series' configurations.

Refer to the AWS documentation on Instance Types (specifically, General Purpose Instances) for details on each virtual machine type used in our tests.

Recommendations for Large-sized instances

We analyzed our benchmarks and came up with the following optimal configuration:

Best-performing and most cost-effective configuration

Component	Recommendation

Application nodes	m5.4xlarge nodes x 4
Database node	m5.2xlarge
NFS node	m5.2xlarge

Performance of this configuration

- Git throughput: 45,844 per hour
- Cost per hour [1]: $4.168
- Average CPU utilization: 45%

[1] In our recommendations for Large-sized profiles, we quoted a *cost per hour* for each configuration. We provide this information to help inform you about the comparative price of each configuration. This cost only calculates the price of the nodes used for the Bitbucket application, database, and NFS nodes. It does not include the cost of using other components of the application like shared home and application load balancer.

These figures are in USD, and were correct as of July 2019.

We measured performance stability in terms of how far the instance's average CPU utilization is from the 75% threshold. As mentioned, once we hit this threshold, git operations start to slow down. The further below the instance is from 75%, the less prone it is to slow due to sudden traffic spikes.

However, there are no disadvantages in using larger-size hardware (m5.12xlarge, for example), which will provide better performance.

Low-cost configuration

We also found a low-cost configuration with acceptable performance at **$2.84** per hour:

Component	Recommendation
Application nodes	m5.4xlarge x 3
Database node	m5.xlarge
NFS node	m5.xlarge

This low-cost configuration offered a lower Git throughput of 43,099 git hosting calls per hour than the optimal configuration. However, this is still above our minimum threshold of 32,700 git hosting calls per hour. The trade-off for the price is fault tolerance. If the instance loses one application node, CPU usage spikes to 85%, which is above our maximum threshold. The instance will survive, but performance will suffer.

The following table shows all test configurations that passed our threshold, that is, above 32,500 git hosting operations per hour and below 75% CPU utilization, with no node crashes. We sorted each configuration by descending throughput.

Application nodes	Database node	NFS node	Git throughput	Cost per hour
m5.4xlarge x 6	m5.4xlarge	m5.4xlarge	46,833	6.800
m5.12xlarge x 2	m5.4xlarge	m5.4xlarge	45,848	6.792
m5.4xlarge x 4	**m5.4xlarge**	**m5.4xlarge**	**45,844**	**5.264**
m5.2xlarge x 8	**m5.4xlarge**	**m5.4xlarge**	**45,626**	**5.264**
m5.4xlarge x 3	m5.4xlarge	m5.4xlarge	44,378	4.496

m5.4xlarge x 3	m5.2xlarge	m5.4xlarge	43,936	3.784
m5.2xlarge x 6	m5.4xlarge	m5.4xlarge	43,401	4.496
m5.4xlarge x 3	**m5.xlarge**	**m5.xlarge**	**43,099**	**2.840**
m5.4xlarge x 3	m5.xlarge	m5.4xlarge	43,085	3.428

As you can see, the configuration m5.4xlarge x 4 nodes for the application doesn’t provide the highest git throughput. However, configurations with higher throughput cost more and provide only marginal performance gains.

Recommendations for XLarge instances

We analyzed our benchmarks and came up with the following optimal configuration:

Best-performing configuration

Component	Recommendation
Application nodes	m5.12xlarge x 4
Database node	m5.2xlarge
NFS node	m5.2xlarge

Performance of this configuration

- Git throughput: 75,860 per hour
- Cost per hour [1]: $10.312
- Average CPU utilization: 65%

We measured performance stability in terms of how far the instance’s average CPU utilization is from the 75% threshold. As mentioned, once we hit this threshold, git operations start to slow down. The further below the instance is from 75%, the less prone it is to slow due to sudden traffic spikes.

[1] In our recommendations for Extra Large-sized profiles, we quoted a *cost per hour* for each configuration. We provide this information to help inform you about the comparative price of each configuration. This cost only calculates the price of the nodes used for the Bitbucket application, database, and NFS nodes. It does not include the cost of using other components of the application like shared homeand application load balancer.

These figures are in USD, and were correct as of July 2019.

Low-cost configuration

We also found a low-cost configuration with good performance at **$7.02** per hour:

Component	Recommendation
Application nodes	m5.8xlarge x 4
Database node	m5.2xlarge
NFS node	m5.xlarge

This low-cost configuration offered a lower Git throughput of 74,275 git hosting calls per hour than the optimal configuration.However, this is still well above the defined threshold of 65,400 git hosting calls per hour. The trade-off for the price is fault tolerance. There were timeouts and errors observed on the m5. 8xlarge x 3 nodes, so performance degradation may be encountered if the an application node goes down.

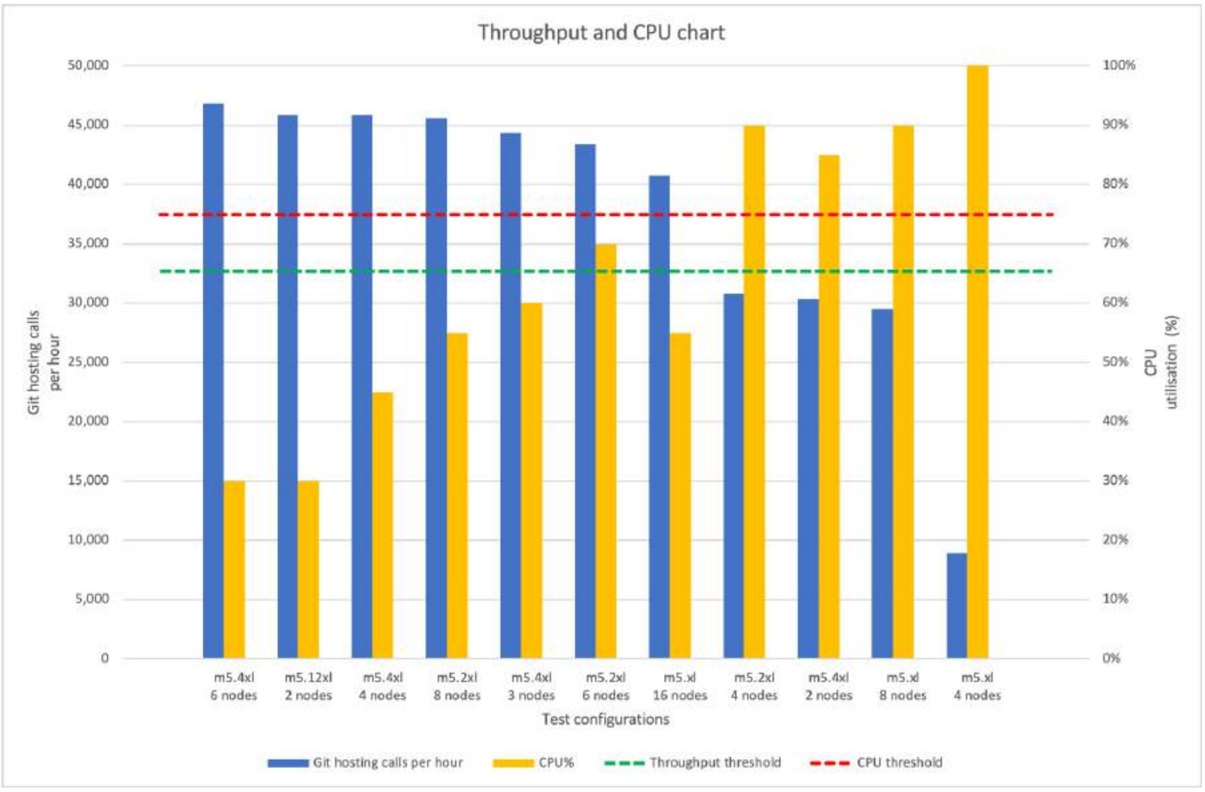
The following table shows all test configurations that passed our threshold, that is, above 32,500 git hosting operations per hour and below 75% CPU utilization, with no node crashes. We sorted each configuration by descending throughput.

Application nodes	Database node	NFS node	Git throughput	Cost per hour
m5.12xlarge x 4	**m5.2xlarge**	**m5.2xlarge**	**75,860**	**$ 10.31**
m5.4xlarge x 8	m5.2xlarge	m5.2xlarge	73,374	$ 7.24
m5.8xlarge x 4	**m5.2xlarge**	**m5.xlarge**	**74,275**	**$ 7.02**
m5.4xlarge x 6	m5.2xlarge	m5.2xlarge	71,872	$ 5.70
m5.12xlarge x 3	m5.2xlarge	m5.2xlarge	66,660	$ 8.01

Application node test results

Our first test series focused on finding out which AWS virtual machine types to use (and how many) for the application node. For these tests, we used a single **m4.4xlarge** node for the database and single **m4. 4xlarge** node for the NFS server.

Benchmarks show the best git throughput came from using m5.4xlarge (16 CPUs) and m5.12xlarge nodes (46 CPUs). You will need at **least three nodes for m5.4xlarge and two nodes for m5.12xlarge.**



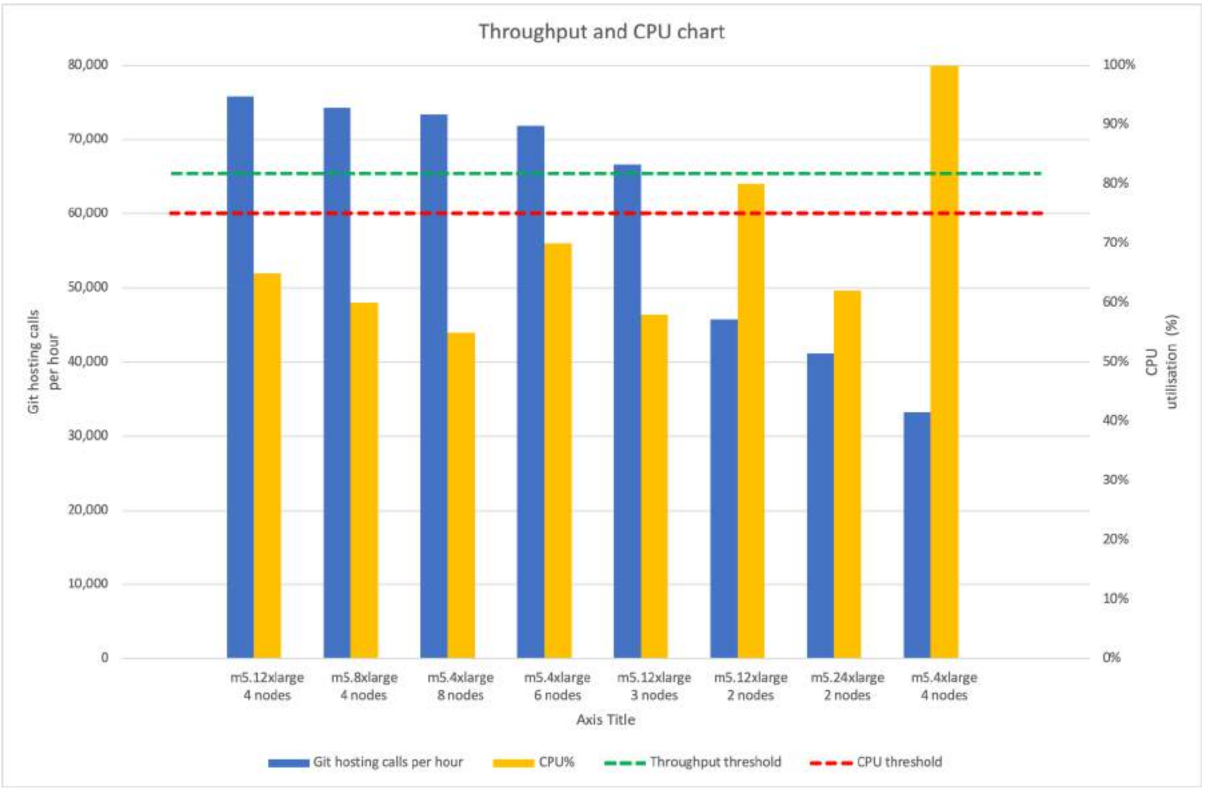
CPU is underutilized at 30% for the following application node configurations:

- m5.4xlarge x 6
- m5.12xlarge x 2

This demonstrates both configurations are overprovisioned. It would be more cost-effective to use **three or four m5.4xlarge nodes** for the application**.**

However, on the three-node m5.4xlarge set-up, the CPU usage would be at ~85% if one of the nodes failed. For this reason, we recommend the **four-node m5.4xlarge** set-up for better fault tolerance.
Our first test series focused on finding out which AWS virtual machine types to use (and how many) for the application node. For these tests, we used a single **m4.2xlarge** node for the database and single **m4.2xlarge** node for the NFS server.

Benchmarks show the best git throughput came from using **m5.12xlarge (48 CPUs) and m5.8xlarge nodes (32 CPUs)**. You will need four nodes for both instance types.

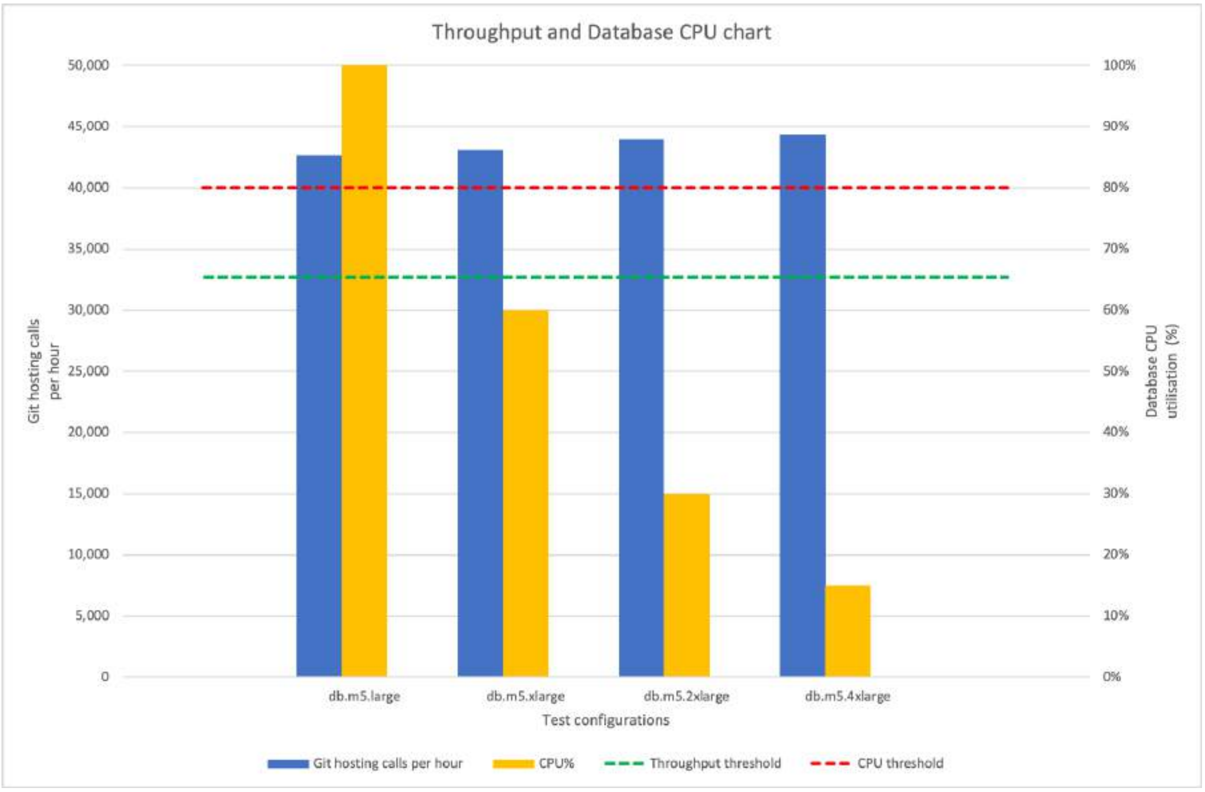


We have also carried out performance testing on 2 nodes (96 CPUs), but this resulted in poor performance, not meeting the threshold. Test results showed that 2 node deploys are not suitable for xlarge load. During the 2 node tests, the time spent on kernel was very high, which was not evident on 4+ nodes.

Database node test results

- From the application node test series, we found using **three m5.4xlarge** nodes for the application yielded optimal performance (even if it wasn't the most fault tolerant). For our second test series, we tested this configuration against the following virtual machine types for the database:
    - m4.large
    - m4.xlarge
    - m4.2xlarge
    - m4.4xlarge

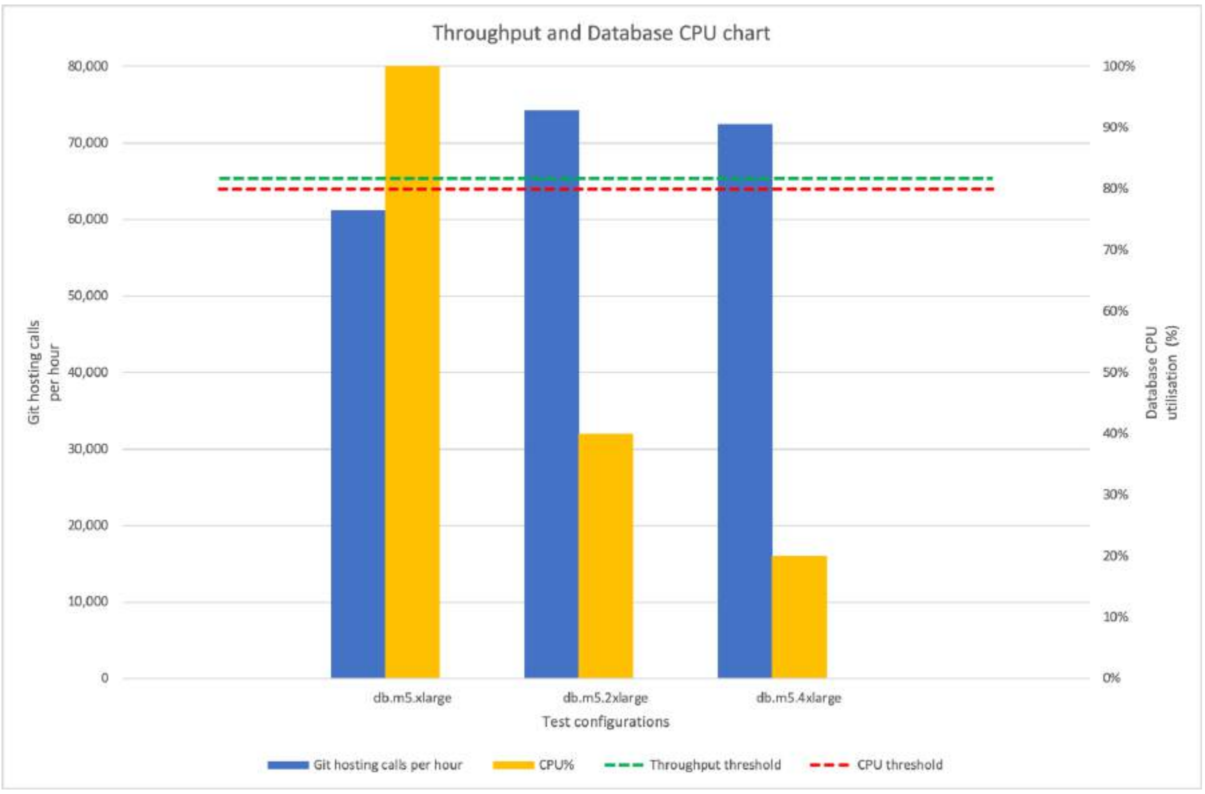
As expected, the more powerful virtual machine used, the better the performance. We saw the biggest gains in CPU utilization. Git throughput also improved, but only marginally.



Only **m5.large** failed the CPU utilization threshold. All other tested virtual machine types are acceptable, although, **m5.xlarge** is pretty close to our CPU utilization threshold at 60%.
From the application node test series, we found using **four m5.12xlarge** nodes for the application yielded optimal performance. For our second test series, we tested this configuration against the following virtual machine types for the database:

- m4.xlarge
- m4.2xlarge
- m4.4xlarge

The m4.xlarge was saturated on CPU at 100%, and db.m4.4xlarge did not result in improvements in performance. For this reason, m4.2xlarge remains the recommended instance type for the extra-large load. The CPU utilisation was at ~ 40% on m4.2xlarge.



NFS node test results
In previous tests (where we benchmarked different application and database node configurations), we used **m5.4xlarge** for the NFS node (NFS protocol v3). During each of those tests, NFS node CPU remained highly underutilized at under 18%. We ran further tests to see if we could downgrade the NFS server (and, by extension, find more cost-effective recommendations). Results showed identical git throughput, using the downsized m5.xlarge NFS node. This led to our low-cost recommendation.

Component	Recommendation
Application nodes	m5.4xlarge x 3
Database node	m5.xlarge
NFS node	m5.xlarge

As mentioned, this recommendation costs $3.044 per hour but offers lower fault tolerance.

Based on other test results, we recommend that, for the NFS node, use at least **m5.xlarge** with **IOPs higher than 1500**.
Benchmarks for the extra-large tests all used **m5.2xlarge** for the NFS instance. During each of those tests, the NFS node CPU remained highly underutilized at 25%. We ran further tests to see if we could downgrade the NFS server (and, by extension, find more cost-effective recommendations). Results show ed identical git throughput, using the downsized **m5.xlarge** NFS node with CPU utilisation at 60%.

This led to our low-cost recommendation.

Component	Recommendation
Application nodes	m5.8xlarge x 4
Database node	m5.2xlarge

NFS node	m5.xlarge

Disk I/O

Disk I/O performance is often a limiting factor, so we also paid attention to disk utilization. Our tests revealed the disk specifications we used for the NFS node were appropriate to our traffic:

- 900GB General Purpose SSD (gp2) for storage
- IOPS:
  - Baseline of 2700 IOPS
  - Burstable to 3,000 IOPS.

As mentioned, we initialized this volume at the start of each test.

Please be aware this information is only a guideline, as IOP requirements will depend on usage patterns.

The table below shows the I/O impact of our tests on the NFS node’s disk:

Metric	Value
Total throughput (Read + Write throughput)	1,250 IOPS
Read throughput	700 IOPS
Write throughput	550 IOPS
Read bandwidth	100 MB/s
Write bandwidth	10 MB/s
Average queue length	1.3
Average read latency	1.5 ms/op
Average write latency	0.6 ms/op
Disk utilization	45%

Disk I/O performance is often a limiting factor, so we also paid attention to disk utilization. Our tests revealed the disk specifications we used for the NFS node were appropriate to our traffic:

- 1800GB General Purpose SSD (gp2) for storage
- IOPS: baseline of 4500 IOPS

As mentioned, we initialized this volume at the start of each test.

Please be aware this information is only a guideline, as IOP requirements will depend on usage patterns.

Metric	Value
Total throughput (Read + Write throughput)	9,00 IOPS
Read throughput	2,700 IOPS
Write throughput	IOPS
Read bandwidth	113 MB/s

Write bandwidth	15 MB/s
Average queue length	3.5
Average read latency	1.0 ms/op
Average write latency	0.70 ms/op
Disk utilization	80 %

Although the average disk utilisation is high at 80%, the read and write latency was low at < 1ms/op. It is recommended that the NFS server disk to have 4500 IOPs or more to ensure that it does not become the bottleneck.

Secure Bitbucket in AWS

The AWS Quick Start template as a method of deployment is nearing its end-of-support date on February 29, 2024. You can still use the template after this date but we won't maintain or update it. Learn more about the AWS deployment template

We recommend deploying your Data Center products on a Kubernetes cluster using our Helm charts for a more efficient and robust infrastructure and operational setup. Learn more about deploying on Kubernetes

AWS now recommends switching launch configurations, which our AWS Quick Start template uses, to launch templates. We won't do this switch, since we're ending our support for the AWS Quick Start template. You'll still be able to create launch configurations until December 31, 2023.

This page describes security best practices for running and maintaining Bitbucket in AWS.

Amazon Virtual Private Cloud (VPC) and Subnets

Amazon VPC enables you to launch AWS resources into a virtual network that you've defined. This virtual network closely resembles a traditional network that you'd operate in your own data center, with the benefits of using the scalable infrastructure of AWS. See Amazon EC2 and Amazon Virtual Private Cloud for more information.

A subnet is a range of IP addresses in your VPC. You can launch AWS resources into a subnet that you select. Use a public subnet for resources that must be connected to the internet, and a private subnet for resources that won't be connected to the internet.

See Amazon's article called Your VPC and Subnets for a general overview of VPCs and subnets.

To bolster the security of your VPC you may wish to enable one or more of the following:

- Secure your VPC with a firewall virtual appliance / AMI to defend against unauthorized network activity
- Configure a site-to-site VPN to ensure information is transferred securely between Bitbucket and its users
- Configure an intrusion prevention or intrusion detection virtual appliance to detect when unauthorized network activity has occurred
- Enable Amazon CloudTrail to log VPC API operations and keep an audit trail of network changes

Atlassian Standard Infrastructure

If you deployed Bitbucket through the AWS Quick Start, it will use the Atlassian Standard Infrastructure (ASI). The ASI is a virtual private cloud (VPC) that contains the components required by all Atlassian Data Center applications. For more information, see Atlassian Standard Infrastructure (ASI) on AWS.

Security Groups

A security group acts as a virtual firewall that controls the traffic for one or more instances. The security group(s) that apply to newly launched instances depend on your launch method:

- If you launched instance(s) via the AWS console or API, the EC2 launch process gives you the opportunity to either create a new security group or associate one or more existing security group(s) with the instance. We recommend allowing inbound access to Bitbucket only on ports 22, 80, 443, and 7999, and only allowing access from the tightest possible IP address range.
- If launched via **BitbucketServer.template** or **BitbucketDataCenter.template**, AWS CloudFormation creates and manages a security group as part of the stack, allowing inbound access on ports 22, 80, 443, and 7999 from the **Permitted IP range** of addresses you specify. We recommend specifying the tightest possible **Permitted IP range** and not adding unnecessary inbound access to the security group after launch.

We recommend using security groups to restrict incoming traffic to your Bitbucket instance to the absolute minimum required.

See Amazon EC2 Security Groups for Linux Instances for more information.

Configure SSL to enable HTTPS

In order to enable HTTPS, you need a valid SSL certificate. SSL certificates are issued by a trusted third party Certificate Authority (CA), such as VeriSign, DigiCert or Thawte, which provide such services on a commercial basis. Atlassian does not provide such services.

Once you have a proper SSL certificate from a CA, you can import it to AWS Certificate Manager. This will enable you to use the certificate later on when deploying Bitbucket on AWS. To do that (for example, when deploying Bitbucket through the Quick Start), you'll need to provide the your certificate's Amazon Resource Number (ARN).

Until you install a valid SSL certificate, new Bitbucket Server and Data Center instances are configured to serve requests over plain HTTP, not HTTPS. This means all passwords and data will be sent unencrypted over the public internet (unless users are connected to AWS via a Virtual Private Gateway).

Load balancer settings with SSL enabled or disabled

When you deploy Bitbucket with SSL enabled, your load balancer's listeners will be set up as follows:

Load Balancer Protocol	Load Balancer Port	Instance Protocol	Instance Port
HTTP	80	HTTP	7991
HTTPS	443	HTTP	7990

But if you didn't have an SSL certificate set up at initial launch time, your ELB will be configured with only one HTTP listener as follows:

Load Balancer Protocol	Load Balancer Port	Instance Protocol	Instance Port
HTTP	80	HTTP	7990

Replace any self-signed SSL certificates (for Bitbucket Server)

When you use the Quick Start to deploy Bitbucket Data Center, you can supply a proper CA certificate to your deployment immediately at launch time. However, if you deploy Bitbucket Server via **BitbucketServer.template** (or manually as described in Launching Bitbucket in AWS manually), there is currently no way to install your own SSL certificate at initial launch time.

If you intend for your Bitbucket Server instance to be internet facing, we recommend setting `ATL_SSL_SELF_CERT_ENABLED=true` to enable HTTPS to your instance at launch time. This setting will generate a self-signed certificate for your Bitbucket Server instance.

Self-signed certificates do not offer the same security as proper CA certificates. If your Bitbucket Server instance uses a self-signed certificate:

- most browsers will display security warnings that must be ignored before proceeding to the Bitbucket Server Web interface
- git clients will refuse to connect to Bitbucket Server over HTTPS unless configured to ignore the self-signed certificate with `git config --global http.sslVerify false`
- application links and/or integrations with other applications that use Bitbucket Server's REST API and don't accept self-signed certificates may fail

Because of this, we recommend that you replace any self-signed SSL certificate with a proper CA certificate for your domain. To do this:

1. Place your certificate file at (for example) `/etc/nginx/ssl/my-ssl.crt`
2. Place your *password-less* certificate key file at `/etc/nginx/ssl/my-ssl.key`

3. Edit `/etc/nginx/nginx.conf` as follows:
    a. Replace references to `/etc/nginx/ssl/self-ssl.crt` with `/etc/nginx/ssl/my-ssl.crt`
    b. Replace references to `/etc/nginx/ssl/self-ssl.key` with `/etc/nginx/ssl/my-ssl.key`
4. Append the contents of `/etc/nginx/ssl/my-ssl.crt` to the default system PKI bundle (`/etc/pki/tls/certs/ca-bundle.crt`) to ensure scripts on the instance (such as DIY backup) can `curl` successfully.
5. Restart nginx.

Installing or changing your SSL certificate after deploying

When you deploy Bitbucket Data Center for the first time through the Quick Start, we recommend that you supply a proper CA certificate. To do this, you need to import your certificate to AWS Certificate Manager and then specify its Amazon Resource Number through the **SSL Certificate ARN** field.

If you didn't do this during deployment through the Quick Start (or if you used a self-signed certificate), you can still install or change your SSL certificate anytime *after* initial deployment:

1. In the AWS console, go to **Services > CloudFormation**, select your stack, and click **Update Stack**.
2. Specify your certificate's Amazon Resource Number (ARN) in the **SSL Certificate ARN** field. See Importing Certificates into AWS Certificate Manager for more information.
3. Configure the HTTP to HTTPS redirect manually in the `bitbucket.properties` file, located in the `<Bitbucket home directory>/shared` directory, as described in Redirect HTTP Requests to HTTPS.
4. Restart the Bitbucket service by running the following command on all application nodes

```
sudo service atlbitbucket restart
```

If the hostname of your Bitbucket instance has changed you will need to update Bitbucket's base URL as described in the page Specify the Bitbucket base URL.

Keeping your system up-to-date

It is essential to keep your Bitbucket Server instance up-to-date with patches and updates to maximize security and minimize opportunity for exploits and misadventure. On first boot a Bitbucket Server AMI instance will download the latest official release of Bitbucket Server at that time so you are assured of having the very latest version of Bitbucket Server when you first start using Bitbucket Server in AWS.

Please be sure to always perform a backup of your instance before attempting any update.

Amazon Linux Security Updates

The Bitbucket Server AMI is based on Amazon Linux and the latest version of this is used whenever we cut a new release of the Bitbucket Server AMI. Occasionally vulnerabilities in libraries and utilities used in Amazon Linux will be detected and updates posted in the Amazon Linux AMI yum repository. Atlassian will issue new versions of the Bitbucket Server AMI where necessary to ensure new Bitbucket Server AWS instances start with these updates but if you are managing an existing instance you may need to apply these updates yourself. By default, Amazon Linux applies all security updates on reboot. Alternatively you can run "yum update --security".

You may wish to apply other updates from the Amazon Linux AMI yum repository to your Bitbucket Server instance. You must ensure that any updated packages are supported by the version of Bitbucket Server you are running. Bitbucket Server version requirements can always be found on the Supported platforms page.

Bitbucket Server Updates

The Atlassian Bitbucket Server team have a strong release cadence and routinely issue releases including new features, performance and security fixes. It is strongly recommended you keep Bitbucket Server as up to date as possible. To update Bitbucket Server in an existing instance please follow the Bitbucket Server upgrade guide.

Using Bitbucket DIY Backup in AWS

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This page describes considerations for DIY Backup and Restore of Bitbucket instances deployed in an Amazon Web Services (AWS) environment.

About Bitbucket Server DIY Backup for AWS

The Bitbucket Server DIY Backup tools fully support backup and restore of Bitbucket instances deployed on Amazon Elastic Block Store (EBS) volumes and/or Amazon Relational Database Service (RDS) instances.

The tools work by taking EBS and/or RDS snapshots of Bitbucket's database and shared home directory volume. These snapshots can later be launched as new EBS volumes and/or RDS instances, and attached to your running instance, thus restoring Bitbucket to a specific point in time.

The benefits of using native Amazon EBS and RDS support in Bitbucket Server DIY Backup are:

- taking AWS native snapshots are faster than filesystem level copying
- backup-associated downtimes can be eliminated
- the snapshots are stored with the redundancy and durability of S3
- it makes it easy to relocate an instance to a different Region or Availability Zone in the future

The scripts use the AWS CLI toolset, which is included in all instances launched from the AMI, regardless of the method you used to launch it.

If you launched your Bitbucket instance via **BitbucketServer.template** or **BitbucketDataCenter.template**, your EC2 node(s) should already belong to an IAM role with a policy granting the permissions required to backup and restore the EBS volume and/or RDS instance. If you did not launch your Bitbucket instance in AWS via one of these CloudFormation templates, then see the Setting up the instance role section below for an example policy with similar permissions.

Configuring the Bitbucket Server DIY Backup in AWS

If you launched your Bitbucket instance via **BitbucketServer.template** or **BitbucketDataCenter.template**, there is already a copy of the Bitbucket Server DIY Backup tools pre-installed and pre-configured on your instance. Just SSH to your instance (the shared file server node in the case of Bitbucket Data Center), and run:

```
cd /opt/atlassian/bitbucket-diy-backup
git pull
./bitbucket.diy-backup.sh
```

If you launched your Bitbucket instance in AWS manually, you need to clone the Bitbucket Server DIY Backup repository and configure the variables manually.

```
git clone git@bitbucket.org:atlassianlabs/atlassian-bitbucket-diy-backup.git
cd atlassian-bitbucket-diy-backup
cp -i bitbucket.diy-backup.vars.sh.example-aws bitbucket.diy-backup.vars.sh
```

Then edit `bitbucket.diy-backup.vars.sh` appropriately for your environment.

Once you have configured bitbucket.diy-backup.vars.sh correctly, you can then run your backups by typing:

```
./bitbucket.diy-backup.sh
```

See Bitbucket zero downtime backup for more information.

Setting up the instance role

The DIY backup and restore scripts use the AWS CLI toolset to do their job. These tools need to authenticate with AWS in order to gain access to your resources (EBS volumes, snapshots, etc). The recommended way of providing credentials to the instance is by launching it with an instance role that has a suitable policy attached. If you are using the Bitbucket Server CloudFormation template, it'll take care of creating a policy for you and attach it to the instance at launch time.

If you need to create your own policy, you can use this JSON object as an example of the minimum permissions required for an instance:

```
{
    "Statement": [
        {
            "Resource": [
                "*"
            ],
            "Action": [
                "ec2:AttachVolume",
                "ec2:CreateSnapshot",
                "ec2:CreateTags",
                "ec2:CreateVolume",
                "ec2:DescribeSnapshots",
                "ec2:DescribeVolumes",
                                "ec2:DetachVolume"
            ],
            "Effect": "Allow"
        }
    ],
    "Version": "2012-10-17"
}
```

For other ways of configuring the AWS CLI toolset, please refer to the documentation.

Specify the Bitbucket base URL

The base URL is the root URL for your installation of Bitbucket Data Center. For example, `https://teamsinspace.yourdomain.com`

All links **which are not from a web request** (for example in Bitbucket email notifications), will be prefixed by this URL.

Who can use this procedure?

System admins

To specify **Bitbucket**'s base URL:

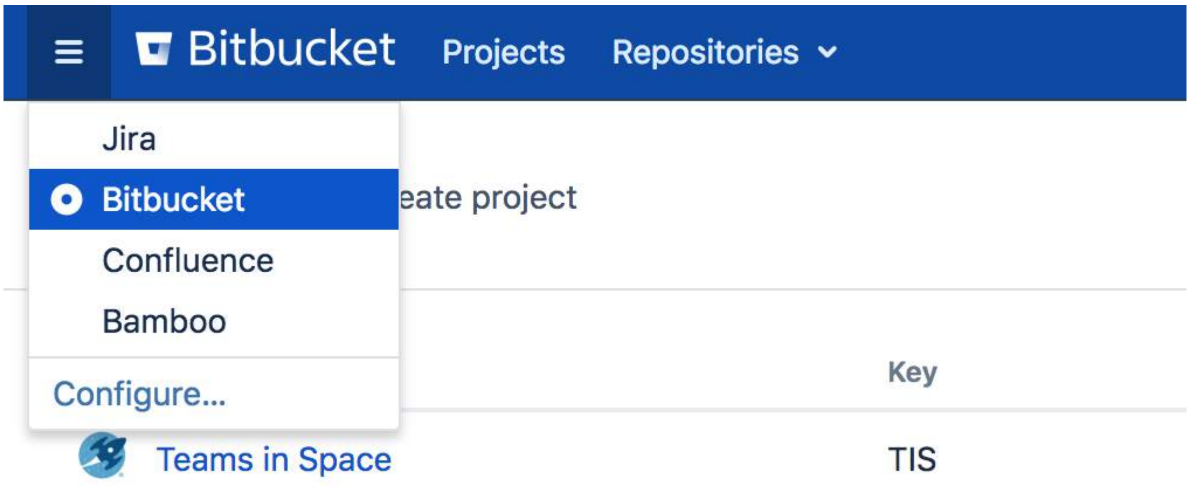
1. Go to **Administration** > **Settings** > **Server settings**.
2. In the **Base URL** field, type the URL address of your Bitbucket instance.
3. Select **Save**.

If you're experiencing trouble with setting an `https` base URL, make sure that you've configured Tomcat with SSL correctly.

If you're looking to set up the SSH base URL or enable SSH access to Git repositories, see Enable SSH access to Git repositories.

Configuring the application navigator

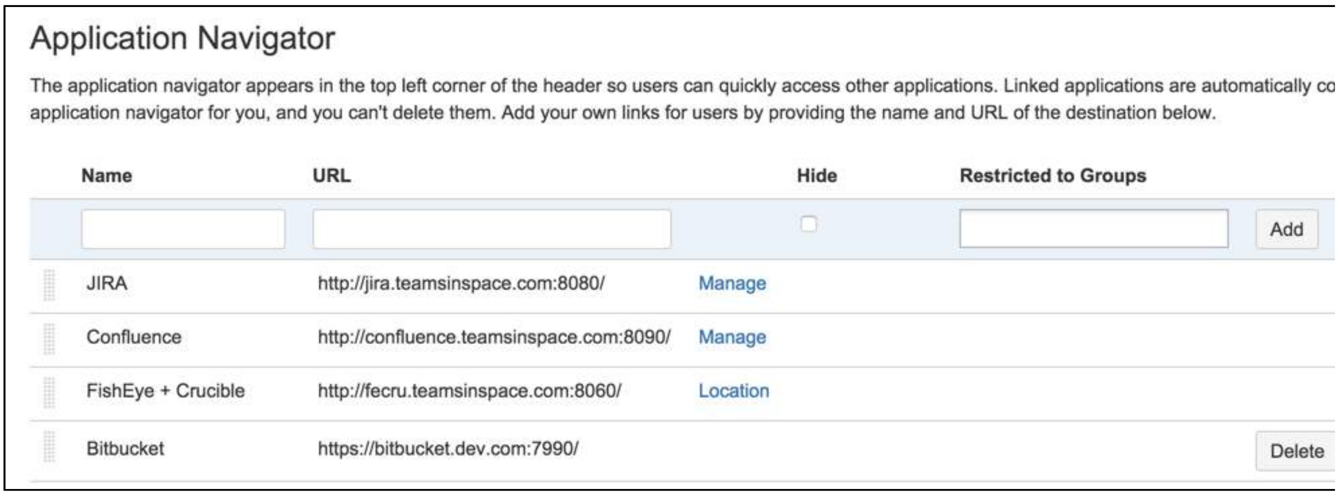
The application navigator, on the left of the Bitbucket Data Center header, allows you to switch to your other applications, such as JIRA Software and Bamboo – or any other web application – all from the Bitbucket header:



Users only see the application navigator when links are set up – if there are no links, only administrators can see it.

Bitbucket administrators can configure which apps appear in the navigator – just click **Configure** in the application navigator, or go to the Bitbucket admin area and click **Application Navigator**:

- Linked applications are automatically configured in the application navigator, and can't be deleted. Click **M anage** to configure those in the source application.
- Specify new links, as required by your users, by entering a **Name** and **URL**.
- Restrict the visibility of links to particular user groups, or hide the link completely. Click in a row, under the Groups column header, to edit those properties for existing rows.
- Use the 'handles' at the left to change the link order when seen in Bitbucket.



Application Navigator

The application navigator appears in the top left corner of the header so users can quickly access other applications. Linked applications are automatically co
application navigator for you, and you can't delete them. Add your own links for users by providing the name and URL of the destination below.

Name	URL		Hide	Restricted to Groups	
			☐		Add
JIRA	http://jira.teamsinspace.com:8080/	Manage			
Confluence	http://confluence.teamsinspace.com:8090/	Manage			
FishEye + Crucible	http://fecru.teamsinspace.com:8060/	Location			
Bitbucket	https://bitbucket.dev.com:7990/				Delete

Managing apps

An app is an installable component that supplements or enhances the functionality of Bitbucket Data Center in some way. For example, the Awesome Graphs for Bitbucket enables you to track your team's activity and progress. Other apps are available for adding graphs to Bitbucket, importing SVN source control projects, and accessing Atlassian support.

On this page

Bitbucket comes with many pre-installed apps (called system apps). You can install more apps, either by acquiring the app from the Atlassian Marketplace or by uploading it from your file system. This means that you can install apps you have developed yourself. For information about developing your own apps for Bitbucket, see Bitbucket Developer Documentation.

About the Universal Plugin Manager (UPM)

You administer apps for Bitbucket using the Universal Plugin Manager (UPM). The UPM is itself an app that exposes app administration pages in the Bitbucket Administration Console. UPM works across Atlassian applications, providing a consistent interface for administering apps in Bitbucket, Crucible, Confluence, Fisheye, Jira applications, and Bamboo.

UPM comes pre-installed in recent versions of all Atlassian applications, so you do not normally need to install it yourself. However, like other apps, the UPM software is subject to regular software updates. Before administering apps in Bitbucket, therefore, you should verify your version of the UPM and update it if needed.

Administering apps in Bitbucket

You can update UPM, or any app, from the UPM's own app administration pages. Additionally, you can perform these tasks from the UPM administration pages:

- Install or remove apps
- Configure app settings
- Discover and install new apps from the Atlassian Marketplace
- Enable or disable apps and their component modules

It shows only those plugins that are supported in your version of the product, so that you do not install incompatible plugins.

If the app request feature is enabled in your Atlassian application, non-administrative users can also discover apps on the Atlassian Marketplace. Instead of installing the apps, however, these users have the option of requesting the apps from you, the administrator of the Atlassian application.

For more information on administering the app request feature or performing other common app administration tasks, see the Universal Plugin Manager documentation. For an end-user's view of requesting apps in Bitbucket, see Requesting apps.

Starting from Bitbucket Data Center 8.18, app installation with UPM from files and through the REST API is disabled by default. However, you can install apps from the Marketplace on the **Find apps** page without any restrictions.

If app installation from files and through the REST API is an integral part of your workflow, we strongly recommend setting the relevant property to enable it **prior** to the upgrade.

To enable app installation with these two methods, in the `bitbucket.properties` file, set the property `upm.plugin.upload.enabled=true`.

Then, **restart Bitbucket** for the changes to take effect. If you run a Bitbucket cluster, a rolling restart is enough to pick up the configuration properties you set to enable the features.

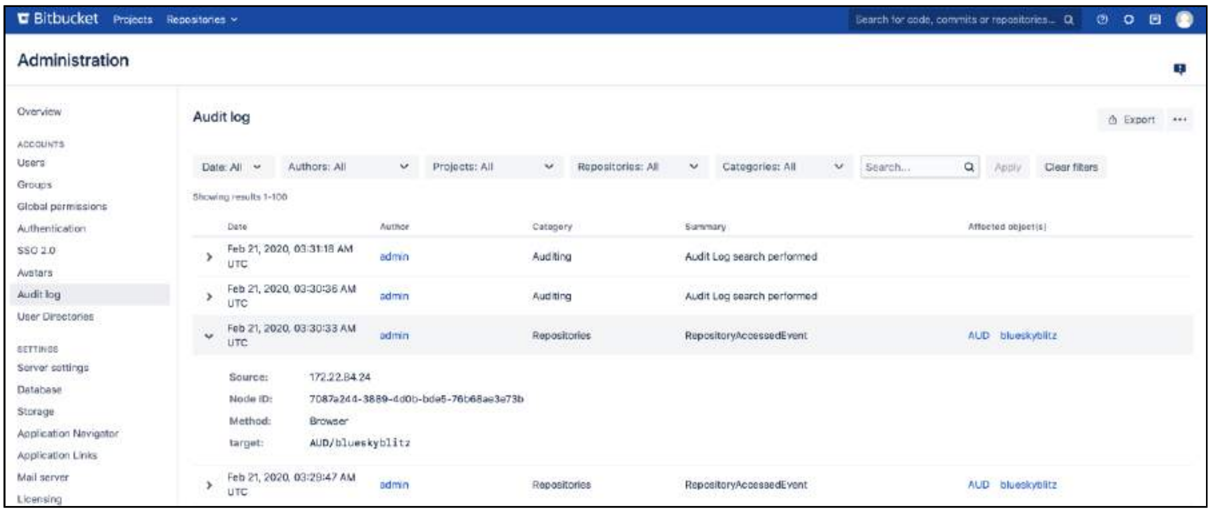
Apps for Bitbucket Data Center

Installing, and managing, apps for Bitbucket Data Center is done in the same way, as described above. The only requirement is that the app is Data Center-compatible – see Bitbucket Data Center Apps for compatibility information.

You can install an app from any cluster node. The app is stored on the shared file system for the Bitbucket Data Center, and made available to all nodes in the cluster.

View and configure the audit log

The auditing feature tracks key activities in Bitbucket Data Center, allowing administrators to get an insight into the way Bitbucket is being used. The audit system can be used to identify authorized and unauthorized changes, or suspicious activity over a period of time. The audit log experience lets you search and filter the log for details, along with utilizing grouped coverage areas for clarity.



Showing results 1-100

Date	Author	Category	Summary	Affected object(s)
Feb 21, 2020, 03:31:18 AM UTC	admin	Auditing	Audit Log search performed	
Feb 21, 2020, 03:30:36 AM UTC	admin	Auditing	Audit Log search performed	
Feb 21, 2020, 03:30:33 AM UTC	admin	Repositories	RepositoryAccessedEvent	AUD blueskyblitz

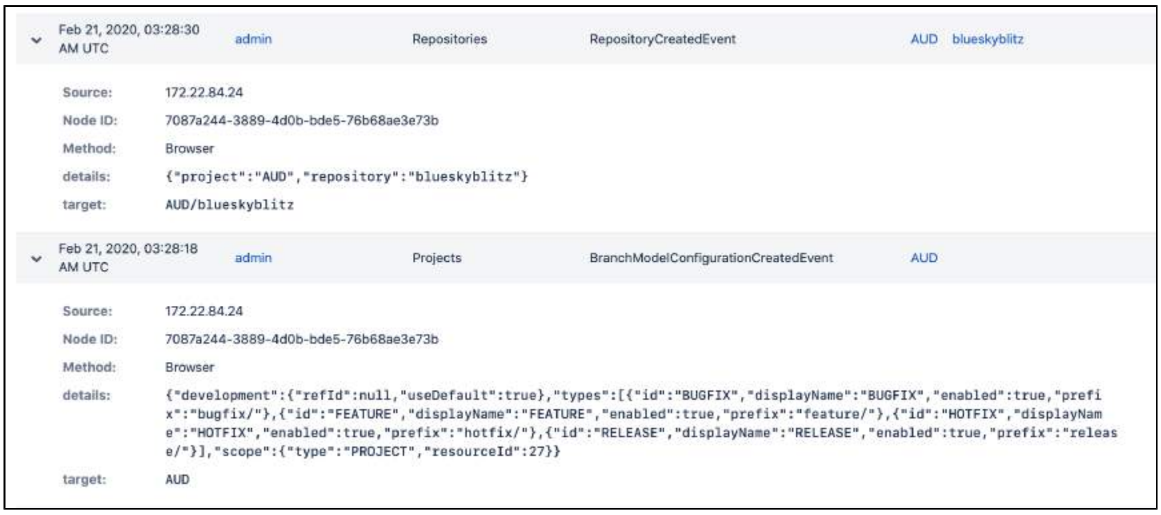
```
Source:    172.22.84.24
Node ID:   7087a244-3889-4d0b-bde5-76b68ae3e73b
Method:    Browser
target:    AUD/blueskyblitz
```

Date	Author	Category	Summary	Affected object(s)
Feb 21, 2020, 03:29:47 AM UTC	admin	Repositories	RepositoryAccessedEvent	AUD blueskyblitz

Viewing the audit logs for your instance

To view the global audit page:

1. In the administration area, go to **Audit log** (under Accounts).
2. **Expand** any event to get more details.



Feb 21, 2020, 03:28:30 AM UTC	admin	Repositories	RepositoryCreatedEvent	AUD blueskyblitz

```
Source:    172.22.84.24
Node ID:   7087a244-3889-4d0b-bde5-76b68ae3e73b
Method:    Browser
details:   {"project":"AUD","repository":"blueskyblitz"}
target:    AUD/blueskyblitz
```

Feb 21, 2020, 03:28:18 AM UTC	admin	Projects	BranchModelConfigurationCreatedEvent	AUD

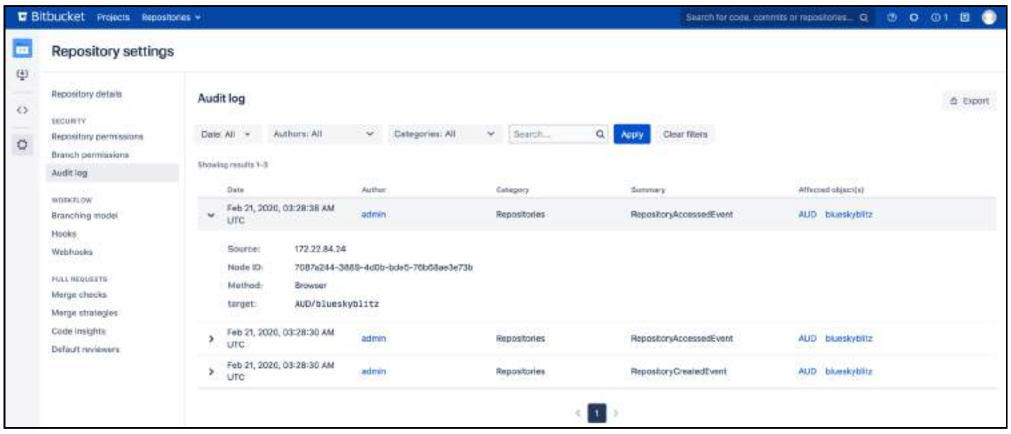
```
Source:    172.22.84.24
Node ID:   7087a244-3889-4d0b-bde5-76b68ae3e73b
Method:    Browser
details:   {"development":{"refId":null,"useDefault":true},"types":[{"id":"BUGFIX","displayName":"BUGFIX","enabled":true,"prefi
           x":"bugfix/"},{"id":"FEATURE","displayName":"FEATURE","enabled":true,"prefix":"feature/"},{"id":"HOTFIX","displayNam
           e":"HOTFIX","enabled":true,"prefix":"hotfix/"},{"id":"RELEASE","displayName":"RELEASE","enabled":true,"prefix":"releas
           e/"}],"scope":{"type":"PROJECT","resourceId":27}}
target:    AUD
```

Information for each event may include:

- **IP address** - IP address of the user who performed the action (though not recorded for system-generated events) Can also show the node IP address.
- **Node ID** - unique ID of the node where the action was performed
- **Method** - depending on how the action was performed, will be either Browser (end user) or System (system process)
- **Target** - a legacy attribute that represents the target of an action
- **Details** - a legacy attribute containing additional information about event details
- **Load balancer/proxy** - shown while using a load balancer or proxy

Some of the information in each event is not available for events logged by Bitbucket 6.x.

In addition to viewing all events in the global audit page, administrators, system administrators, and delegated administrators can also see a list of events for each project and repository by going to the settings and selecting **Audit log** (under Security). These audit logs display a subset of the events recorded in the log file.



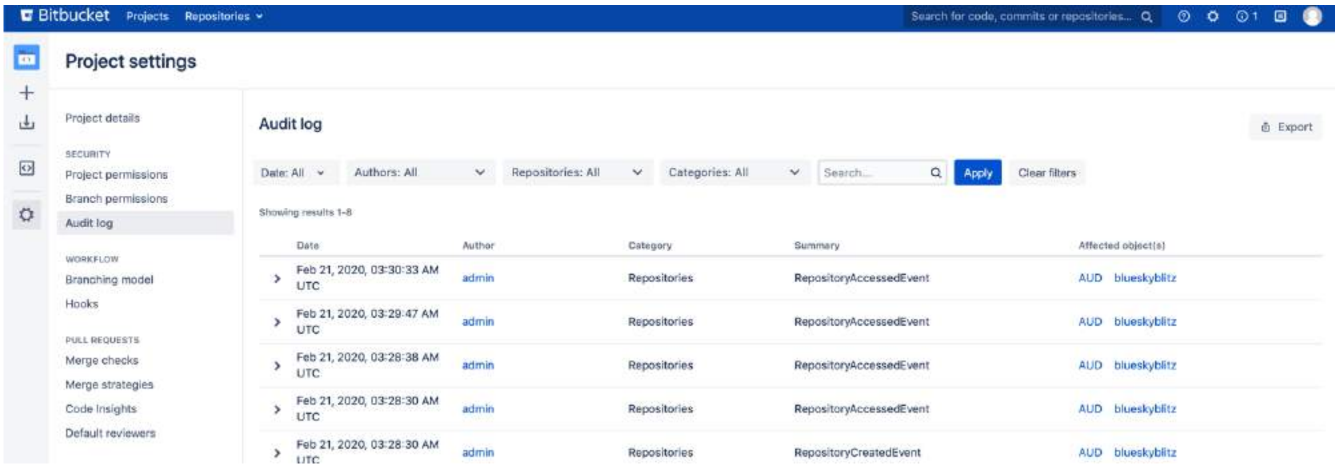
Audit log

Showing results 1-3

Date	Author	Category	Summary	Affected object(s)
Feb 21, 2020, 03:28:38 AM UTC	admin	Repositories	RepositoryAccessedEvent	AUD blueskyblitz

Source: 172.22.84.24
Node ID: 7087a244-3889-4d0b-bde5-76b68ae3e73b
Method: Browser
target: AUD/blueskyblitz

Date	Author	Category	Summary	Affected object(s)
Feb 21, 2020, 03:28:30 AM UTC	admin	Repositories	RepositoryAccessedEvent	AUD blueskyblitz
Feb 21, 2020, 03:28:30 AM UTC	admin	Repositories	RepositoryCreatedEvent	AUD blueskyblitz



Audit log

Showing results 1-8

Date	Author	Category	Summary	Affected object(s)
Feb 21, 2020, 03:30:33 AM UTC	admin	Repositories	RepositoryAccessedEvent	AUD blueskyblitz
Feb 21, 2020, 03:29:47 AM UTC	admin	Repositories	RepositoryAccessedEvent	AUD blueskyblitz
Feb 21, 2020, 03:28:38 AM UTC	admin	Repositories	RepositoryAccessedEvent	AUD blueskyblitz
Feb 21, 2020, 03:28:30 AM UTC	admin	Repositories	RepositoryAccessedEvent	AUD blueskyblitz
Feb 21, 2020, 03:28:30 AM UTC	admin	Repositories	RepositoryCreatedEvent	AUD blueskyblitz

Accessing audit logs

You can find the log file in the `<home directory>/log/audit` directory. On clustered Bitbucket Data Center deployments, each application node will have its own log in the local `<home directory>/log/audit` directory. The audit log file is used primarily for integrating with third-party logging platforms.

Refer to Audit log integrations for detailed information about the log file.

All audit log events are stored in the database. There is a limit of 10 million events logged in the database. When that limit is reached, the oldest records will be deleted as necessary.

Audit log events from previous versions of Bitbucket

Any events that were logged before you upgraded to Bitbucket 7.x:

- won't be visible until after the migration task completes in the background
- will appear as two separate entries in the list
- won't contain details like Source, Node ID, and Method

Adjusting data retention and selecting which events to log

In the audit log settings, you can decide how long you want to retain the logged events in the database and the areas from which you want to collect the logs.

Setting the database retention period

You can decide to retain the data in the database for a maximum of 99 years, however, setting long retention periods can increase the size of your DB and affect performance.

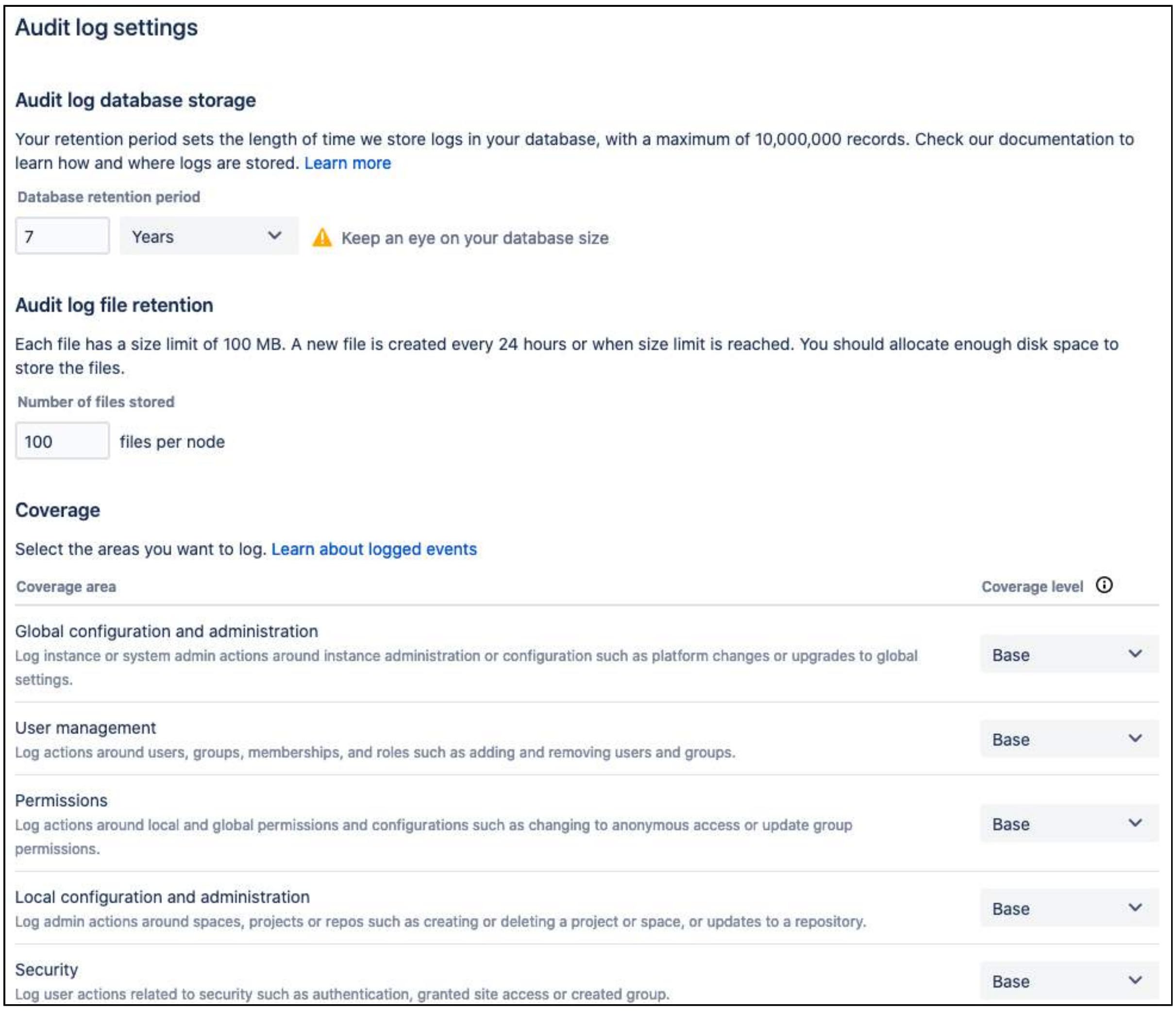
To set the retention period:

1. In the administration area, go to **...** > **Settings**.
2. Adjust the **Database retention period**.
3. **Save** your changes.

If you limit the retention period, all the events that exceed the newly set period will be deleted from the database and from the UI, however, they will be retained in the audit log file.

Selecting events to log

The events that are logged are organized in categories that belong to specific coverage areas. For example, mirror-related events are logged in the Global administration category that belongs to the Global configuration and administration coverage area. For all coverage areas and events logged in each area, see Audit log events.



Audit log settings

Audit log database storage

Your retention period sets the length of time we store logs in your database, with a maximum of 10,000,000 records. Check our documentation to learn how and where logs are stored. Learn more

Database retention period

7 Years ⚠ Keep an eye on your database size

Audit log file retention

Each file has a size limit of 100 MB. A new file is created every 24 hours or when size limit is reached. You should allocate enough disk space to store the files.

Number of files stored

100 files per node

Coverage

Select the areas you want to log. Learn about logged events

Coverage area	Coverage level
Global configuration and administration Log instance or system admin actions around instance administration or configuration such as platform changes or upgrades to global settings.	Base
User management Log actions around users, groups, memberships, and roles such as adding and removing users and groups.	Base
Permissions Log actions around local and global permissions and configurations such as changing to anonymous access or update group permissions.	Base
Local configuration and administration Log admin actions around spaces, projects or repos such as creating or deleting a project or space, or updates to a repository.	Base
Security Log user actions related to security such as authentication, granted site access or created group.	Base

To adjust the coverage:

In the administration area, go to **...** > **Settings**.

In the **Coverage level** drop-down, choose **Base** to log the most important events or **Off** to stop collecting events from a particular area.

Coverage levels reflect the number and frequency of events that are logged.

Off: Turns off logging events from this coverage area.

Base: Logs low-frequency and some of the high-frequency core events from selected coverage areas.

Advanced: Logs everything in Base, plus additional events where available.

Full: Logs all the events available in Base and Advanced, plus additional events for a comprehensive audit.

Exporting audit log events

You can export up to 100,000 events as a CSV file. If you have more events than that, only the 100,000 newest events are included in the export. In Bitbucket Data Center, you can also export up to 100k filtered events based on your current search.

To export audit log events:

1. On the **Audit log** page, select **Export**.
2. Select **Filtered result**s (Data Center only) or the **Latest 100k events**.
3. Select **Export**.

Change the audit log file retention

You can choose how many audit log files to store in the local home directory on each node. By default, we store 100 files. Make sure you've provisioned enough disk space for these files, especially if you have set the logging level to Advanced or Full.

To change the file retention setting:

1. On the **Audit log** page, select ... **Settings**.
2. Enter the maximum number of files to be stored and select **Save**.

Once a node reaches the log file retention limit, the oldest one is deleted. If you need to keep these logs, for example for compliance purposes, you may want to manually back up the files in this directory on a regular basis, or send them to a third party logging platform. See Audit log integrations in Bitbucket.

Audit log events

The auditing component of Bitbucket Data Center will log many different events that occur when being used. Events have been assigned a coverage level to reflect the number and frequency of events that are logged – these levels can be used to control how much information is added to the audit log file. For example, if you have an instance under high load and no need for auditing in certain coverage areas, you may wish to turn audit logging off by selecting **Off** in the Audit log settings page. Learn more about these settings in View and configure the audit log.

Coverage levels available with a Data Center license:

- **Off**: Turns off logging events from this coverage area.
- **Base**: Logs low-frequency and some of the high-frequency core events from selected coverage areas.
- **Advanced**: Logs the core events as well as the low and medium frequency events from the coverage areas.
- **Full**: Logs all the events available in Base and Advanced, plus additional events for a comprehensive audit.

> The events generated by external apps that call Jira REST API that fall into the Apps coverage area are not listed here because they are app-dependent.

The following tables provide lists of new and legacy event summaries for all coverage levels and categories.

On this page:

Global configuration and administration coverage area

Global administration category

Base	Base URL changed (BaseUrlChangedEvent) Database migration cancelled (MigrationCanceledEvent) Database migration failed (MigrationFailedEvent) Database migration started (MigrationStartedEvent) Database migration succeeded (MigrationSucceededEvent) Elasticsearch full sync started (ElasticsearchFullSynchronisationAuditEvent) Elasticsearch settings changed (ElasticsearchConfigurationChangeAuditEvent) Global secret scanning deleted (SecretScanningRuleDeletedEvent) Global secret scanning rule created (SecretScanningRuleCreatedEvent) Global secret scanning rule updated (SecretScanningRuleUpdatedEvent) HTTP access to SCM hosting changed (HttpScmHostingChangedEvent) Instance setup completed (ApplicationSetupEvent) Jira site config created (JiraSiteConfigCreatedEvent) Jira site config deleted (JiraSiteConfigDeletedEvent) Jira site config updated (JiraSiteConfigUpdatedEvent) Mail server changed (MailHostConfigurationChangedEvent) Mesh migration finished Mesh migration started Mesh node registered (MeshNodeRegisteredEvent) Mesh node unregistered (MeshNodeUnregisteredEvent) Mirror disabled (MirrorDisabledEvent) Mirror enabled (MirrorEnabledEvent) Mirror installed (MirrorInstalledEvent) Mirror uninstalled (MirrorUninstalledEvent) Mirroring request accepted (MirroringRequestAcceptedEvent) Mirroring request received (MirroringRequestCreatedEvent) Mirroring request rejected (MirroringRequestRejectedEvent) Product license changed (LicenseChangedEvent) Resource throttled (TicketRejectedEvent) Server email address changed (ServerEmailAddressChangedEvent) Server name changed (DisplayNameChangedEvent) Server time zone changed (ServerTimeZoneChangedEvent) SSH key global expiry changed (SshKeysGlobalExpiryChangedEvent) SSH key min length changed (SshKeyMinLengthChangedEvent) System backup cancelled (BackupCanceledEvent) System backup failed (BackupFailedEvent) System backup started (BackupStartedEvent) System backup succeeded (BackupSucceededEvent) System signing configuration changed (SystemSigningConfigurationChangedEvent) X.509 certificate created (X509CertificateCreatedEvent) X.509 certificate deleted (X509CertificateEvent)
Advanced	Announcement banner created (AnnouncementBannerCreatedEvent) Announcement banner deleted AnnouncementBannerDeletedEvent) Announcement banner updated (AnnouncementBannerUpdatedEvent) Application link created (ApplicationLinkAddedEvent) Application link deleted (ApplicationLinkDeletedEvent) Application link edited (ApplicationLinkUpdatedEvent) Default rate limiting settings changed (DefaultRateLimitSettingsModifiedEvent) LFS disabled (GitLfsFeatureDisabledEvent) LFS enabled (GitLfsFeatureEnabledEvent) Logging settings disabled (LoggingSettingsDisabledEvent) Logging settings enabled (LoggingSettingsEnabledEvent) Profiling settings disabled (ProfilingSettingsDisabledEvent) Profiling settings enabled (ProfilingSettingsEnabledEvent) Rate limiting disabled (RateLimitingDisabledEvent) Rate limiting enabled (RateLimitingEnabledEvent) SSH settings changed (SshConfigurationChangedEvent) User rate limiting settings changed (UserRateLimitSettingsModifiedEvent) User rate limiting settings created (UserRateLimitSettingsCreatedEvent) User rate limiting settings deleted (UserRateLimitSettingsDeletedEvent)
Full	No additional events available

Apps category

Base	Plugin disabled (PluginDisabledEvent) Plugin enabled (PluginEnabledEvent) Plugin uninstalled (PluginUninstalledEvent) Plugin upgraded (PluginUpgradedEvent)
Advanced	No additional events available
Full	Plugin container unavailable (PluginContainerUnavailableEvent) Plugin framework started (PluginFrameworkStartedEvent) Plugin module available (PluginModuleAvailableEvent) Plugin module disabled (PluginModuleDisabledEvent) Plugin module enabled (PluginModuleEnabledEvent) Plugin module unavailable (PluginModuleUnavailableEvent)

Data pipeline category

Coverage level	Events logged
Base	No events available
Advanced	Full data export cancelled Full data export triggered Full data export failed Unauthorized full data export triggered Custom export path set Custom export path removed
Full	No events available

User management coverage area

Users and groups category

Base	GPG key added (GpgKeyCreatedEvent) GPG key deleted (GpgKeyDeletedEvent) Group added to user group (GroupMembershipsCreatedEvent) Personal access token changed (AccessTokenModifiedEvent) Personal access token created (AccessTokenCreatedEvent) Personal access token deleted (AccessTokenDeletedEvent) SSH access key created for personal key (SshKeyCreatedEvent) SSH access key deleted for personal key (SshKeyDeletedEvent) User added to user group ((GroupMembershipsCreatedEvent) User automatically created (AutoUserCreatedEvent) User automatically deleted from user group (AutoGroupMembershipDeletedEvent) User created (UserCreatedEvent) User created from directory sync (UserCreatedFromDirectorySynchronisationEvent) User deleted (UserDeletedEvent) User deleted from user group (GroupMembershipDeletedEvent) User directory created (DirectoryCreatedEvent) User directory deleted (DirectoryDeletedEvent) User erased (UserErasedEvent) User group automatically created (AutoGroupCreatedEvent) User group created (GroupCreatedEvent) User group deleted (GroupDeletedEvent) User group updated (GroupUpdatedEvent) User password changed UserCredentialUpdatedEvent) Username changed (UserRenamedEvent)

Advanced	User details export failed (UserExportFailedEvent, extraAttribute withPermissions=false) User details export started (UserExportStartedEvent, extraAttribute withPermissions = false) User details exported (UserExportSucceededEvent, extraAttribute withPermissions=false) User permissions export failed (UserExportFailedEvent, extraAttribute withPermissions=true) User permissions export started (UserExportStartedEvent, extraAttribute withPermissions = true) User permissions exported (UserExportSucceededEvent, extraAttribute withPermissions=true)
Full	No additional events available

Permission coverage area

Permissions category

Base	Global permission change request (GlobalPermissionModificationRequestedEvent) Global permission changed (GlobalPermissionModifiedEvent) Global permission granted (GlobalPermissionGrantedEvent) Global permission remove request (GlobalPermissionRevocationRequestedEvent) Global permission removed Global permission requested (GlobalPermissionGrantRequestedEvent) Project permission change request (ProjectPermissionModificationRequestedEvent) Project permission changed (ProjectPermissionModifiedEvent) Project permission granted (ProjectPermissionGrantedEvent) Project permission remove request (ProjectPermissionRevocationRequestedEvent) Project permission removed (ProjectPermissionRevokedEvent) Project permission requested (ProjectPermissionGrantRequestedEvent) Repository archive policy changed (RepositoryArchivePolicyChangedEvent) Repository cascading merge configuration changed (RepositoryCascadingMergeConfigUpdatedEvent) Repository delete policy changed (RepositoryDeletePolicyChangedEvent) Repository permission change request (RepositoryPermissionModificationRequestedEvent) Repository permission changed (RepositoryPermissionModifiedEvent) Repository permission granted (RepositoryPermissionGrantedEvent) Repository permission remove request (RepositoryPermissionRevocationRequestedEvent) Repository permission removed (RepositoryPermissionRevokedEvent) Repository permission requested (RepositoryPermissionGrantRequestedEvent)
Advanced	No additional events available
Full	No additional events available

Local configuration and administration coverage area

Personal category

Base	SSH key edited for personal key (SShKeyEditedEvent)

Projects category

Base	All project default tasks deleted (DefaultTaskBulkDeletedEvent) Hook changed (HookScriptUpdatedEvent) Hook configuration removed (HookScriptConfigurationRemovedEvent) Hook configuration set (HookScriptConfigurationSetEvent) Hook created (HookScriptCreatedEvent) Hook deleted (HookScriptDeletedEvent) Hook deleted by app (HookScriptsDeletedByPluginKeyEvent) Project auto-decline settings changed (ProjectAutoDeclineSettingsUpdatedEvent) Project auto-decline settings created (ProjectAutoDeclineSettingsCreatedEvent) Project auto-decline settings deleted (ProjectAutoDeclineSettingsDeletedEvent) Project cascadingmerge configuration changed (RepositoryCascadingMergeConfigUpdatedEvent) Project avatar changed (ProjectAvatarUpdatedEvent) Project auto-merge settings changed (AutoMergeSettingsUpdatedEvent) Project auto-merge settings created (AutoMergeSettingsCreatedEvent) Project auto-merge settings deleted (AutoMergeSettingsDeletedEvent) Project branch model created (ProjectBranchModelConfigurationCreatedEvent) Project branch model deleted (ProjectBranchModelConfigurationDeletedEvent) Project branch model updated (ProjectBranchModelConfigurationUpdatedEvent) Project branch permission added (ProjectRefRestrictionAddedEvent) Project branch permission deleted (ProjectRefRestrictionDeletedEvent) Project branch permission updated (ProjectRefRestrictionUpdatedEvent) Project code insight condition added (ProjectInsightReportConditionAddedEvent) Project code insight condition changed (ProjectInsightReportConditionUpdatedEvent) Project code insight condition deleted (ProjectInsightReportConditionDeletedEvent) Project created (ProjectCreatedEvent) Project creation requested (ProjectCreationRequestedEvent) Project default reviewers added (ProjectPullRequestConditionCreatedEvent) Project default reviewers deleted (ProjectPullRequestConditionDeletedEvent) Project default reviewers updated (ProjectPullRequestConditionUpdatedEvent) Project default tasks added (DefaultTaskAddedEvent) Project default tasks deleted (DefaultTaskDeletedEvent) Project default tasks updated (DefaultTaskModifiedEvent) Project deleted (ProjectDeletedEvent) Project deletion requested (ProjectDeletionRequestedEvent) Project imported (ProjectImportedEvent) Project Jira issues configuration created (IssueValidationConfigurationCreatedEvent) Project Jira issues configuration deleted (IssueValidationConfigurationDeletedEvent) Project Jira issues configuration updated (IssueValidationConfigurationUpdatedEvent) Project secret scanning allowlist rule added (SecretScanningAllowlistRuleCreatedEvent) Project secret scanning allowlist rule deleted (SecretScanningAllowlistRuleDeletedEvent) Project secret scanning allowlist rule updated (SecretScanningAllowlistRuleUpdatedEvent) Project secret scanning rule created (SecretScanningRuleCreatedEvent) Project secret scanning rule deleted (SecretScanningRuleDeletedEvent) Project secret scanning rule updated (SecretScanningRuleUpdatedEvent) Project settings change requested (ProjectModificationRequestedEvent) Project settings changed (ProjectModifiedEvent) Project settings restriction created (ProjectSettingsRestrictionCreatedEvent) Project settings restriction deleted (ProjectSettingsRestrictionDeletedEvent) Project webhook created (InternalProjectWebhookCreatedEvent) Project webhook deleted (InternalProjectWebhookDeletedEvent) Project webhook changed (InternalProjectWebhookModifiedEvent) Secret scanning exempt repository added (SecretScanningExemptRepoAddedEvent) Secret scanning exempt repository removed (SecretScanningExemptRepoDeletedEvent) SSH access key added to project (SshAccessKeyGrantedEvent) SSH access key deleted from project (SshAccessKeyRevokedEvent) SSH access key edited for project (SshAccessKeyEditedEvent)

Advanced	Project pull request merge config deleted (ProjectPullRequestMergeConfigDeletedEvent) Project pull request merge config updated (ProjectPullRequestMergeConfigUpdatedEvent) Pull request description template created (PullRequestTemplateCreatedEvent) Pull request description template deleted (PullRequestTemplateDeletedEvent) Pull request description template updated (PullRequestTemplateUpdatedEvent) Pull request reviewer group created (ReviewerGroupCreatedEvent) Pull request reviewer group deleted (ReviewerGroupDeletedEvent) Pull request reviewer group updated (ReviewerGroupUpdatedEvent)
Full	No additional events available

Repositories category

Base	Repository auto-merge settings changed (AutoMergeSettingsUpdatedEvent) Repository auto-merge settings created (AutoMergeSettingsCreatedEvent) Repository auto-merge settings deleted (AutoMergeSettingsDeletedEvent) Repository created (RepositoryCreatedEvent) Repository failed to create (RepositoryCreationFailedEvent) Default branch changed (RepositoryDefaultBranchModifiedEvent) Repository deleted (RepositoryDeletedEvent) Repository deletion requested (RepositoryDeletionRequestedEvent) Repository forked (RepositoryForkedEvent) Repository fork failed (RepositoryForkFailedEvent) Repository hook deleted (RepositoryHookDeletedEvent) Repository hook disabled (RepositoryHookDisabledEvent) Repository hook enabled (RepositoryHookEnabledEvent) Repository hook settings changed (RepositoryHookSettingsChangedEvent) Repository imported (RepositoryImportedEvent) Repository change requested (RepositoryModificationRequestedEvent) Repository settings changed (RepositoryModifiedEvent) Elasticsearch repository sync completed (ElasticsearchRepositorySynchronisationAuditEvent) Repository branch model created (RepositoryBranchModelConfigurationCreatedEvent) Repository branch model deleted (RepositoryBranchModelConfigurationDeletedEvent) Repository branch model updated (RepositoryBranchModelConfigurationUpdatedEvent) Repository branch permission added (RepositoryRefRestrictionAddedEvent) Repository branch permission deleted (RepositoryRefRestrictionDeletedEvent) Repository branch permission updated (RepositoryRefRestrictionUpdatedEvent) Repository code insight condition added (RepositoryInsightReportConditionAddedEvent) Repository code insight condition deleted (RepositoryInsightReportConditionDeletedEvent) Repository code insight condition changed (RepositoryInsightReportConditionUpdatedEvent) Repository default reviewers added (RepositoryPullRequestConditionCreatedEvent) Repository default reviewers deleted (RepositoryPullRequestConditionDeletedEvent) Repository default reviewers updated (RepositoryPullRequestConditionUpdatedEvent) Repository auto-decline settings created (RepositoryAutoDeclineSettingsCreatedEvent) Repository auto-decline settings deleted (RepositoryAutoDeclineSettingsDeletedEvent) Repository auto-decline settings changed (RepositoryAutoDeclineSettingsUpdatedEvent) Repository required build merge check created (RequiredBuildConditionCreatedEvent) Repository required build merge check deleted (RequiredBuildConditionDeletedEvent) Repository required build merge check updated (RequiredBuildConditionUpdatedEvent) Branch deletion on merge enabled Branch deletion on merge disabled Branch deletion on merge inherited from project Repository Jira issues configuration created (IssueValidationConfigurationCreatedEvent) Repository Jira issues configuration deleted (IssueValidationConfigurationDeletedEvent) Repository Jira issues configuration updated (IssueValidationConfigurationUpdatedEvent) Repository default tasks added (DefaultTaskAddedEvent) Repository default tasks deleted (DefaultTaskDeletedEvent) Repository default tasks updated (DefaultTaskModifiedEvent) All repository default tasks deleted (DefaultTaskBulkDeletedEvent) Repository webhook created (InternalRepositoryWebhookCreatedEvent) Repository webhook deleted (InternalRepositoryWebhookDeletedEvent) Repository webhook changed (InternalRepositoryWebhookModifiedEvent) Repository secret scanning rule created (SecretScanningRuleCreatedEvent) Repository secret scanning rule deleted (SecretScanningRuleDeletedEvent) Repository secret scanning rule updated (SecretScanningRuleUpdatedEvent) Repository secret scanning allowlist rule added (SecretScanningAllowlistRuleCreatedEvent) Repository secret scanning allowlist rule deleted (SecretScanningAllowlistRuleDeletedEvent) Repository secret scanning allowlist rule updated (SecretScanningAllowlistRuleUpdatedEvent) SSH access key added to repo (SshAccessKeyGrantedEvent) SSH access key deleted from repo (SshAccessKeyRevokedEvent) SSH access key edited for repo(SshAccessKeyEditedEvent)

Advanced	Pull request reviewer group created (ReviewerGroupCreatedEvent) Pull request reviewer group deleted (ReviewerGroupDeletedEvent) Pull request reviewer group updated (ReviewerGroupUpdatedEvent) Repository LFS disabled (GitLfsDisabledEvent) Repository LFS enabled (GitLfsEnabledEvent) Repository pull request merge config deleted (RepositoryPullRequestMergeConfigDeletedEvent) Repository pull request merge config updated (RepositoryPullRequestMergeConfigUpdatedEvent) Repository transcode diff setting disabled (GitTranscodeDiffDisabledEvent) Repository transcode diff setting enabled (GitTranscodeDiffEnabledEvent)
Full	No additional events available

System category

Base	No additional events available
Advanced	SCM pull request merge config deleted (ScmPullRequestMergeConfigDeletedEvent) SCM pull request merge config updated (ScmPullRequestMergeConfigUpdatedEvent)
Full	No additional events available

Security coverage area

Auditing category

Base	Audit log configuration updated Audit log exported Audit log search performed
Advanced	No events available
Full	No events available

Authentication category

Base	No events available
Advanced	User logged out (LogoutSuccessEvent) User login failed (AuthenticationFailureEvent) User login failed (SSH) (SshAuthenticationFailureEvent)
Full	User logged in (AuthenticationSuccessEvent) User logged in (SSH) (SshAuthenticationSuccessEvent)

Security category

Base	Secret detected (SecretDetectedEvent) Secret scanning commit limit reached (SecretScanningCommitLimitReachedEvent) Secret scanning incomplete (SecretScanningIncompleteEvent)
Advanced	Unauthorized access to a resource (AuthorizationFailureEvent)
Full	No events available

End user activity coverage area

Repositories category

Base	Repository accessed by user (RepositoryAccessedEvent) Run build (AnalyticsActionRunEvent)
Advanced	Branch created (BranchCreatedEvent) Branch deleted (BranchDeletedEvent) Diff succeeded (DiffSuccessfulEvent) Git archive created (ContentArchiveSuccessfulEvent) Git archive failed (ContentArchiveFailedEvent) Repository notification settings updated (RepositoryNotificationSettingsUpdatedEvent) Repository watcher added (RepositoryWatcherAddedEvent) Repository watcher removed (RepositoryWatcherRemovedEvent)
Full	Changes pushed to repository (RepositoryPushEvent) Changes read from repository (RepositoryOtherReadEvent) Git hook activity (RepositoryHookEvent) Repository cloned (RepositoryCloneEvent) Repository pulled (RepositoryPullEvent) Repository written to (RepositoryOtherWriteEvent)

Pull requests category

Base	Cascading merge failed (CascadingMergeStoppedEvent) Cascading merge succeeded (CascadingMergeSucceededEvent) Pull request approved by participant (PullRequestParticipantApprovedEvent) Pull request auto-merge requested (PullRequestAutoMergeRequestedEvent) Pull request auto-merge canceled (PullRequestAutoMergeCancelledEvent) Pull request declined (PullRequestDeclinedEvent) Pull request deleted (PullRequestDeletedEvent) Pull request draft changed (PullRequestUpdatedEvent) Pull request merged (PullRequestMergedEvent) Pull request open request (PullRequestOpenRequestedEvent) Pull request opened (PullRequestOpenedEvent) Pull request participants changed (PullRequestParticipantsUpdatedEvent) Pull request reopened (PullRequestReopenedEvent) Pull request reviewed by participant (PullRequestParticipantReviewedEvent) Pull request reviewers changed (PullRequestReviewersUpdatedEvent) Pull request unapproved by participant (PullRequestParticipantUnapprovedEvent)
Advanced	Pull request filters used (PullRequestFilterEvent) Pull request rebased (PullRequestRebasedEvent) Pull request watcher added (PullRequestWatcherAddedEvent) Pull request watcher removed (PullRequestWatcherRemovedEvent)
Full	Pull request comment changed (PullRequestCommentEditedEvent) Pull request comment created (PullRequestCommentAddedEvent) Pull request comment deleted (PullrequestCommentDeletedEvent) Pull request comment reply added (PullRequestCommentRepliedEvent) Pull request task changed (PullRequestTaskEditedEvent) Pull request task created (PullRequestTaskAddedEvent) Pull request task deleted (PullRequestTaskDeletedEvent)

Search category

Base	No events available
Advanced	No events available
Full	Code search succeeded (CodeSearchSuccessfulEvent) Repository search succeeded (RepositoriesSearchSucessfulEvent)

Apps category

This category is for auditing events generated by third-party apps.

Bitbucket Data Center customers can set the configuration property `audit.legacy.events.logging.forced=true` to move the following events from **Full** to **Base** level:

- Plugin container unavailable, Plugin module disabled, Plugin module enabled, Plugin module available, Plugin framework started
- User log in failed, User logged in, User logged in (SSH)
- Repository read event, Repository write event, Repository pull event, Repository push event, Git hook activity, Repository cloned

Note that adding these events to **Base** can significantly increase the size of the audit log.

Audit log integrations

Bitbucket Data Center writes audit logs to the database and a log file. By itself, the log file saves you the effort of periodically exporting your audit logs from the database for long-term storage. However, the main purpose of the file is to easily integrate Bitbucket to a third-party logging platform.

Selecting which events to log and adjusting data retention

The Audit log settings menu controls the coverage of audit logs in both database and log file.

The log file's retention is ultimately controlled by log rotation. We use basic log rotation to manage the volume of logs. We automatically archive the audit log file when:

- the node's time reaches 12:00 midnight, or
- the audit log file reaches 100MB.

Once a node reaches the log file retention limit, the oldest one is deleted. By default the limit is 100 log files (the current audit log file + 99 archives). Make sure you allocate enough disk space for these log files on each application node. For the default setting of 100 files, you should allow 10GB.

To customize the log rotation rules (and, ultimately, the retention rules), use the following `bitbucket.properties` file parameters:

- `com.atlassian.audit.file.max.file.size` controls the maximum size (in MB) for the current audit log file before it is archived.
- `com.atlassian.audit.file.max.file.count` controls the maximum number of audit log files (counting the current audit log file and all archived log files).

Both default to `100`. If you adjust either of these values, make sure you allocate the right amount of space on each application node. For example, if you set `com.atlassian.audit.file.max.file.count=150`, you should allocate at least 15GB just for log files on each application node.

For more information on using the `bitbucket.properties` file, click here.

Log file details

On clustered Bitbucket Data Center deployments, each application node will produce its own log file in its local home directory.

Location

To integrate the audit log file with a third-party logging platform, you'll need to know its exact location. This may vary, depending on how you configured your home directory. For more information about the local home directory, click here).

On a clustered Bitbucket Data Center deployment, the audit log file's directory should be the same on all nodes.

See CloudWatch Logs Agent Reference for more information. If you want to see how we automate this via Ansible, check out our deployment playbooks on https://bitbucket.org/atlassian/dc-deployments-automation/src/master/.

File name

The audit log file name uses the following naming convention:

```
YYYYMMDD-XXXXX.audit.log
```

The `XXXXX` portion is a 5-digit number (starting with `00000`) tracking the number of audit log files archived in the same day (`YYYMMDD`). For example, if there are 5 archived log files today (January 1, 2020), then:

- the oldest archived log file is `20200101.00000.audit.log`
- the current audit log file is `20200101.00005.audit.log`

Format

Each audit log is written as a JSON entry to the audit log file. Every line in the file represents a single event, allowing you to use regular expressions to do simple searches if needed.

Integrating with logging agents

Most enterprise environments use a third-party logging platform to aggregate, store, and otherwise manage logs from all hosts. Logging platforms like AWS CloudWatch and Splunk use *agents* to collect logs from every host in the environment. These agents are installed on each host, collecting local logs and sending them back to a centralized location to be aggregated, analyzed, audited, and/or stored.

If your logging platform uses agents this way, you can configure each node's agent to monitor the audit log file directly. Logging agents from most major platforms (including AWS CloudWatch, Splunk, ELK, and Sumo Logic) are compatible with the audit log file.

Amazon CloudWatch Agent

We provide Quick Starts for Bitbucket Data Center for easy deployments on AWS. This Quick Start lets you deploy Bitbucket Data Center along with an Amazon CloudWatch instance to monitor it.

To set up Amazon CloudWatch, use the **Enable CloudWatch Integration** parameter's default setting (namely, `Metrics and Logs`). The Quick Start will then configure the Amazon CloudWatch Agent to collect the logs from each node's audit log files. The agent will send these logs to a separate log group named `bitbucket-<aws-stack-name>-audit`.

Our Quick Start also sets up a default dashboard to help you read the collected data, including logs from each audit log file. Refer to Working With Log Groups and Log Streams for related information.

Manual configuration

If needed, you can also manually configure the Amazon CloudWatch agent to collect the audit log files. To do this, set the following parameters in the Agent Configuration File:

- `file`: set this to to `<local home directory>/log/audit/*`. Don't forget to set the absolute path to the home directory.
- `log_group_name and log_stream_name:` use these to send Bitbucket Data Center's audit logs to a specific log group or stream.

Splunk Universal Forwarder

For Splunk Enterprise or Splunk Cloud, you can use the Splunk Universal Forwarder as your logging agent. This will involve installing the universal forwarder on each application node.

You'll also need to define each node's audit log directory as one of the forwarder's inputs. This will set the forwarder to send all logs from the audit log directory to a pre-configured receiver. One way to define the forwarder's inputs is through the Splunk CLI. For Linux systems, use the following command on each application node:

```
./splunk add monitor <local home directory>/log/audit/*audit.log
```

Refer to the following links for detailed instructions on configuring the Splunk Universal Forwarder on each node:

- How to forward data to Splunk Enterprise

- How to forward data to Splunk Cloud

Filebeat (for the ELK stack)

Within the ELK stack, you can use the Filebeat plugin to collect logs from each node's audit log files. Each time a log is written to the current audit log file, Filebeat will forward that log to Elasticsearch or Logstash.

To set this up, install Filebeat first on each application node. Then, set the audit log file directory as a Filebeat input. To do that, add its directory as a `path` in the `filebeat.inputs` section of each node's `filebeat.yml` configuration file. For example:

```
filebeat.inputs:
- type: log
  enabled: true
  paths:
    - <local home directory>/log/audit/
```

Sumo Logic installed collectors

If you have a Sumo Logic instance, you can use installed collectors to collect logs from each node's audit log files. To do this, install a collector on each node first. Then, add `<local home directory>/log/audit/*` as a Local File Source to each node's collector.

Deprecated audit log file format

Previous Bitbucket releases also generated an audit log file, but this file used a different format. This format is now deprecated. If you require logs generated in this format, you can configure Bitbucket to generate the legacy format alongside the current one. However, we recommend that you use the current audit log file. The legacy format was removed in Bitbucket 8.0.

The legacy audit log file will have the same set of defaults and settings as Bitbucket releases before 7.0, such as:

- The file will rotate at 25 MB.
- There will be a 100-file limit to the number of legacy audit log files that Bitbucket keeps. When the limit is reached, the oldest file is deleted each day.

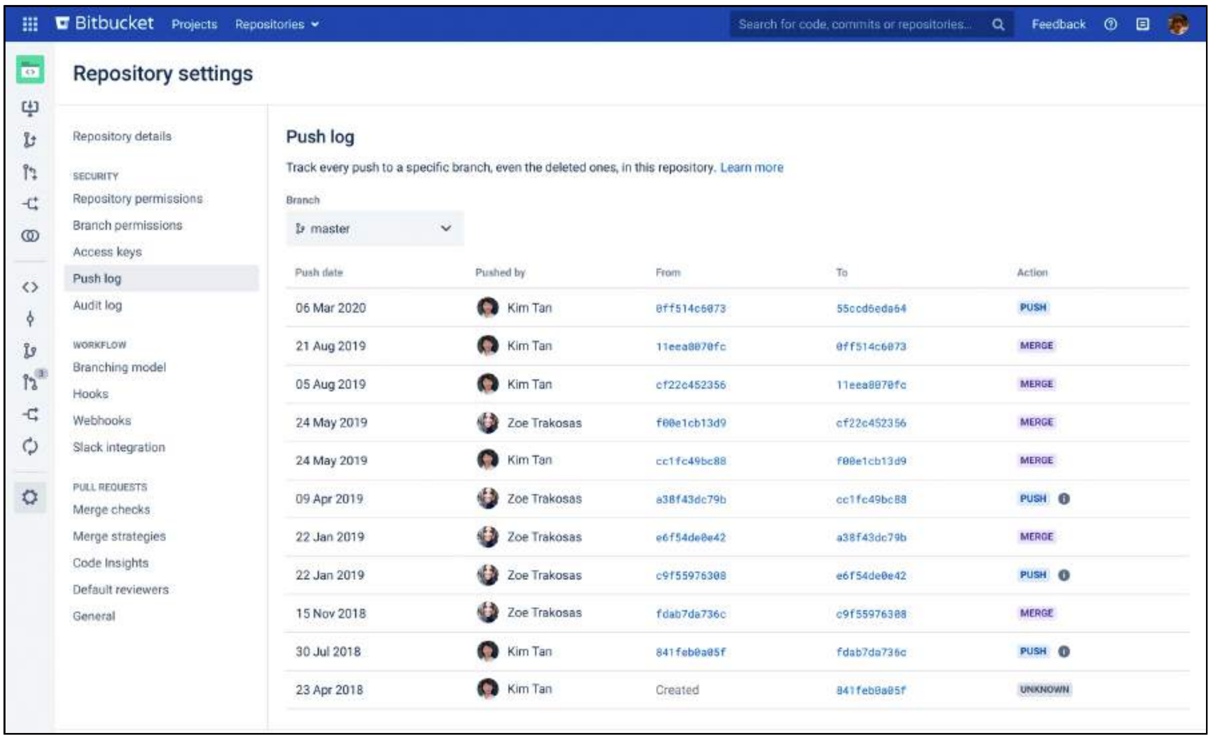
To enable the legacy audit log file, set `audit.legacy.log=true` in the `bitbucket.properties` file. For more information on using this file, click here.

Push logs

Bitbucket Data Center retains logs of important audit events with the auditing feature. However, when it comes to knowing who pushed certain commits and who was responsible for creating or deleting branches, a push log can be used by anyone that can administer the repository.

Viewing a push log

1. In the Repository settings, go to **Push log** (under Security).
2. Review any push events, created branch events, deleted branch events, modified files, and merge events.



Push log

Track every push to a specific branch, even the deleted ones, in this repository. Learn more

Branch: master

Push date	Pushed by	From	To	Action
06 Mar 2020	Kim Tan	0ff514c6073	55ccd6eda64	PUSH
21 Aug 2019	Kim Tan	11eea8070fc	0ff514c6073	MERGE
05 Aug 2019	Kim Tan	cf22c452356	11eea8070fc	MERGE
24 May 2019	Zoe Trakosas	f00e1cb13d9	cf22c452356	MERGE
24 May 2019	Kim Tan	cc1fc49bc88	f00e1cb13d9	MERGE
09 Apr 2019	Zoe Trakosas	a38f43dc79b	cc1fc49bc88	PUSH ⓘ
22 Jan 2019	Zoe Trakosas	e6f54de0e42	a38f43dc79b	MERGE
22 Jan 2019	Zoe Trakosas	c9f55976308	e6f54de0e42	PUSH ⓘ
15 Nov 2018	Zoe Trakosas	fdab7da736c	c9f55976308	MERGE
30 Jul 2018	Kim Tan	841feb0a05f	fdab7da736c	PUSH ⓘ
23 Apr 2018	Kim Tan	Created	841feb0a05f	UNKNOWN

Each row in the push log represents:

- **Push date** – a date for the push
- **Pushed by** – who performed the push
- **From/To** – what range of commits were affected
    - Created – the first time a user pushes their branch
    - Deleted – a branch has been deleted
- **Action** – trigger types for each event, which can be any of the following:
    - Merge
    - Push
    - Forced push
    - Create branch
    - Delete branch
    - File edit
    - Unknown (automatic branch merges, imported repository, pull request rebase)

Tracking push events

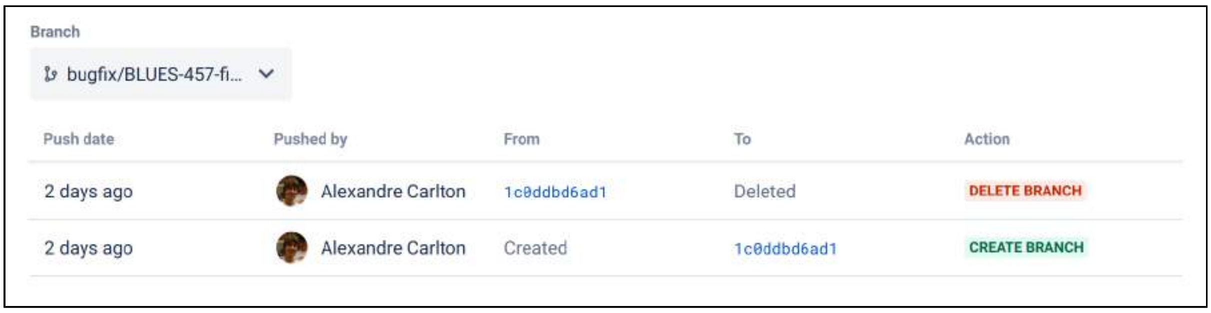
Bitbucket will track whether updates are forced or not and display these events. Previously, tracking was not available, so we may not know whether they were forced. In these cases, there will be an `(i)` with a tooltip next to the action trigger to indicate this status.

Filtering branches

By default, you'll see the repository's default branch (typically `master`). You can search for history and details by another branch (even a deleted one) in the push log. For example; see what commit a branch pointed to before it was deleted, or who created a branch and when.

To view how and when a branch was deleted:

1. In the **Push log** page, from the **Branch** dropdown, select any deleted branch.
2. Once selected, the events results are displayed.



Push date	Pushed by	From	To	Action
2 days ago	Alexandre Carlton	1c0ddbd6ad1	Deleted	DELETE BRANCH
2 days ago	Alexandre Carlton	Created	1c0ddbd6ad1	CREATE BRANCH

Update your license key

When you upgrade or renew your Bitbucket Data Center license, you'll receive a new license key. To update your license key:

1. Go to ⚙ > **Licensing**.
2. Select **Edit license.**
3. Enter your new license.
4. Select **Save.**

ⓘ You can access your license key at http://my.atlassian.com

For more information about licensing or to find out more about starter licenses, see our licensing FAQ.

Configuration properties

This page describes the configuration properties that can be used to control behaviour in Bitbucket Data Center. Create the `bitbucket.properties` file, in the shared folder of your home directory, and add the system properties you need, use the standard format for Java properties files.

Note that `bitbucket.properties` is created automatically when you perform a database migration.

Bitbucket must be restarted for changes to become effective.

Default values for system properties, where applicable, are specified in the tables below.

Analytics

Default value	Description
analytics.aws.enabled	
`true`	Controls whether AWS instance analytics events are published. This setting only has an effect if analytics is enabled.

Application mode

Default value	Description
application.mode	
`default`	Controls what mode Bitbucket is in - currently "mirror" and "default" are supported

Attachments

Default value	Description
attachment.upload.max.size	
`20971520`	Defines the largest single attachment the system will allow. Attachments larger than this will be rejected without ever being stored locally. This setting applies to all uploaded data, including avatars. Some types may have their own further restriction they apply on top of this. However, for such types, the file *will* be stored locally prior to that secondary limit being applied. If that secondary limit is higher than this limit, this limit is the one that will be applied. This value is in **bytes**.

Audit

These properties control the auditing feature, determining the number of audit entries logged, or stored in the database, and the size of those entries. Changing these settings will only affect new audit entries.

Increasing the amount of auditing done may have an adverse effect on performance.

Default value	Description

audit.legacy.events.logging.forced	
`false`	This property controls whether ADVANCED or FULL level logging is enforced for actions that were audited prior to application version 7.0. If this property is set as true, those actions will be audited regardless of coverage settings.
plugin.audit.search.max.concurrent.nontext.requests	
`10`	Maximum number of concurrent non-freetext search requests allowed, defaults to 10 per node
plugin.audit.search.max.concurrent.text.requests	
`5`	Maximum number of concurrent freetext search requests allowed, defaults to 10 per node
plugin.audit.search.query.timeout	
`30`	Timeout in seconds for a queued search request, defaults to 30 seconds
plugin.audit.db.limit.rows	
`10000000`	Maximum number of audit event rows stored in DB, events exceeding the limit get deleted in time order, defaults to 10M checked on hourly basis
plugin.audit.db.limit.buffer.rows	
`1000`	Buffer to accommodate new audit events, defaults to 1000 rows
plugin.audit.db.delete.batch.limit	
`10000`	maximum number of events to be deleted per database transaction used when enforcing retention limits, defaults to 10,000 rows
plugin.audit.log.view.sysadmin.only	
`false`	Only allows the the system admin (but not admin) to see the global audit log
plugin.audit.schedule.db.limiter.interval.mins	
`60`	Database size check, running every 60 minutes
plugin.audit.broker.exception.loggedCount	
`3`	Maximum number of audit events written to system log file in case of error, defaults to 3
plugin.audit.retention.interval.hours	
`23`	Database retention check, which deletes events exceeding retention period, running every day at midnight, and only runs if the last run is more than 23 hours.
plugin.audit.file.max.file.size	
`100`	Size limit in megabytes for individual audit file, file rotates when limit is reached, defaults to 100MB
plugin.audit.file.max.file.count	
`100`	Maximum number of audit files, the earliest file will be deleted when limit is reached, defaults to 100
plugin.audit.consumer.buffer.size	
`10000`	Maximum number of audit events kept in buffer waiting to be consumed, defaults to 10,000
plugin.audit.broker.default.batch.size	
`3000`	Maximum number of audit events dispatched to consumer, defaults to 3,000 per batch

plugin.audit.coverage.cache.read.expiration.seconds	
`30`	How long the coverage cache is valid, defaults to 30 seconds
plugin.audit.distinct.categories.and.actions.cache.refresh.seconds	
`900`	How long the distinct categories and actions cache is refreshed, defaults to 900 seconds
plugin.audit.retention.file.configuration.expiration.seconds	
`300`	How frequently the retention file configuration cache (i.e. count) is refreshed, defaults to 300 seconds

Authentication

See also Connecting Bitbucket to Crowd.

Default value	Description
auth.cache.tti	
5	Controls the time-to-idle for entries in the authentication cache. A short TTI (5 to 10 seconds) helps narrow the window for malicious users authenticating with outdated credentials and is recommended. Setting this to a value less than 1 will default it to the configured TTL (`auth.cache.ttl`). This value is in **seconds**.
auth.cache.ttl	
`30`	Controls the time-to-live for entries in the authentication cache. Setting this to a value less than 1 will disable the cache. The maximum allowed value is 300 seconds (5 minutes). Longer TTLs pose a security risk, as potentially out-of-date credentials can still be used while they remain in the cache. A short TTL, like the default, can reduce burst load on remote authentication systems (Crowd, LDAP) while keeping potential exposure to outdated credentials low, especially when paired with a shorter TTI. This value is in **seconds**.
auth.remember-me.enabled	
`optional`	Controls whether remember-me authentication is disabled, always performed or only performed when a checkbox is checked on the login form. The 'Remember my login' checkbox is only displayed when set to 'optional'. Possible values are: • `always` No checkbox, remember-me cookie is always generated on successful login. • `optional` Checkbox is displayed on login form. Remember-me cookie is only generated when checkbox is checked. • `never` Remember-me authentication is disabled completely.
auth.remember-me.cookie.name	

`_atl_bitbucket_remember_me`	Defines the cookie name used for the remember-me authentication
auth.remember-me.token.expiry	
`30`	How long remember-me tokens are valid. Note that once a remember-me token is used for authentication, the token is invalidated and a new remember-me token is returned. This value is in **days**.
auth.remember-me.token.grace.period	
`60`	How long a token can be re-used for authentication *after* it has been used to authenticate . This setting allows a grace period to allow parallel authentication attempts to succeed. This commonly happens when a browser is started and opens multiple tabs at once. This value is in **seconds**
auth.remember-me.token.cleanup.interval	
`300`	Controls how frequently expired remember-me tokens are cleaned up. This value is in **minutes**
plugin.auth-crowd.sso.enabled	
`false`	Whether SSO support should be enabled or not. Regardless of this setting SSO authentication will only be activated when the system is connected to a Crowd directory that is configured for SSO.
plugin.auth-crowd.sso.config.ttl	
`15`	The auth plugin caches the SSO configuration that is retrieved from the remote Crowd server. This setting controls the time to live of that cache. This value is in **minutes**.
plugin.auth-crowd.sso.config.error.wait	
`1`	If an error occurs while retrieving the SSO configuration from the remote Crowd server, the system will wait this long before retrying. The wait time between subsequent attempts is incremented exponentially (1s -> 1.5s -> 2.3s -> 3.4s, etc). The wait time is capped at the configured TTL. This value is in **seconds**.
plugin.auth-crowd.sso.http.max.connections	
`20`	The maximum number of HTTP connections in the connection pool for communication with the Crowd server.
plugin.auth-crowd.sso.http.proxy.host	
	The name of the proxy server used to transport SOAP traffic to the Crowd server.
plugin.auth-crowd.sso.http.proxy.port	
	The connection port of the proxy server (must be specified if a proxy host is specified).
plugin.auth-crowd.sso.http.proxy.username	

	The username used to authenticate with the proxy server (if the proxy server requires authentication).
plugin.auth-crowd.sso.http.proxy.password	
	The password used to authenticate with the proxy server (if the proxy server requires authentication).
plugin.auth-crowd.sso.http.timeout	
`5000`	The HTTP connection timeout used for communication with the Crowd server. A value of zero indicates that there is no connection timeout. This value is in **milliseconds**.
plugin.auth-crowd.sso.socket.timeout	
`20000`	The socket timeout. You may wish to override the default value if the latency to the Crowd server is high. This value is in **milliseconds**.
plugin.auth-crowd.sso.session.validationinterval	
`3`	The number of minutes to cache authentication validation in the session. If this value is set to 0, each HTTP request will be authenticated with the Crowd server.
plugin.auth-crowd.sso.session.lastvalidation	
`atl.crowd.sso.lastvalidation`	The session key to use when storing a Date value of the user's last authentication.
plugin.auth-crowd.sso.session.tokenkey	
`atl.crowd.sso.tokenkey`	The session key to use when storing a String value of the user's authentication token.

Avatars

Default value	Description
avatar.max.dimension	
`1024`	Controls the max height *and* width for an avatar image. Even if the avatar is within the acceptable file size, if its dimensions exceed this value for height *or* width, it will be rejected. When an avatar is loaded by the server for processing, images with large dimensions may expand from as small as a few kilobytes on disk to consume a substantially larger amount of memory, depending on how well the image data was compressed. Increasing this limit can *subst antially* increase the amount of heap used while processing avatars and may result in OutOfMemoryErrors. This value is in **pixels**.
avatar.max.size	

`1048576`	Controls how large an avatar is allowed to be. Avatars larger than this are rejected and cannot be uploaded to the server, to prevent excessive disk usage. This value is in **bytes**.
avatar.url.default	
`mm`	Defines the fallback URL to be formatted into the "avatar.url.format.http" or "avatar.url.format.https" URL format for use when a user does not have an acceptable avatar configured. This value may be a URL or, if using Gravatar, it may be the identifier for one of Gravatar's default avatars.
avatar.url.format.http	
`http://www.gravatar.com/avatar/%1$s.jpg?s=%2$d&d=%3$s`	Defines the default URL format for retrieving user avatars over HTTP. This default uses any G-rated avatar provided by the Gravatar service The following format parameters are available: • %1$s The user's e-mail address, MD5 hashed, or "00000000000000000000000000000000" if the user has no e-mail. • %2$d The requested avatar size. • %3$s The fallback URL, URL-encoded, which may be defined using "avatar.url.default". • %4$s The user's e-mail address, not hashed, or an empty string if the user has no e-mail.
avatar.url.format.https	
`https://secure.gravatar.com/avatar/%1$s.jpg?s=%2$d&d=%3$s`	Defines the default URL format for retrieving user avatars over HTTPS. This default uses any G-rated avatar provided by the Gravatar service The following format parameters are available: • %1$s The user's e-mail address, MD5 hashed, or "00000000000000000000000000000000" if the user has no e-mail. • %2$d The requested avatar size. • %3$s The fallback URL, URL-encoded, which may be defined using "avatar.url.default". • %4$s The user's e-mail address, not hashed, or an empty string if the user has no e-mail.

Backups

Default value	Description
backup.drain.scm.timeout	

`60`	Controls how long the backup should wait for outstanding SCM operations to complete before failing. This value is in **seconds**.
backup.drain.db.timeout	
`90`	Draining database connections during backup happens in two stages. Stage 1 passively waits a set amount of time for all connections to be returned to the pool. If connections are still leased when backup.drain.db.timeout seconds has elapsed then stage 2 begins and will interrupt the owning threads, wait backup.drain.db.force.timeout seconds and finally attempt to roll back and close any remaining connections. In stage 1 of draining connections during backup, this setting controls how long the backup should wait for outstanding database operations to complete before moving to stage 2. See backup.drain.db.force.timeout This value is in **seconds**.
backup.drain.db.force.timeout	
`30`	In stage 2 of draining connections during backup, this property controls how long the backup process should wait (after interrupting the owning threads) for those threads to release the connections before forcibly rolling back and closing them. Note if all connections have been returned to the pool stage 2 is skipped and so this property has no effect. A negative value will skip stage 2 completely. See backup.drain.db.timeout This value is in **seconds**.

Branch Information

Default value	Description
plugin.bitbucket-branch-information.timeout	
`5`	Controls timeouts for retrieving branch information, which for large repositories can be quite slow and consume a single Git process. This value is in **seconds**.
plugin.bitbucket-branch-information.max.branches	
`1000`	Controls the maximum number of branches that are shown the user

Branch Utils

Default value	Description
plugin.bitbucket-auto-merge.limit	
`30`	**This setting is deprecated for removal in 9.0.** Use `plugin.bitbucket-cascading-merge.limit` instead.
plugin.bitbucket-auto-merge.timeout	
`300`	**This setting is deprecated for removal in 9.0.** Use `plugin.bitbucket-cascading-merge.timeout` instead.
plugin.bitbucket-branch-model.version.separator	

`[_\\-.+]`	The version component separator for branch model. This value is a regular expression pattern that is used to split branch names parsed as version strings into separate components for comparison. The default value results in any of the following 4 characters being used for comparison: _ - + .
plugin.bitbucket-branch-model.validation.prefix.length	
`30`	The maximum allowed length of branch prefixes in branch model
plugin.bitbucket-cascading-merge.limit	
`${plugin.bitbucket-auto-merge.limit:30}`	Defines the maximum number of merges allowed along in a single cascading merge chain. If the number of merges included in the chain exceeds this limit, the *entire chain* will be skipped. Setting this limit to 0 means cascading merging is effectively disabled, since the merge chain must always be empty.
plugin.bitbucket-cascading-merge.timeout	
`${plugin.bitbucket-auto-merge.timeout:300}`	Defines the maximum amount of time any command used to perform a single cascading merge from the chain is allowed to execute *or* idle. Since a cascading merge may require a series of different commands at the SCM level, this timeout does *not* define the upper bound for how long the overall merge process might take; it only defines the duration allotted to any single command. This value is in **seconds**.

Builds

Default value	**Description**
build.actions.threads.max	
`1*${scaling.concurrency}`	When performing actions on a build status, this sets the upper limit to the number of concurrent threads that can be performing actions at the same time. There is limited support for mathematical expressions; +,-,*,/ and () are supported.
build.actions.cache.expiry	
`5`	The maximum number of minutes to wait for a response from a remote CI system. This value is in **minutes**
build.actions.cache.max.pending	
`5000`	The maximum number of concurrent requests to a remote CI system.
build.status.reject-untrusted	
`false`	Reject build status that can't be verified to have been sent from a trusted build server. Bitbucket, via the PluginBuildServerProvider SPI, has the ability to verify the build server that POSTed a build status. This is used to establish the concept of a trusted build status. Bitbucket will always prevent certain actions on untrusted builds, for example it will never provide a list of download URLs for artifacts for an untrusted build. This property allows Bitbucket to outright reject untrusted builds, returning a 400 status code.

Clustering

Default value	Description
hazelcast.node.authentication.enabled	
`true`	Enable node authentication. When this is enabled the group name and password are verified before any other checks are run
hazelcast.enterprise.license	
	Specifies a Hazelcast enterprise license. An enterprise license is *not* required, but supplying one will unlock additional Hazelcast functionality, such as the ability to use the Hazelcast Management Center with clusters containing more than 2 nodes, which may be useful in production environments.
hazelcast.managementcenter.url	
	Specifies the URL where the Hazelcast Management Center is running. When a URL is configured each node in the cluster will connect to the Management Center at that URL and broadcast its status. This setting is deprecated and will be removed in 9.0
hazelcast.group.name	
`${user.name}`	Specifies the cluster group the instance should join. This can be used, for example, to partition development and production clusters.
hazelcast.group.password	
`${user.name}`	The password required to join the specified cluster group.
hazelcast.http.sessions	
`local`	Specifies how HTTP sessions should be managed. The following values are supported: • `local` HTTP sessions are managed per node. When used in a cluster, the load balancer MUST have sticky sessions enabled. If a node fails or is shut down, users that were assigned to that node need to log in again. • `sticky` HTTP sessions are distributed across the cluster with a load balancer configured to use sticky sessions. If a node fails or is shut down, users do not have to log in again. In this configuration, session management is optimized for sticky sessions and will not perform certain cleanup tasks for better performance. • `replicated` HTTP sessions are distributed across the cluster. The load balancer does not need to be configured for sticky sessions. `local` is the recommended setting for standalone installations. For clustered installations `local` is the most performant option, followed by `sticky` and `replicated`.
hazelcast.local.public.address	
	In most environments it should not be necessary to configure this explicitly. However, when using NAT, such as when starting cluster nodes using Docker, it may be necessary to configure the public address explicitly to avoid request binding errors.
hazelcast.network.autodetect	

`false`	A `boolean` flag to indicate whether Hazelcast should auto-detect the appropriate network discovery mechanism. No other properties are required for this configuration. Note that this configuration is not recommended for production environments.
hazelcast.network.aws	
`false`	A `boolean` flag to indicate whether Hazelcast has AWS EC2 Auto Discovery enabled. When setting this property to `true`, either `hazelcast.network.aws.iam.role` or (`hazelcast.network.aws.access.key` and `hazelcast.network.aws.secret.key`) become required properties.
hazelcast.network.aws.iam.role	
	If `hazelcast.network.aws` is `true`, then you must either set this property to your AWS role or set `hazelcast.network.aws.access.key` and `hazelcast.network.aws.secret.key` in order to discover your cluster node instances via the AWS EC2 API.
hazelcast.network.aws.access.key	
	If `hazelcast.network.aws` is `true` and `hazelcast.network.aws.iam.role` is not set, then you must set this property to your AWS account access key, in order to discover your cluster node instances via the AWS EC2 API.
hazelcast.network.aws.secret.key	
	If `hazelcast.network.aws` is `true` and `hazelcast.network.aws.iam.role` is not set, then you must set this property to your AWS account secret key, in order to discover your cluster node instances via the AWS EC2 API.
hazelcast.network.aws.region	
	The AWS region to query. If empty, Hazelcast's default ("us-east-1") is used. If set, it will override any value for "hazelcast.network.aws.host.header" (see below).
hazelcast.network.aws.host.header	
	The Host: header to use when querying the AWS EC2 API. If empty, then Hazelcast's default ("ec2.amazonaws.com") is used. If set, then "hazelcast.network.aws.region" shouldn't be set as it will override this property.
hazelcast.network.aws.port.range	
	Port to connect to on instances found via the AWS discovery mechanism. Can be a port range in the format 5701-5703 or single port. Providing a range with more than 3 ports may impact the application startup time. By default this is set to the value of the hazelcast.port property
hazelcast.network.aws.security.group.name	
	There are 2 mechanisms for filtering out AWS instances and these mechanisms can be combined (AND). • If `hazelcast.network.aws.security.group.name` is set, only instances within that security group will be selected. • If `hazelcast.network.aws.tag.key` and `hazelcast.network.aws.tag.value` are set, only instances with that tag key/value will be selected.
hazelcast.network.aws.tag.key	
	The AWS tag key to use to filter instances to form a cluster with.
hazelcast.network.aws.tag.value	
	The AWS tag value to use to filter instances to form a cluster with.

hazelcast.network.azure	
`false`	A `boolean` flag to indicate whether Hazelcast has Azure Auto Discovery enabled.
hazelcast.network.azure.instance.metadata.available	
`false`	A `boolean` flag to indicate whether to use Azure Instance Metadata service when retrieving current configuration parameters. Should be set to false when using the plugin outside of Azure Environment or Azure Instance Metadata service is not available. When setting this property to `true`, none of `hazelcast.network.azure.tenant.id`, `hazelcast.network.azure.client.id`, `hazelcast.network.azure.client.secret`, `hazelcast.network.azure.subscription.id`, `hazelcast.network.azure.resource.group`, should be configured. When setting this property to `false`, all the properties above should be configured. Note: `hazelcast.network.azure.tag` should always be configured.
hazelcast.network.azure.tag	
	If `hazelcast.network.azure` is `true`, then you must set this property to the name of the tag on the hazelcast vm or scale set resources, the value of the tag should be the port that hazelcast will use to communicate. This property should have the format key\=value, note that the \ in front of the = is needed to ensure the values are read properly.
hazelcast.network.azure.group.name	
	Note: this has been completely replaced by `hazelcast.network.azure.resource.group` as part of Hazelcast 5 upgrade.
hazelcast.network.azure.resource.group	
`${hazelcast.network.azure.group.name}`	If `hazelcast.network.azure` is `true` and `hazelcast.network.azure.instance.metadata.available` is `false, then you must set this property to the Azure resource group name of the cluster.
hazelcast.network.azure.subscription.id	
	If `hazelcast.network.azure` is `true` and `hazelcast.network.azure.instance.metadata.available` is `false`, then you must set this property to your Azure subscription ID.
hazelcast.network.azure.client.id	
	If `hazelcast.network.azure` is `true` and `hazelcast.network.azure.instance.metadata.available` is `false`, then you must set this property to your Azure Active Directory Service Principal client ID.
hazelcast.network.azure.client.secret	
	If `hazelcast.network.azure` is `true` and `hazelcast.network.azure.instance.metadata.available` is `false`, then you must set this property to your Azure Active Directory Service Principal client secret.
hazelcast.network.azure.tenant.id	
	If `hazelcast.network.azure` is `true` and `hazelcast.network.azure.instance.metadata.available` is `false`, then you must set this property to your Azure Active Directory tenant ID.
hazelcast.network.kubernetes	
`false`	A `boolean` flag to indicate whether Hazelcast has Kubernetes Auto Discovery enabled. No other properties are required for configuration of Kubernetes.

hazelcast.network.multicast	
`false`	A `boolean` flag to indicate whether Hazelcast has multicasting enabled.
hazelcast.network.multicast.address	
	The multicast address for the cluster, used to locate members when multicast discovery is enabled. If no value is set here, Hazelcast's default (224.2.2.3) is used. This value should not need to be configured explicitly on most networks.
hazelcast.network.multicast.port	
`${hazelcast.port}`	The multicast port to bind to. By default, this will be the `hazelcast.port` (5701, unless configured otherwise), and updating that setting will also update this one unless this port is configured explicitly.
hazelcast.network.tcpip	
`false`	A `boolean` flag to indicate whether Hazelcast has TCP/IP enabled.
hazelcast.network.tcpip.members	
`localhost:5701,localhost:5702`	List of members that Hazelcast nodes should connect to when TCP/IP is enabled. These nodes function as root nodes, allowing cluster nodes to discover each other. This comma-separated list does *not* need to include every node in the cluster. When new nodes join they will use the connected node to find the other cluster nodes.
hazelcast.port	
`5701`	The network port where Hazelcast will listen for cluster members. If multiple instances are run on the same server Hazelcast will automatically increment this value for additional nodes.

Code Insights

Default value	Description
plugin.bitbucket-code-insights.reports.expiry.days	
`60`	Controls how long code insight cards are kept in the database. This value is in **days**.
plugin.bitbucket-code-insights.pullrequest.changedlines.cache.max	
`500`	Controls the number of pull request diffs kept in the insights diff cache
plugin.bitbucket-code-insights.pullrequest.changedlines.cache.ttl	
`7200`	Controls the number of seconds for which the diff cache is kept. This value is in **seconds**

Code owners

Default value	Description
code.owners.file.path	
`.bitbucket/CODEOWNERS`	Controls where bitbucket will look for the CODEOWNERS file in the repository. File path should be relative to the root of the repository.

code.owners.maximum.users	
100	Controls the maximum number of code owners suggested when creating a new pull request.
code.owners.maximum.filesize	
524288	Controls the maximum file size of a CODEOWNERS file, in bytes. Bitbucket will not attempt to read CODEOWNERS files larger than this size.

Comment Likes and Comment Reactions

Default value	Description
plugin.bitbucket-comment-likes.max.resources	
500	The maximum number of comment likes associated with a single comment. The system will allow to create more likes than this number, but the results of API calls to get likes will be *strictly limited* to the value configured here, with appropriate warnings recorded in the application logs.
plugin.bitbucket-comment-likes.max.page	
100	The maximum size of a page of comment likes
plugin.bitbucket-comment-likes.max.reactions	
50	The maximum number of specific comment reactions for a single comment. The system will not allow you to add more of the same reaction.

Commit Indexing

These properties control how commits are indexed when after pushes or pull request merges.

Default value	Description
indexing.max.threads	
4	Controls the maximum number of threads which are used to perform indexing. The resource limits configured below are not applied to these threads, so using a high number may negatively impact server performance.
indexing.import.max.threads	
1	Controls the maximum number of threads which are used to perform indexing during Data Center migration imports. The resource limits configured below are not applied to these threads, so using a high number may negatively impact server performance.
indexing.job.batch.size	
250	Defines the number of commits which will be indexed in a single database transaction.
indexing.job.queue.size	
150	Defines the maximum number of pending indexing requests. When this limit is reached, attempts to queue another indexing operation will be rejected.
indexing.queue.timeout.poll	

`60`	Controls how long indexing processes are allowed to wait for the next commit to be made available in the commit queue before assuming the process that retrieves the commits is stuck and giving up. This value is in **seconds**.
indexing.queue.size	
`1024`	Defines the size of the queue that will be used for indexing. When the limit is reached the program will block until there is space in the queue to add any required new items.
indexing.process.timeout.execution	
`3600`	Controls how long indexing processes are allowed to execute before they are interrupted, even if they are producing output or consuming input. This value is in **seconds**.
indexing.snapshot.timeout.execution	
`120`	Controls how long snapshot generation, which captures the state of a repository's branches and tags, is allowed to execute before it is interrupted. This timeout is applied whether the process is producing output or not. This value is in **seconds**.
indexing.snapshot.timeout.idle	
`${indexing.snapshot.timeout.execution}`	Controls how long snapshot generation, which captures the state of a repository's branches and tags, is allowed to run without producing output before it is interrupted. This value is in **seconds**.

Commit graph cache

Default value	Description
commit.graph.cache.min.free.space	
`1073741824`	Controls how much space needs to be available on disk (specifically under <BITBUCKET_HOME>/caches) for caching to be enabled. This setting ensures that the cache plugin does not fill up the disk. This value is in **bytes**.
commit.graph.cache.max.threads	
`2`	Defines the number of threads that will be used to create commit graph cache entries.
commit.graph.cache.max.job.queue	
`1000`	Defines the maximum number of pending cache creation jobs.

Commits

Default value	Description
commit.diff.context	

`10`	Defines the number of context lines to include around diff segments in commit diffs.
commit.lastmodified.timeout	
`120`	Defines the timeout for streaming last modifications for files under a given path, applying a limit to how long the traversal can run before the process is canceled. This timeout is applied as both the execution and idle timeout. This value is in **seconds**.
commit.list.follow.renames	
`true`	Defines whether file history commands in the UI should follow renames by default. Setting this to false may reduce load for repositories with long commit logs, as users will have to manually enable the 'follow renames' toggle in the UI in order to perform the more expensive --follow command.
commit.message.max	
`262144`	Controls the maximum length of the commit message to be loaded when retrieving one or more commits from the SCM. Commit messages longer than this limit will be truncated. The default limit is high enough to not affect processing for the general case, but protects the system from consuming too much memory in exceptional cases.
commit.message.bulk.max	
`16384`	Controls the maximum length of the commit message to be loaded when bulk retrieving a commits from the SCM. Commit messages longer than this limit will be truncated. The default limit is high enough to not affect processing for the common case, but protects the system from consuming too much memory when many commits have long messages.

Content

Default value	Description
content.archive.timeout	
`1800`	Defines the timeout for archive processes, applying a limit to how long it can take to stream a repository's archive before the process is canceled. This timeout is applied as both the execution and idle timeout. This value is in **seconds**.
content.patch.timeout	
`1800`	Defines the timeout for patch processes, applying a limit to how long it can take to stream a diff's patch before the process is canceled. This timeout is applied as both the execution and idle timeout. This value is in **seconds**.

Data Center Migration

Default value	Description
migration.threadpool.size	
2	Maximal size of thread pool – the maximum number of concurrent migrations.

Database

Database properties allow explicitly configuring the database the system should use. They may be configured directly in `bitbucket.properties`, or they may be specified during setup. Existing systems may be migrated to a new database using the in-app migration feature.

If no database is explicitly configured, an internal database will be used automatically. Which internal database is used is not guaranteed.

If the `jdbc.driver`, `jdbc.url`, `jdbc.password` and `jdbc.user` properties are specified in `bitbucket.properties` when the Setup Wizard runs after installation, then those values will be used, and the Setup Wizard will not display the database configuration screen.

Warning: `jdbc.driver` and `jdbc.url` are available to plugins via the `ApplicationPropertiesService`. Some JDBC drivers allow the username and password to be defined in the URL. Because that property is available throughout the system (and will be included in support requests), that approach should not be used. The `jdbc.username` and `jdbc.password` properties should be used for these values instead.

Default value	Description
jdbc.driver	
`org.h2.Driver`	The JDBC driver class that should be used to connect to the database. The system uses an internal database by default, and stores its data in the home directory. The following JDBC drivers are bundled with the distribution: • `com.microsoft.sqlserver.jdbc.SQLServerDriver` (more info) • `oracle.jdbc.OracleDriver` (more info) • `org.postgresql.Driver` (more info) *The JDBC driver for MySQL is not bundled*, due to licensing restrictions; administrators will need to download and install that driver manually. See Connecting to MySQL for instructions.
jdbc.url	
`jdbc:h2:async:${bitbucket.shared.home}/data/db;DB_CLOSE_DELAY=-1;DB_CLOSE_ON_EXIT=FALSE;FILE_LOCK=FILE`	This is the JDBC URL that will be used to connect to the database. This URL varies depending on the database you are connecting to. Please consult the documentation for your JDBC driver to determine the correct URL.
jdbc.user	
`sa`	This is the user that will be used to authenticate with the database. *This user must have full DDL rights*. It must be able to create, alter and drop tables, indexes, constraints, and other SQL objects, as well as being able to create and destroy temporary tables.
jdbc.password	
	The password that the user defined by `jdbc.user` will connect with. This will be decrypted by the class mentioned in the `jdbc.password.decrypter.classname` property if defined.
jdbc.password.decrypter.classname	

	Fully qualified name of the class that's used for decrypting `jdbc.password`. This class must implement the `com.atlassian.db.config.password.Cipher` interface, and must be available on the classpath. Do not specify this parameter if `jdbc.password` isn't encrypted. **Deprecated** in favor of the global `encrypted-property.cipher.classname` property. **Warning:** Only one secret store classname property can be specified and including both will result in exceptions.

Database Pool

These properties control the database pool. The pool implementation used is HikariCP. Documentation for these settings can be found on the HikariCP configuration section.

To get a feel for how these settings really work in practice, the most relevant classes in HikariCP are:

- `com.zaxxer.hikari.HikariConfig`

  Holds the configuration for the database pool and has documentation for the available settings.
- `com.zaxxer.hikari.pool.HikariPool`

  Provides the database pool and manages connections.
- `com.zaxxer.hikari.util.ConnectionBag`

  Holds references to open connections, whether in-use or idle.

Default value	Description
db.pool.rejectioncooldown	
`10`	When a connection cannot be leased because the pool is exhausted, the stack traces of all threads which are holding a connection will be logged. This defines the cooldown that is applied to that logging to prevent spamming stacks in the logs on every failed connection request. This value is in **minutes**
db.pool.size.idle	
`5`	Defines the number of connections the pool tries to keep idle. *The system can have more idle connections than the value configured here.* As connections are borrowed from the pool, this value is used to control whether the pool will eagerly open new connections to try and keep some number idle, which can help smooth ramp-up for load spikes.
db.pool.size.max	
`80`	Defines the maximum number of connections the pool can have open at once.
db.pool.timeout.connect	
`15`	Defines the amount of time the system will wait when attempting to open a new connection before throwing an exception. The system may hang, during startup, for the configured number of seconds if the database is unavailable. As a result, the timeout configured here should *not* be generous. This value is in **seconds**.
db.pool.timeout.idle	

`1750`	Defines the maximum period of time a connection may be idle before it is closed. In general, generous values should be used here to prevent creating and destroying many short-lived database connections (which defeats the purpose of pooling). **Note**: If an aggressive timeout is configured on the database server, a *more aggressive* timeout must be used here to avoid issues caused by the database server closing connections from its end. The value applied here should ensure the system closes idle connections before the database server does. This value needs to be less than db.pool.timeout.lifetime otherwise the idle timeout will be ignored. This value is in **seconds**.
db.pool.timeout.leak	
`0`	Defines the maximum period of time a connection may be checked out before it is reported as a potential leak. *By default, leak detection is not enabled*. Long-running tasks, such as taking a backup or migrating databases, can easily exceed this threshold and trigger a false positive detection. This value is in **minutes**.
db.pool.timeout.lifetime	
`30`	Defines the maximum *lifetime* for a connection. Connections which exceed this threshold are closed the first time they become idle and fresh connections are opened. This value is in **minutes**.

Database Schema

These properties control aspects of how the database schema is managed.

Default value	Description
db.schema.lock.maxWait	
`30`	Defines the maximum amount of time the system can wait to acquire the schema lock. Shorter values will prevent long delays on server startup when the lock is held by another instance or, more likely, when the lock was not released properly because a previous start was interrupted while holding the lock. This can happen when the system is killed while it is attempting to update its schema. This value is in **seconds**.
db.schema.lock.pollInterval	
`5`	Defines the amount of time to wait between attempts to acquire the schema lock. Slower polling produces less load, but may delay acquiring the lock. This value is in **seconds**.

Deployments

Default value	Description
deployments.commits.max	

`10000`	Limits the number of commits that can be part of a deployment. This ensures Bitbucket doesn't process too many commits at once when receiving a deployment notification and should only be triggered in the rare case where subsequent deployments to an environment have lots of commits between them. If this limit is reached the deployment will still be accepted and recent commits up to this number will be indexed. However, the remaining commits will not be indexed and therefore not appear as being part of the deployment.
deployments.indexing.threads.max	
`1*${scaling.concurrency}`	When indexing commits in a deployment, this sets the upper limit to the number of concurrent threads that can be performing indexing at the same time. There is limited support for mathematical expressions; +,-,*,/ and () are supported.
deployments.indexing.timeout	
`300`	Configures a hard upper limit on how long the commits command when indexing commits in a deployment is allowed to run. This value is in **seconds**. Using 0, or a negative value, disables the timeout completely.

Diagnostics

Default value	Description
diagnostics.alert.dispatcher.max.threads	
`5`	The maximum number of alert dispatcher threads. The number of dispatcher threads will only be increased when the alert queue is full and this configured limit has not been reached.
diagnostics.alert.dispatcher.queue.size	
`250`	The number of events that can be queued. When the queue is full and no more threads can be created to handle the events, events will be discarded.
diagnostics.issues.event.dropped.threaddump.cooldown.seconds	
`60`	Configures how often thread dumps should be generated for alerts relating to dropped events. Taking thread dumps can be computationally expensive and may produce a large amount of data when run frequently. This value is in **seconds**
diagnostics.issues.event.slow.listener.time.millis	
`15000`	Configures when an alert is raised for a slow event listener. If an event listener takes longer than the configured time to process an event, an warning alert is raised and made visible on the System Health page. This value is in **milliseconds**
diagnostics.issues.event.slow.listener.overrides	

	Configures overrides for specific event listeners and/or specific plugins. This setting can be used to suppress 'slow event listener detected' alerts for specific event listeners or plugins. The value should be comma-separated list of configurations of individual triggers, where a trigger is either the plugin-key, or the plugin-key followed by the event listener class name. Overrides are *only* considered if they specify more tolerant limits than the value specified in the diagnostics.issues.event.slow.listener.time.millis value. Setting a shorter override (e.g. 1000 when the default is 15000) will have no effect. The following example sets the trigger for the com.company.example-plugin to 60s and sets the limit for the com.company.RepositoryCreatedListener event listener in the same plugin to 30s. `com.company.example-plugin:60000, com.company.example-plugin.com.company.RepositoryCreatedListener:30000` Configured values are in **milliseconds**
diagnostics.issues.hookscript.slow.time.seconds	
`30`	Defines the maximum amount of time an individual hook script is allowed to execute *or* idle before a warning would be logged in the diagnostics plugin. This value is in **seconds**. The default is 30 seconds, with a 10 second minimum
diagnostics.alert.retention.time.minutes	
`43200`	Configures the minimum amount of time alerts are kept in the database before being periodically truncated. The default (43200 minutes) is 30 days. This value is in **minutes**
diagnostics.alert.truncation.interval.minutes	
`1440`	Configures the interval at which alerts are truncated from the database; in case of a fresh instance (or full cluster) (re-)start, this is also the initial offset until the truncation is executed for the first time. The default (1440 minutes) is 24 hours. This value is in **minutes**
diagnostics.ipd.monitoring.poll.interval.seconds	
`60`	Configures the interval at which In-product diagnostics jobs emit IPD metrics to JMX and log to a log file. This value is in **seconds**. The default is 60 seconds.
diagnostics.ipd.monitoring.poll.storage.interval.minutes	
`10`	This value is in **minutes**. The default is 10 minutes. Setting a value of less than 10 will result in a warning at start-up and the default value of 10 will be used.

Display

These properties control maximum limits of what will be displayed in the web UI.

Default value	Description
display.max.source.lines	

`20000`	Controls how many lines of a source file will be retrieved before a warning banner is shown and the user is encouraged to download the raw file for further inspection. This property relates to `page.max.source.lines` in that up to (display.max.source.lines/page.max.source.lines) requests will be made to view the page.
display.max.jupyter.notebook.size	
`2097152`	Controls the size of the largest jupyter notebook that will be automatically loaded and rendered in the source view. Users will be prompted to manually trigger loading the notebook for files larger than this. This value is in **bytes**.

Downloads

Default value	Description
http.download.raw.policy	
`Smart`	Controls the download policy for raw content. Possible values are: • `Insecure` Allows all file types to be viewed in the browser. • `Secure` Requires all file types to be downloaded rather than viewed in the browser. • `Smart` Forces "dangerous" file types to be downloaded, rather than allowing them to be viewed in the browser. These options are case-sensitive and defined in `com.atlassian.http.mime.DownloadPolicy`

Encrypted properties

Default value	Description
encrypted-property.cipher.classname	

	Fully qualified name of the class that's used for decrypting encrypted application properties. An application property will be considered encrypted if the value is prefixed with `{ENC}`.
	
	The class specified below must implement the `com.atlassian.db.config.password.Cipher` interface, and must be available on the classpath. If this parameter is not specified, any property identified as encrypted will have the identifying prefix {ENC} stripped off and the remaining value treated as unencrypted plain text.
	
	Example usage using basic base64 obfuscation on the SSL key password:
	
	• Set the cipher class
	`encrypted-property.cipher.classname=com.atlassian.db.config.password.ciphers.base64.Base64Cipher`
	• Use the encrypted value with the identifying prefix
	`server.ssl.key-password={ENC}Y2hhbmdlaXQ=`

Events

These properties control the number of threads that are used for dispatching asynchronous events. Setting this number too high can decrease overall throughput when the system is under high load because of the additional overhead of context switching. Configuring too few threads for event dispatching can lead to events being queued up, thereby reducing throughput. These defaults scale the number of dispatcher threads with the number of available CPU cores.

Default value	Description
event.dispatcher.core.threads	
`0.8*${scaling.concurrency}`	The minimum number of threads that is available to the event dispatcher. The `${scaling.concurrency}` variable is resolved to the number of CPUs that are available.
event.dispatcher.max.threads	
`${scaling.concurrency}`	The maximum number of event dispatcher threads. The number of dispatcher threads will only be increased when the event queue is full and this configured limit has not been reached.
event.dispatcher.queue.size	
`4096`	The number of events that can be queued. When the queue is full and no more threads can be created to handle the events, events will be discarded.
event.dispatcher.queue.rejectioncooldown	
`10`	When an event cannot be dispatched because the queue is full, the stack traces of all busy event processing threads will be logged. This defines the cooldown that is applied to that logging to prevent spamming the stacks in the logs on every rejected event. This value is in **minutes**
event.dispatcher.keepAlive	

`60`	The time a dispatcher thread will be kept alive when the queue is empty and more than core. threads threads are running. This value is in **seconds**.

Executor

Controls the thread pool that is made available to plugins for asynchronous processing.

Default value	Description
executor.max.threads	
`${scaling.concurrency}`	Controls the maximum number of threads allowed in the common `ExecutorService`. This `ExecutorService` is used by for background tasks, and is also available for plugin developers to use. When more threads are required than the configured maximum, the thread attempting to schedule an asynchronous task to be executed will block until a thread in the pool becomes available. By default, the pool size scales with the number of reported CPU cores. Note: A minimum of 4 is enforced for this property. Setting the value to a lower value will result in the default 4 threads being used.

Features

These properties control high-level system features, allowing them to be disabled for the entire instance. Features that are disabled at this level are disabled *completely*. This means instance-level configuration for a feature is overridden. It also means a user's permissions are irrelevant; a feature is still disabled even if the user has the system admin permission.

Default value	Description
feature.attachments	
`true`	Controls whether users are allowed to upload attachments to repositories they have access to. If this feature is enabled and later disabled, attachments which have already been uploaded *are not automatically removed*.
feature.auth.captcha	
`true`	Controls whether to require CAPTCHA verification when the number of failed logins is exceeded. If enabled, any client who has exceeded a set limit for failed logins using either the web interface or Git hosting will be be required to authenticate in the web interface and successfully submit a CAPTCHA before continuing. Disabling this will remove this restriction and allow users to incorrectly authenticate as many times as they like without penalty. **Warning**: It is **strongly** recommended to keep this setting enabled. Disabling it has the following ramifications: • Users may lock themselves out of any underlying user directory service (LDAP, Active Directory etc) because the system will pass through all authentication requests (regardless of the number of previous failures) to the underlying directory service. • For installations where Bitbucket is used for user management or a directory service with no limit on failed login attempts is used, the system will be vulnerable to brute-force password attacks.
feature.bidi.character.highlighting	

`true`	Controls whether Unicode bidirectional characters are highlighted in code contexts (source view, pull requests, code blocks in comments, etc.). If enabled, these characters will be expanded (e.g. `&lt;U+2066&gt;`) so they can be easily seen by reviewers.
feature.code.owners	
`true`	Controls whether code owners will be added as suggested reviewers when creating pull requests
feature.commit.graph	
`true`	Controls whether a commit graph is displayed to the left of the commits on the repository commits page.
feature.commit.show.signatures	
`true`	Controls whether we will index commit signature information and if verification signature details about commits are displayed on the commits page and when selecting specific commit hashes.
feature.deployments	
`true`	Controls whether the deployments feature is available in the UI or via REST.
feature.diagnostics	
`true`	Controls whether diagnostics is enabled. Diagnostics looks for known anti-patterns such as long-running operations being executed on event processing threads and identifies the responsible plugins. Diagnostics adds a little bit of overhead, and can be disabled if necessary.
feature.enforce.project.settings	
`true`	Controls wheather project admins can enforce restrictions on all the repository settings in a project
feature.file.editor	
`true`	Controls whether users can edit repository files in the browser and via REST. When set to `false`, the edit UI and REST interface are disabled globally.
feature.forks	
`true`	Controls whether repositories can be forked. This setting *supersedes and overrides* instance-level configuration. If this is set to false, even repositories which are marked as forkable cannot be forked.
feature.getting.started.page	
`true`	Controls whether new users are redirected to a getting started page after their first login.
feature.hook.scripts	
`false`	Controls whether support for uploading, configuring and running hook scripts is enabled. This feature permits the SYS_ADMIN user to upload scripts that will be executed by the operating system user (i.e. the user that runs the Bitbucket application) and as such may present a security risk in some environments. This feature should be enabled with caution.
feature.git.rebase.workflows	

`true`	Controls whether rebase workflows are enabled for Git repositories. This can be used to fully disable all of the Git SCM's built-in rebase support, including: • "Rebase and fast-forward" and "Rebase and merge" merge strategies - "Rebase" action for pull requests - "Rebase" action for ref sync When this feature is disabled, repository administrators and individual users cannot override it. However, third-party add-ons can still use the Java API to rebase branches or perform rebase "merges".
feature.data.center.migration.export	
`true`	Controls whether Data Center migration archives can be generated on this instance.
feature.data.center.migration.import	
`true`	Controls whether Data Center migration archives can be imported into the instance.
feature.jira.cloud.devinfo	
`true`	Controls whether the system can send development information to Jira Cloud
feature.jira.commit.checker	
`true`	Controls whether the Jira commit checker feature is enabled.
feature.personal.repos	
`true`	Controls whether personal repositories can be created. When set to `false`, personal repository creation is disabled globally.
feature.project.repo.access.tokens	
`true`	Controls whether HTTP access tokens at project and repository level are enabled.
feature.public.access	
`false`	Public access allows anonymous users to be granted access to projects and repositories for read operations including cloning and browsing repositories. When this feature is enabled repositories are not globally made public. Rather, it permits public access to be enabled on a per repository or per project basis in the repository and project administration settings respectively.
feature.pull.request.auto.decline	
`true`	Controls whether the process of automatically declining inactive pull requests is available for the system. When this feature is available, all pull requests that are inactive (no recent comments, pushes etc.) are able to be automatically declined, based on the configured auto decline settings. By default this is turned on for all repositories, but individual projects or repositories are still able to opt-out or configure a different inactivity period. When this feature is unavailable (by setting this property to `false`), it is completely inaccessible by the system. To have the feature still be available, but change the default to off for all repositories (meaning individual projects or repositories have to opt-in), this property should be `true` and `pullrequest.auto.decline.settings.global.enabled` should be set to `false`.
feature.pull.request.auto.merge	

`true`	Controls whether the admins can enable the use of auto-merge feature at project and/or repository level. When this feature is enabled, the admins can control whether the auto-merge setting is enabled or disabled for a particular project or a repository. When the auto-merge setting is enabled for a particular repository, it allows the users to request the system to automatically merge a pull request targeting that repository, on their behalf, when all the merge checks pass.
feature.pull.request.deletion	
`true`	Controls whether the system allows pull requests to be deleted via the UI and REST. Disabling this feature will prevent pull request deletion in *all* repositories, including by admins and sysadmins, and will override any settings applied to individual repositories.
feature.pull.request.drafts	
`true`	Controls whether draft pull requests are enabled
feature.pull.request.suggestions	
`true`	Controls whether the system allows users to add pull request suggestions through inline comments via the UI.
feature.pull.request.templates	
`true`	Controls whether the system allows users to create and manage pull request templates via REST or UI
feature.rate.limiting	
`true`	Controls whether HTTP requests will be rate limited per user. If this is enabled, repeated HTTP requests from the same user in a short time period may be rate limited. If this is disabled, no requests will be rate limited.
feature.repository.archiving	
`true`	Controls whether a user can archive a repository in the UI or the repository update endpoint in REST. This also allows permission policy setting for repository archiving.
feature.repository.delete.policy	
`true`	Controls whether a user can delete a repository by checking their permission level against the repository delete policy.
feature.repository.management	
`true`	Controls whether admins have access to the Repositories view in the UI or the repository-management endpoint in REST.
feature.required.builds	
`true`	Controls whether admins have access to the Required Builds view in the UI or the required-builds endpoint in REST. Note that this feature is only available for Data Center installations.
feature.reviewer.groups	
`true`	Controls whether a user can manage reviewer groups.
feature.rolling.upgrade	
`true`	Controls whether rolling upgrade can be performed for bug-fix versions.
feature.secret.scanning	
`true`	Controls whether secret scanning is enabled for the system.

feature.system.signed.git.objects	
`true`	Controls whether system created Git objects (such as pull request merge commits) are signed. When this feature is enabled the application will sign and verify system created Git objects using an automatically generated signing GPG key pair.
feature.ssh.keys.for.code.signing	
`true`	Controls whether SSH keys can be used to sign commits.
feature.smart.mirrors	
`true`	Controls whether mirrors can be connected to the instance. Note that this feature is only available for Data Center installations
feature.suggest.reviewers	
`true`	Controls whether the suggest reviewers feature is enabled or not.
feature.user.time.zone.onboarding	
`true`	Controls whether users with mismatching time zones are shown an alert prompting them to change their user time zone.
feature.x509.certificate.signing	
`true`	Controls whether signed commits and tags are verified with X.509 certificates and whether trusted X.509 certificates can be managed by the system.

File editor

Default value	Description
content.upload.max.size	
`5242880`	Controls the maximum allowed file size when editing a file through the browser or file edit REST endpoint This value is in **bytes**. Default is 5 MiB

Footer

Default value	Description
footer.links.contact.support	
	Controls whether the Contact Support link is displayed in the footer. If this is not set, then the link is not displayed. Otherwise, the link will redirect to the URL or email that is provided. Example formats: • https://support.example.com/ • mailto: support@example.com

Fork Syncing (Ref Syncing)

Default value	Description
plugin.bitbucket-repository-ref-sync.fetch.timeout	
`300`	Defines the maximum amount of time fetch commands used to synchronize branches in bulk are allowed to execute *or* idle. Because fetch commands generally produce the majority of their output upon completion, there is no separate idle timeout. The default value is 5 minutes. This value is in **seconds**.
plugin.bitbucket-repository-ref-sync.merge.timeout	
`300`	Defines the maximum amount of time any command used to merge upstream changes into the equivalent branch in a fork is allowed to execute *or* idle. Since merging branches may require a series of different commands at the SCM level, this timeout does *not* define the upper bound for how long the overall merge process might take; it only defines the duration allotted to any single command. This value is in **seconds**.
plugin.bitbucket-repository-ref-sync.rebase.timeout	
`300`	Defines the maximum amount of time any command used to rebase a fork branch against upstream changes is allowed to execute *or* idle. Since merging branches may require a series of different commands at the SCM level, this timeout does *not* define the upper bound for how long the overall rebase process might take; it only defines the duration allotted to any single command. This value is in **seconds**.
plugin.bitbucket-repository-ref-sync.threads	
`3`	Controls the number of threads used for ref synchronization. Higher values here will help synchronization keep up with upstream updates, but may produce noticeable additional server load.

Graceful shutdown

Default value	Description
server.shutdown	
`graceful`	Controls whether Tomcat, SSH server and job scheduler should be shutdown gracefully or immediately. When graceful shutdown is enabled, this is how different components would behave after shutdown is initiated - * Tomcat stops accepting new HTTP connections but active connections are not interrupted. * Ssh server stops accepting new SSH connections but active connections are not interrupted. * Job scheduler does not start any new jobs but currently running jobs are not cancelled. System will allow above components to shutdown gracefully for some time which can be controlled by property `graceful.shutdown.timeout`. If value of this property is set as `immediate`, then HTTP/SSH requests and scheduled jobs will not be waited for completion and will be terminated abruptly in their usual shutdown lifecycle.
graceful.shutdown.timeout	

`30`	This is the minimum time for which system is guaranteed to wait for currently active HTTP/SSH requests and scheduled jobs to finish before terminating them. If you are using `stop-bitbucket.sh` to stop Bitbucket, the value of this property is effective only if it is less than or equal to the value of `BITBUCKET_SHUTDOWN_TIMEOUT` environment variable. It is recommended to set the value of this property at least 10 seconds less than `BITBUCKET_SHUTDOWN_TIMEOUT` environment variable. This value is in **seconds**

Hibernate

Default value	**Description**
hibernate.format_sql	
`${hibernate.show_sql}`	When `hibernate.show_sql` is enabled, this flag controls whether Hibernate will format the output SQL to make it easier to read.
hibernate.jdbc.batch_size	
`20`	Controls Hibernate's JDBC batching limit, which is used to make bulk processing more efficient (both for processing and for memory usage).
hibernate.show_sql	
`false`	Used to enable Hibernate SQL logging, which may be useful in debugging database issues. This value should generally only be set by developers, not by customers.

Hook Scripts

Default value	**Description**
hookscripts.output.max	
`32768`	Applies a limit to how many bytes a single hook script can write to stderr or stdout. The limit is enforced *separately* for each, so a limit of 32768 allows for a maximum of 65536 bytes of combined output from a single script. Output beyond the configured limit is truncated, and a message is included to indicate so. This value is in **bytes**. The default is 32K, with a 16K minimum.
hookscripts.path.shell	
	Defines the location of bash.exe, which is used when invoking hook scripts on Windows. This property is ignored on other platforms; only Windows requires using a shell to invoke hook scripts.
hookscripts.size.max	
`10485760`	The size a script can be when it is uploaded. This value is in **bytes**.
hookscripts.timeout	
`120`	Defines the maximum amount of time an individual hook script is allowed to execute *or* idle. Since multiple hook scripts can be registered, this timeout does not define an upper bound for how long overall execution can take; it only defines the duration allotted to any single hook script. This value is in **seconds**. The default is 120 seconds, with a 30 second minimum

Importer

Default value	Description
plugin.importer.external.source.request.socket.timeout	
`30`	Controls how long requests to external repository source servers can continue without producing any data before the importer gives up. This value is in **seconds**.
plugin.importer.external.source.request.timeout	
`30`	Controls how long requests to external repository source servers can proceed before the importer gives up. This value is in **seconds**.
plugin.importer.import.repository.thread.max	
`8`	Maximal size of thread pool – the maximum number of concurrent repository imports.
plugin.importer.repository.fetch.timeout.execution	
`360`	Defines the execution timeout for fetch processes, applying a hard limit to how long the operation is allowed to run even if it is producing output or reading input. The default value is 6 hours. This value is in **minutes**.
plugin.importer.repository.fetch.timeout.idle	
`60`	Defines the idle timeout for fetch processes, applying a limit to how long the operation is allowed to execute without either producing output or consuming input. The default value is 60 minutes. This value is in **minutes**.

JMX

See Enabling JMX counters for performance monitoring.

Default value	Description
jmx.enabled	
`false`	Controls whether JMX management interfaces for the system and its libraries are registered. Note: Some libraries may register their JMX management interfaces regardless of this setting.

Jira

Default value	Description
plugin.jira-integration.circuitbreaker.enabled	

`true`	Defines whether the circuit breaker is enabled/disabled for all Jira sites. If set to true, the call to Jira is allowed. If set to false, the calls to all the Jira sites will fail and no development information will be sent.
plugin.jira-integration.circuitbreaker.failurethreshold	
`50`	Defines the threshold for when the circuit breaker should switch to OPEN (and not let calls through). When the failure rate is equal or greater than the threshold the circuit breaker transitions to OPEN. This value is a **percentage**, must be between 0 inclusive and 100 exclusive.
plugin.jira-integration.circuitbreaker.callsinhalfopen	
`10`	Defines the maximum number of calls allowed through when the circuit breaker is HALF OPEN.
plugin.jira-integration.circuitbreaker.slowcallthreshold	
`2`	Threshold for when a call is considered slow. Too many slow calls will transition the circuit breaker to OPEN state. This value is in **seconds**.
plugin.jira-integration.circuitbreaker.waitinopenstate	
`60`	Defines the time to spend in OPEN state before transitioning over to HALF OPEN (and eventually CLOSED). This value is in **seconds**.
plugin.jira-integration.comment.issues.max	
`500`	Controls the maximum result size allowed when retrieving Jira issues linked to comments.
plugin.jira-integration.pullrequest.attribute.commits.max	
`100`	Controls the maximum number of commits to retrieve when retrieving attributes associated with commits of a pull-request. This value must be between 50 and 1000, which are imposed as lower and upper bounds on any value specified here.
plugin.jira-integration.remote.page.max.issues	
`20`	Controls the maximum number of issues to request from Jira. This value must be between 5 and 50, which are imposed as lower and upper bounds on any value specified here.
plugin.jira-integration.remote.timeout.connection	
`5000`	The connection timeout duration in milliseconds for requests to Jira. This timeout occurs if the Jira server does not answer. e.g. the server has been shut down. This value must be between 2000 and 60000, which are imposed as lower and upper bounds on any value specified here. This value is in **milliseconds**.
plugin.jira-integration.remote.timeout.socket	
`10000`	The socket timeout duration in milliseconds for requests to Jira. This timeout occurs if the connection to Jira has been stalled or broken. This value must be between 2000 and 60000, which are imposed as lower and upper bounds on any value specified here. This value is in **milliseconds**.
plugin.jira-development-integration.reindex.pullrequests.commit.message.max	

`${commit.message.bulk.max}`	Controls the maximum length of the commit message to be loaded when reindexing pull requests. Any commit messages longer than this limit will be truncated. Setting this value less than or equal to 0 will prevent indexing commits when reindexing pull requests, which may be useful for sysadmins if including commits results in excessive load on the server.
plugin.jira-development-integration.reindex.pullrequests.command.timeout	
`300`	Defines the timeout for streaming commits when reindexing pull requests. Pull requests are reindexed in batches, with a separate process for each batch. If a batch's process times out, subsequent batches will be skipped. This value is in **seconds**, and is applied as both the execution and idle timeout.
plugin.jira-development-integration.threads.core	
`4`	When responding to changes that may need to be sent to Jira, processing will be done by a separate thread pool. This property defines the core and max threads for this thread pool. There is limited support for mathematical expressions; +,-,*,/ and () are supported.
plugin.jira-development-integration.threads.keepAliveSeconds	
`60`	When responding to changes that may need to be sent to Jira, processing will be done by a separate thread pool. This property defines the maximum threads for this thread pool. There is limited support for mathematical expressions; +,-,*,/ and () are supported.
plugin.jira-development-integration.threads.queue-capacity	
`10000`	When responding to changes that may need to be sent to Jira, processing will be done by a separate thread pool. This property defines the queue capacity for this thread pool There is limited support for mathematical expressions; +,-,*,/ and () are supported.
plugin.jira-commit-checker.issue-key-cache.expiry	
`360`	Defines the time-to-live of an issue key cache entry after it has been written. This cache is a cache of valid issue keys for each user in order to improve performance of the commit checker when the same user pushes a new commit with the same issue key. This value is in **minutes**.
plugin.jira-commit-checker.issue-key-cache.max	
`10000`	Defines the maximum number of entries that will be stored in the issue key cache.
plugin.jira-commit-checker.issue-key-cache.enabled	
`true`	Defines whether the issue key cache is enabled or disabled.
plugin.jira-commit-checker.circuitbreaker.default.enabled	
`true`	Defines whether the circuit breaker is enabled/disabled for all Jira instances. If set to true, the call to Jira is allowed. If set to false, the call to Jira will fail, no issues will be validated and the push will be rejected.
plugin.jira-commit-checker.circuitbreaker.default.failurethreshold	
`50`	Defines the threshold for when the circuit breaker should switch to OPEN (and not let calls through). When the failure rate is equal or greater than the threshold the circuit breaker transitions to OPEN. This value is a **percentage**, must be between 0 inclusive and 100 exclusive.

plugin.jira-commit-checker.circuitbreaker.default.callsinhalfopen	
`10`	Defines the maximum number of calls allowed through when the circuit breaker is HALF OPEN.
plugin.jira-commit-checker.circuitbreaker.default.slowcallthreshold	
`2`	Threshold for when a call is considered slow. Too many slow calls will transition the circuit breaker to OPEN state. This value is in **seconds**.
plugin.jira-commit-checker.circuitbreaker.default.waitinopenstate	
`60`	Defines the time to spend in OPEN state before transitioning over to HALF OPEN (and eventually CLOSED). This value is in **seconds**.
plugin.jira-commit-checker.jira-validation.timeout	
`5`	The timeout duration for the maximum allowed time for the hook to validate issues in Jira. If the timeout is reached, the push is rejected. This value is in **seconds**.
plugin.jira-commit-checker.project.key.ignore	
`UTC,GMT,ISO,SHA,AES,UTF,RFC`	The following project keys will be ignored when validating commit messages. The main use case for this are keys that look like Jira keys but are not in fact Jira keys (eg. UTF-8). This value is a comma-separated list and is case-sensitive.

Jira Automatic Transition Trigger Events

These properties control whether events should be converted into Remote Events so they can trigger automatic issue transitions in Jira.

Default value	Description
plugin.dev-summary.pr.commits.threshold	
`${plugin.jira-integration.pullrequest.attribute.commits.max}`	Limit the number of commits to be scanned per pull request
plugin.dev-summary.pr.events.enabled	
`true`	Controls whether pull request events should be published
plugin.dev-summary.branch.events.threshold	
`10`	Limit the number of branch events sent per synchronization If set to zero then no branch events will be published
plugin.dev-summary.commit.events.threshold	
`100`	Limit the number of commit events sent per synchronization If set to zero then no commit events will be published
plugin.dev-summary.issuechanged.events.threshold	

`100000`	Limit the number of issue changed events sent per synchronization. Issue changed events are based on the issue keys within the commit messages for commit events or within branch names for branch events. For branches, this value is the maximum of branches considered. For commits, this value is the maximum number of commits considered. If set to zero then no issue changed events will be published
plugin.dev-summary.issue.commits.threshold	
`100`	Limit the number of commits to be returned per issue
plugin.dev-summary.repository.trigger.settings.enabled	
`false`	Controls whether the Jira triggers page is visible on repository settings

Jira cloud development information events

These properties control what type of information is sent to jira cloud

Default value	Description
plugin.jira-development-integration.cloud.build-status.send.enabled	
`true`	Controls whether build status information received from 3rd party CI tools are sent to jira cloud.
plugin.jira-development-integration.cloud.deployment.send.enabled	
`true`	Controls whether deployment information received from 3rd party deployment tools are sent to jira cloud.
plugin.jira-development-integration.deployment-environment-type.keywords.dev	
`dev,review,development, trunk`	Keywords used to map a development environment type
plugin.jira-development-integration.deployment-environment-type.keywords.prod	
`prod,production,prd, live`	Keywords used to map a production environment type
plugin.jira-development-integration.deployment-environment-type.keywords.staging	
`staging,stage,stg, preprod,pre-prod,model, internal`	Keywords used to map a staging environment type
plugin.jira-development-integration.deployment-environment-type.keywords.test	
`test,testing,tests,tst, integration,integ,intg, int,acceptance,accept, acpt,qa,qc,control, quality`	Keywords used to map a testing environment type
plugin.jira-development-integration.cloud.deployment.association.values.max	
`500`	Limit the number of values (usually a set of issue keys) for each deployment association entity. The API documentation specifies this should not be set above 500
plugin.jira-development-integration.cloud.devinfo.commit.files.max	
`10`	Limit the number of files on each Commit object. The API documentation specifies this should not be set above 10

plugin.jira-development-integration.cloud.devinfo.entity.issuekeys.max	
`100`	Limit the number of issue keys per entity (commit, branch, pull request) The API documentation specifies this should not be set above 100
plugin.jira-development-integration.cloud.devinfo.event.branch.max	
`100`	Limit the number of branches we process per event This ensures Bitbucket doesn't process too many branches at once and should only be triggered on the initial push of a large, existing repository.
plugin.jira-development-integration.cloud.devinfo.event.commit.max	
`200`	Limit the number of commits we process per event This ensures Bitbucket doesn't process too many commits at once and should only be triggered on the initial push of a large, existing repository.
plugin.jira-development-integration.cloud.devinfo.repository.entity.max	
`100`	Limit the number of entities (branches, commits, pull requests) we put on each repository object. The API documentation specifies this should not be set above 400
plugin.jira-development-integration.cloud.permissions.cache.ttl	
`3600`	Controls how long to cache the permissions associated with a jira cloud site. Builds, deployments and dev information is not sent to jira cloud if the corresponding permission is not present for the registered jira site. The permission check is done each time before sending the information to jira cloud. This value is in **seconds**.

Job Scheduler

Controls the scheduler that processes background jobs submitted by the system and by plugins.

Default value	**Description**
scheduler.history.expiry.days	
`30`	Controls how long job history is remembered after it is last updated before it expires. Job history in the "RunDetails" class available to plugins from atlassian-scheduler is only valid for the last run of the job on the same cluster node. Calls to retrieve RunDetails for the same job on different cluster nodes may return different results. This value is in **days**. The value cannot be negative.
scheduler.refresh.interval.minutes	
`1`	Controls the frequency at which the scheduler will automatically poll for changes to clustered jobs. If the value is positive, then the scheduler will refresh its queue of clustered jobs at the specified interval in minutes. If the value is 0 or negative, then jobs submitted on one cluster node will never be scheduled on other cluster nodes. It is not recommended to modify this setting unless recommended by Atlassian Support. This value is in **minutes**. Using 0, or a negative value, disables clustering of background jobs completely.
scheduler.worker.threads	

4	Controls the number of worker threads that will accept jobs from the queue on each cluster node. If the value is 0 or negative, then the scheduler's default of 4 threads will be used.

Liquibase

Default value	Description
liquibase.commit.block.size	
`10000`	The maximum number of changes executed against a particular Liquibase database before a commit operation is performed. Very large values may cause DBMS to use excessive amounts of memory when operating within transaction boundaries. If the value of this property is less than one, then changes will not be committed until the end of the change set.

Logging

Logging levels for any number of loggers can be set in `bitbucket.properties` using the following format:

```
logging.logger.{name}={level}
```

To configure all classes in the `com.atlassian.bitbucket` package to DEBUG level:

```
logging.logger.com.atlassian.bitbucket=DEBUG
```

To adjust the ROOT logger, you use the special name ROOT (case-sensitive):

```
logging.logger.ROOT=INFO
```

Migration

Draining database connections during database migration happens in two stages. Stage 1 passively waits a set amount of time for all connections to be returned to the pool. If connections are still leased when migration.drain.db.timeout seconds has elapsed then stage 2 begins and will interrupt the owning threads, wait `migration.drain.db.force.timeout` seconds and finally attempt to roll back and close any remaining connections.

Default value	Description
migration.drain.db.timeout	
`${backup.drain.db.timeout}`	In stage 1 of draining connections during migration, this setting controls how long the migration should wait for outstanding database operations to complete before moving to stage 2. See `migration.drain.db.force.timeout` This value is in **seconds**.
migration.drain.db.force.timeout	
`${backup.drain.db.force.timeout}`	In stage 2 of draining connections during migration, this property controls how long the migration process should wait (after interrupting the owning threads) for those threads to release the connections before forcibly rolling back and closing them. Note if all connections have been returned to the pool stage 2 is skipped and so this property has no effect. A negative value will skip stage 2 completely. See `migration.drain.db.timeout` This value is in **seconds**.

Mirroring

Default value	Description
plugin.mirroring.farm.max.ref.change.queue.dump.size	
`1024`	Defines the maximum number of items that will be returned when querying the contents of the ref changes queue
plugin.mirroring.farm.operation.callback.timeout	
`300`	Defines how long a distributed operation in a mirror farm will wait for responses from other farm members before timing out. This values is in **seconds**.
plugin.mirroring.farm.operation.max.inflight	
`1000`	Defines the maximum number of in-flight operations to keep track of per operation type before evicting the eldest.
plugin.mirroring.farm.operation.refchange.chunk.timeout	
`14400`	Defined how long to wait before timing out an operation to distribute and fetch refs This value is in **seconds**
plugin.mirroring.farm.operation.update.refs.timeout	
`1800`	Defined how long to wait before timing out a update ref command This values is in **seconds**
plugin.mirroring.farm.max.lock.acquisition.attempts	
`1800`	Defines the number of times an attempt is made to acquire a lock on a repository during initial synchronization before giving up.
plugin.mirroring.farm.max.chunk.size	
`5000`	Defines the maximum number of ref-changes before they will be split into a new chunk.
plugin.mirroring.farm.operation.threads	
`5`	Defines the maximum thread pool size for executing distributed operations.
plugin.mirroring.farm.operation.initial.retry.delay	
`1`	Defines how long the system should wait before retrying an operation that has failed the first time. This values is in **seconds**.
plugin.mirroring.farm.operation.retry.attempts	
`5`	Defines the maximum number of times an operation is attempted before giving up and the failure is propagated.
plugin.mirroring.farm.vet.threads	
`5`	Defines the maximum thread pool size for executing operations to fix repository inconsistencies.
plugin.mirroring.http.write.enabled	

`true`	For *mirror instances*, this controls whether SCM write operations should be allowed for HTTP requests. If enabled, write requests are redirected to the upstream server. If disabled, an error message will be displayed when attempting a push, etc.
plugin.mirroring.lfs.download.upstream	
`false`	For *mirror instances*, this controls whether Large File Support (LFS) downloads are always requested from the upstream. If enabled, LFS downloads are always requested from the upstream If disabled, LFS downloads are served from the mirror
plugin.mirroring.ssh.upstream.proxying.enabled	
`true`	For *upstream/primary instances*, this controls whether SCM commands proxied by a mirror over SSH should be allowed. If enabled, such proxied commands are performed on the upstream with the same user identity, rights and privileges as the user executing the command on the mirror. If disabled, an error message will be sent when a user attempts to execute a command that must be proxied on the upstream (such as a push).
plugin.mirroring.ssh.proxy.enabled	
`true`	For *mirror instances*, this controls whether compatible SCM commands are proxied to the upstream on behalf of the user. If enabled, such commands are performed on the upstream by the mirror acting with the same user identity, rights and privileges as the user executing the command on the mirror. If disabled, an error message will be sent to the user unless the command can be safely executed on the mirror (e.g. `whoami`). Note that SSH push proxying is not supported for mirrors of bitbucket.org and this flag is ignored.
plugin.mirroring.ssh.proxy.parseconfig	
`false`	This controls whether the SSH client created to proxy SCM commands is configured with the runtime user's SSH config file (usually found at ~/.ssh/config) This is disabled by default but may be enabled if features like host aliasing are required.
plugin.mirroring.ssh.proxy.upstream.timeout.execution	
`86400`	Defines a hard limit for the amount of time that a proxied push to an upstream over SSH can run for even if it is producing input/output This values is in **seconds**.
plugin.mirroring.ssh.proxy.upstream.timeout.idle	
`1800`	Defines an idle timeout when proxying pushes over SSH to an upstream server. If no data is sent or received in this amount of time the connection will be terminated. This values is in **seconds**.
plugin.mirroring.strict.hosting.status	

`false`	Controls whether the mirror http status endpoint will return a 200 status code only when the mirror is synchronized. *NOTE* Use with caution as at least one mirror node must always be accessible from the upstream server. This is intended for deployments using advanced load balancer configurations.
plugin.mirroring.upstream.url	
	Defines where the mirror server should be mirroring from, this is also referred to as the base URL of the upstream server. Only define this property for mirror servers.
plugin.mirroring.capabilities.refresh.interval	
`10`	Controls how frequently the mirror will attempt to refresh the capabilities from the upstream server. This value is in **minutes**
plugin.mirroring.local.command.timeout.idle	
`180`	Defines the idle timeout for local commands, applying a limit to how long the operation is allowed to execute without either producing output or consuming input. The default value is 3 minutes. This value is in **seconds**.
plugin.mirroring.remote.command.timeout.idle	
`3660`	Defines the idle timeout for remote commands, applying a limit to how long the operation is allowed to execute without either producing output or consuming input. The default value is 61 minutes. This value should be greater than the `throttle.resource.mirror-hosting.timeout` value set on the upstream. This value is in **seconds**.
plugin.mirroring.state.refresh.interval	
`1`	Controls how frequently the mirror will attempt to refresh its state from the upstream server. This value is in **minutes**
plugin.mirroring.synchronization.delay.initial	
`15`	Controls how long after startup the first full synchronization should be attempted. This value is in **seconds**
plugin.mirroring.synchronization.fetch.timeout.execution	
`172800`	Defines the execution timeout for fetch processes, applying a hard limit to how long the operation is allowed to run even if it is producing output or reading input. The default value is 48 hours. This value is in **seconds.**
plugin.mirroring.synchronization.interval	
`3`	Controls how frequently a full synchronization with the upstream server should run This value is in **minutes**
plugin.mirroring.synchronization.ls-remote.timeout	
`15`	Controls how long to wait for an ls-remote command to the upstream server before it times out. This value is in **minutes**
plugin.mirroring.synchronization.max.failures	

3	Controls the number of consecutive failed synchronizations on a repository before the mirror gives up.
plugin.mirroring.synchronization.repository.page.size.max	
`100`	Controls how large the pages should be when requesting upstream repositories
plugin.mirroring.upstream.auth.cache.ttl	
`300`	Controls how long to cache the result of authentication requests made against the primary server such that if the same credentials are provided to the mirror within that period, the same result is used to calculate the outcome of the authentication and a remote (network) calls for the authentication request is avoided. Note: this caches both authentication successes (valid username/password, SSH key registered to user) but also failures (incorrect username/password pairs, unknown SSH keys). Also note: that cache entries expire after they are inserted, not after the last access. Repeatedly making authentication requests to the mirror with the same credentials will not prevent expiry of the result from the cache. This value is in **seconds**. A positive value will cache an authentication result for the configured period. A non-positive value will disable the cache and cause all authenticated requests to be executed remotely every time. Defaults to 5 minutes.
plugin.mirroring.upstream.auth.cache.max	
`-1`	Configures the maximum number of authentication cache entries. Cache entries for Bitbucket mirrors can be heavy for certain permission schemes so this setting can control how much memory is devoted to this cache. For Bitbucket mirrors, there is one cache entry consumed for each combination of {user credentials, authentication method (HTTP basic/SSH)} For bitbucket.org mirrors, there is one cache entry consumed for each combination of {user credentials, authentication method (HTTP basic/SSH), repository} A negative value indicates an unlimited cache. A zero value indicates the cache should be disabled. A positive value indicates a specific cache limit. Defaults to unlimited.
plugin.mirroring.upstream.auth.cache.fallback.ttl	
`1800`	Controls the expiry of values in a secondary cache (separate to plugin.mirroring.upstream.auth.cache.expiry) which caches the result of authentication requests to be used to recover from remote authentication request fails for environmental or connectivity reasons. The types of problems this cache will try to overcome are network partition, request timeout, socket timeout, thread interruption, invalid HTTP response codes or entities from the primary. Note: this caches both authentication successes (valid username/password, SSH key registered to user) but also failures (incorrect username/password pairs, unknown SSH keys). Also note: that cache entries expire after they are inserted, not after the last access. Repeatedly making authentication requests to the mirror with the same credentials will not pause expiry of the result from the cache. This value is in **seconds**. A positive value will cache the authentication results for the configured period. If the value is postive and smaller than plugin.mirroring.upstream.auth.cache.expiry it will be adjusted upwards. A non-positive value will disable the cache and cause any failing authentication requests to not attempt recovery using a previously changed result thus failing any related authentication requests by clients. Defaults to half an hour.

plugin.mirroring.upstream.auth.cache.fallback.max	
`-1`	Configures the maximum number of fallback authentication cache entries. Cache entries for Bitbucket mirrors can be heavy for certain permission schemes so this setting can control how much memory is devoted to this cache. For Bitbucket mirrors, there is one cache entry consumed for each combination of {user credentials, authentication method (HTTP basic/SSH)} For bitbucket.org mirrors, there is one cache entry consumed for each combination of {user credentials, authentication method (HTTP basic/SSH), repository} A negative value indicates an unlimited cache. A zero value indicates the cache should be disabled. A positive value indicates a specific cache limit. Defaults to unlimited.
plugin.mirroring.upstream.event.ref.change.max.count	
`25`	Defines the maximum number of ref-changes that will be published to the upstream server as part of the RepositorySynchronizedEvent. This prevents event objects from occupying unbounded amounts of memory while they are queued to be published or processed.
plugin.mirroring.upstream.request.socket.timeout	
`15`	Controls how long active requests to upstream servers can continue without producing any data before the mirror gives up. Must be a value smaller than plugin.ssh.auth.timeout by a decent margin if auth fallback caching is to be effective for socket timeouts This value is in **seconds**.
plugin.mirroring.upstream.request.timeout	
`15`	Controls how long requests to upstream servers can proceed before the mirror gives up. Must be a value smaller than plugin.ssh.auth.timeout by a decent margin if auth fallback caching is to be effective for request timeouts This value is in **seconds**.
plugin.mirroring.delete.on.startup	
`false`	Controls whether the system will delete mirrors upon startup. Note: deleting mirrors in this way does not put them into a "deleted" state and they will continue to function as normal if they are still connected to a different upstream instance. This property can be used when setting up clones of a production instance.

Notifications

Default value	Description
plugin.bitbucket-notification.mail.max.comment.size	
`2048`	Controls the maximum allowed size of a single comment in characters (not bytes). Extra characters will be truncated.
plugin.bitbucket-notification.mail.max.description.size	
`2048`	Controls the maximum allowed size of a single description in characters (not bytes). Extra characters will be truncated.
plugin.bitbucket-notification.mentions.enabled	
`true`	Controls whether mentions are enabled

plugin.bitbucket-notification.max.mentions	
`200`	Controls the maximum number of allowed mentions in a single comment
plugin.bitbucket-notification.sendmode.default	
`BATCHED`	Default mode for sending notifications for users who have not set an explicit preference. This value is either `BATCHED` or `IMMEDIATE`.
plugin.bitbucket-notification.batch.min.wait.minutes	
`10`	The minimum time to wait for new notifications in a batch before sending it (inactivity timeout). This value is in **minutes**.
plugin.bitbucket-notification.batch.max.wait.minutes	
`30`	The maximum time to wait since the first notification of a batch before sending it (staleness avoidance timeout). This value is in **minutes**.
plugin.bitbucket-notification.batch.notification.flush.limit	
`40`	The maximum number of notifications collected in a batch before the batch is sent automatically. Once this number of notifications is reached, the batch will be sent regardless of the time settings.

Paging

These properties control the maximum number of objects which may be returned on a page, regardless of how many were actually requested by the user. For example, if a user requests `Integer.MAX_INT` branches on a page, their request will be limited to the value set for `page.max.branches`.

This is intended as a safeguard to prevent enormous requests from tying up the server for extended periods of time and then generating responses whose payload is prohibitively large. The defaults configured here represent a sane baseline, but may be overridden by customers if necessary.

Default value	Description
page.max.attachments	
`500`	Maximum number of attachments per page.
page.max.branches	
`1000`	Maximum number of branches per page.
page.max.changes	
`1000`	Maximum number of changes per page. Unlike other page limits, this is a hard limit; subsequent pages cannot be requested when the number of changes in a commit exceeds this size.
page.max.commits	
`100`	Maximum number of commits per page.
page.max.diff.lines	
`10000`	Maximum number of segment lines (of any type, total) which may be returned for a single diff. Unlike other page limits, this is a hard limit; subsequent pages cannot be requested when a diff exceeds this size.

page.max.directory.children	
`1000`	Maximum number of directory entries which may be returned for a given directory.
page.max.directory.recursive.children	
`100000`	Maximum number of file entries which may be returned for a recursive listing of a directory. A relatively high number as this is used by the file finder which needs to load the tree of files upfront.
page.max.groups	
`1000`	Maximum number of groups per page.
page.max.granted.permissions	
`1000`	Maximum number of granted permissions per page.
page.max.hookscripts	
`100`	Maximum number of hook scripts per page.
page.max.index.results	
`50`	Maximum number of commits which may be returned from the index when querying by an indexed attribute. For example, this limits the number of commits which may be returned when looking up commits against a Jira issue.
page.max.projects	
`1000`	Maximum number of projects per page.
page.max.pullrequest.activities	
`500`	Maximum number of pull request activities per page.
page.max.pullrequests	
`1000`	Maximum number of pull requests per page.
page.max.repositories	
`1000`	Maximum number of repositories per page.
page.max.reviewergroups	
`100`	Maximum number of reviewer groups per page.
page.max.source.length	
`5000`	Maximum length for any line returned from a given file when viewing source. This value truncates long lines. There is no mechanism for retrieving the truncated part short of downloading the entire file.
page.max.source.lines	
`5000`	Maximum number of lines which may be returned from a given file when viewing source. This value breaks large files into multiple pages. This property relates to display.max.source.line in that up to (display.max.source.lines/page.max.source.lines) requests will be made to view the page.
page.max.tags	
`1000`	Maximum number of tags per page.
page.max.users	

1000	Maximum number of users per page.
page.scan.pullrequest.activity.size	
500	The page size to use when searching activities to find a specific one.
page.scan.pullrequest.activity.count	
4	The number of pages of activities to scan, when searching for a given activity, before giving up.

Password Reset

Default value	Description
password.reset.validity.period	
4320	Controls how long a password reset token remains valid for. Default period is 72 hours. This value is in **minutes**.

Process execution

Controls timeouts for external processes, such as `git`.

Default value	Description
process.timeout.execution	
120	Configures a hard upper limit on how long the command is allowed to run even if it is producing output. This value is in **seconds**. Using 0, or a negative value, disables the timeout completely.
process.timeout.idle	
60	The idle timeout configures how long the command is allowed to run without producing any output. This value is in **seconds**. Using 0, or a negative value, disables the timeout completely.

Profiling

Default value	Description
atlassian.profile.maxframenamelength	
300	Controls the maximum character length of the frame names that are written to the profiler log. Any characters beyond this maximum are truncated. Ex: [83.0ms] - nio: /usr/bin/git log --format=commit %H%n%H%x02%P%x02%aN%x02%aE%x02%at%x02%cN%x02%cE%x02%ct%n%B%n%x03END%x04 -2 --no-min-parents ... This value is in **number of characters**.
atlassian.profile.mintime	

`1`	Controls the threshold time below which a profiled section should not be reported. This value is in **milliseconds**.
atlassian.profile.mintotaltime	
`0`	Controls the threshold time below which a profiled request should not be reported. This value is in **milliseconds**.

Pull Request - Reviewer Groups

Default value	Description
pullrequest.reviewergroups.max.size	
`100`	Defines the maximum number of users a reviewer group may contain

Pull Request - Suggestions

Default value	Description
pullrequest.suggestions.commit-author	
`AUTHOR`	Defines whether the author of the commit that results when applying a suggestion should be the suggestion author or the user who applied the suggestion. Valid values are: - `AUTHOR` the suggestion commit author should be the suggestion author - `ACTOR` the suggestion commit author should be the user who applied the suggestion Regardless of this value, the merge commit committer will always be the user who merged the pull request.
pullrequest.suggestions.drift.timeout	
`30`	Defines the maximum amount of time SCM commands used to drift suggestions back to the source branch are allowed to execute before they are terminated. In most cases a user will be waiting whilst this happens, so we need to balance between applying the suggestion and user experience. If this timeout is exceeded, the user is advised to apply the suggestion manually. This value is in **seconds**.

Pull Request Commit Indexing

Controls how commits are associated with pull requests.

Default value	Description
pullrequest.commit.indexing.maximum.commits	
`1000`	Defines the maximum number of commits that will be associated with a pull request when a pull request is created or when new commits are pushed to a pull request. A larger number will impact pull request creation and rescoping time. Pull requests that have more than this number of commits may not appear linked in the commit screen.
pullrequest.commit.indexing.backfill.maximum.processed	
`5000`	Defines the maximum number of pull requests to process at once while backfilling pull request commits. A lower limit will mean less data needs to be stored in memory at once, but processing will take longer as a result.

pullrequest.commit.indexing.backfill.batch.size	
`250`	Defines the maximum number of pull request commit relationships to commit to the database in a single transaction.
pullrequest.commit.indexing.backfill.process.timeout	
`600`	Defines the maximum amount of time SCM commands used to backfill pull request commits are allowed to execute before they are terminated. This value is in **seconds**.

Pull Requests

Default value	Description
pullrequest.auto.decline.settings.global.enabled	
`true`	Controls whether or not automatically declining inactive pull requests is on by default for all repositories. This setting applies when a repository and its project do not have any explicit auto decline configuration. By default this is set to `true` and individual projects and repositories are able to opt-out. Setting this to `false` means automatically declining inactive pull requests is instead off by default, and individual projects and repositories are able to opt-in.
pullrequest.auto.decline.settings.global.inactivityWeeks	
`4`	Controls the default inactivity period for all repositories when automatically declining inactive pull requests. This setting applies when a repository and its project do not have any explicit auto decline configuration. Individual projects and repositories are able to override this value by configuring a different inactivity period. This value is in **weeks**, and must be set to a valid inactivity weeks value (1, 2, 4, 8, or 12). If the provided inactivity weeks is invalid the system will default to 4 weeks.
pullrequest.bulk.rescope.timeout	
`300`	Defines the maximum amount of time any command used to analyse the effects of ref changes to open pull requests (rescoping) is allowed to execute. For these commands, the standard idle timeout for processes applies. This value is in **seconds**
pullrequest.deletion.role	
`AUTHOR`	Determines which users can delete pull requests. Valid values are: - `AUTHOR` pull request authors and repository admins can delete pull requests - `REPO_ADMIN` repository admins can delete pull requests
pullrequest.diff.context	
`10`	Defines the number of context lines to include around diff segments in pull request diffs. By default, git only includes 3 lines. The default is 10, to try and include a bit more useful context around changes, until the ability to "expand" the context is implemented.
pullrequest.diff.context.expand.size	
`25`	Defines the number of context lines to show at a time when clicking the expand buttons around segments in the pull request diff.
pullrequest.merge.commit-author	

`AUTHOR`	Defines whether the author of the merge commit that results when merging a pull request should be the pull request author or the user who merged the pull request. Valid values are: - `AUTHOR` the merge commit author should be the pull request author - `ACTOR` the merge commit author should be the user who merged the pull request Regardless of this value, the merge commit committer will always be the user who merged the pull request.
pullrequest.merge.timeout	
`300`	Defines the maximum amount of time any command used to merge a pull request is allowed to execute *or* idle. Since merging a pull request may require a series of different commands at the SCM level, this timeout does *not* define the upper bound for how long the overall merge process might take; it only defines the duration allotted to any single command. This value is in **seconds**.
pullrequest.rescope.commits.display	
`5`	Defines the maximum number of commits per type (either added or removed) to display in a rescope activity.
pullrequest.rescope.commits.max	
`1000`	Defines the absolute maximum number of commits that will be evaluated when attempting to determine, for a given rescope activity, which commits were added to or removed from a pull request. Adjusting this setting can have significant memory footprint impact on the system. It is not recommended to be changed, but the option is provided here to support unique use cases.
pullrequest.rescope.cleanup.interval	
`30`	Controls how frequently empty rescope activities are cleaned up. Because pull requests rescope very frequently it is important to remove empty rescopes from the database to keep activity queries performant. This value is in **minutes**.
pullrequest.rescope.detail.threads	
`2`	Defines the maximum number of threads to use for precalculating rescope details. These threads perform the requisite processing to determine the commits added and removed when a pull request is rescoped, where most rescopes do not add or remove any commits. Such "dead" rescopes are deleted during processing. The primary goal is to ensure all details have already been calculated when users try to view a pull request's overview.
pullrequest.rescope.drift.commandtimeout	
`180`	Defines the maximum amount of time SCM commands used to perform comment drift are allowed to execute before they are terminated. Aggressive timeouts should *not* be used here. Commands which timeout may result in comments which are still present in the diff being orphaned or drifted incorrectly. This value is in **seconds**.
pullrequest.rescope.drift.maxattempts	
`5`	Controls how many times comment drift will be retried when it fails. Certain failure types are considered to be unrecoverable and will not be retried regardless of this setting. Unrecoverable failures are logged.
pullrequest.rescope.drift.threads	
`4`	Defines the maximum number of threads to use when processing comment drift for a pull request during rescope. Higher numbers here do *not* necessarily mean higher throughput! Performing comment drift will usually force a new merge to be created, which can be very I/O intensive. Having a substantial number of merges running at the same time can significantly *reduce* the speed of performing comment drift.

pullrequest.rescope.threads	
`1`	Defines the maximum number of threads to use for rescoping pull requests.

Pull request auto-merge

Default value	Description
pullrequest.auto.merge.job.interval	
`15m`	Controls how often the pull request auto-merge job runs. This job processes all the pending auto-merge requests for all the pull requests. This value is in **minutes** by default but certain suffixes (s,m,h,d for seconds, minutes, hours, or days) can be used to make the value more readable. Standard ISO-8601 format used by java.time.Duration (PT1H, for example) is also supported.
pullrequest.auto.merge.max.queue.size	
`1000`	Controls the maximum size of the queue which holds the auto-merge requests which were ready to merge but their source and/or target branch was not up-to-date with the corresponding SCM refs.
pullrequest.auto.merge.max.threads	
`1`	Controls the maximum number of threads allowed per node to process auto-merge requests.
pullrequest.auto.merge.request.max.lifetime	
`14d`	Controls how long the system will wait for the pull request to be ready for merging since the time auto-merge was requested. If the pull request was not merged after this time, the auto-merge request will be cancelled by the system and the user has to either manually merge the pull request when it is ready to merge or request auto-merge again. This value is in **days** by default but certain suffixes (s,m,h,d for seconds, minutes, hours, or days) can be used to make the value more readable. Standard ISO-8601 format used by java.time.Duration (PT1H, for example) is also supported.
pullrequest.auto.merge.request.mergeabilityCheck.timeout	
`30s`	Controls the maximum time allowed to check the mergeability of a pull request while trying to auto-merge it. If the time taken exceeds this time, the auto-merge request will be cancelled for the corresponding pull request. This value is in **seconds** by default but certain suffixes (s,m,h,d for seconds, minutes, hours, or days) can be used to make the value more readable. Standard ISO-8601 format used by java.time.Duration (PT1H, for example) is also supported.

Ref Restrictions (Branch permissions)

Default value	Description
plugin.bitbucket-ref-restriction.case.insensitive	
`true`	Controls whether refs are matched case insensitively for ref restrictions.
plugin.ref-restriction.feature.ascii.art	
`true`	Controls whether ASCII art is displayed when a push is rejected.

plugin.ref-restriction.feature.splash	
`true`	Controls whether new users are shown a splash page when first viewing ref restrictions.
plugin.bitbucket-ref-restriction.max.resources	
`100`	The maximum number of ref restrictions per repository. This count refers to each permission item, not each branch. High numbers of branch permissions will adversely impact the speed of pushes to the repository, so increasing this limit is not recommended.
plugin.bitbucket-ref-restriction.max.resource.entities	
`50`	The maximum number of access grants per ref restriction.

Ref metadata

Default value	Description
ref.metadata.timeout	
2	Controls timeouts for retrieving metadata associated with a collection of refs from all metadata providers collectively. This values is in **seconds**.
ref.metadata.max.request.count	
`100`	Maximum number of refs that can be used in a metadata query.

Ref searching

Default value	Description
ref.search.boost.branches.max	
`1000`	Maximum number of refs we can guarantee exact and prefix matching in correct ordering

Repository shortcuts

Default value	Description
plugin.repository.shortcut.url.scheme.extended.whitelist	
	The extended whitelist for allowed URL schemes. The URL for a repository shortcut must begin with one of the schemes in the default whitelist or a scheme in this property. Schemes should be comma separated, e.g. 'scheme1:,scheme2:'.

Resource Throttling

These properties define concurrent task limits for the ThrottleService, limiting the number of concurrent operations of a given type that may be run at once. This is intended to help prevent overwhelming the server hardware with running processes. Two settings are used to control the number of processes that are allowed to process in parallel: one for the web UI and one for 'hosting' operations (pushing and pulling commits, cloning repositories).

When the limit is reached for the given resource, the request will wait until a currently running request has completed. If no request completes within a configurable timeout, the request will be rejected.

When requests to the UI are rejected, users will see either a 501 error page indicating the server is under load, or a popup indicating part of the current page failed to load.

When SCM hosting commands (pull/push/clone) are rejected, it is messaged in multiple ways:

- An error message is returned to the client, which the user will see on the command line: "Bitbucket is currently under heavy load and is not able to service your request. Please wait briefly and try your request again"
- A warning message is logged for every time a request is rejected due to the resource limits, using the following format: "`A [scm-hosting] ticket could not be acquired (12/12)`"
- For five minutes after a request is rejected, a red banner will be displayed in the UI to warn that the server is reaching resource limits.

The underlying machine-level limits these are intended to prevent hitting are very OS- and hardware-dependent, so you may need to tune them for your instance. When hyperthreading is enabled for the server's CPUs, for example, it is likely that the default settings will allow sufficient concurrent operations to saturate the I/O on the machine. In such cases, we recommend starting off with a less aggressive default on multi-cored machines; the value can be increased later if hosting operations begin to back up.

Additional resource types may be configured by defining a key with the format 'throttle.resource.<resource-name>'. When adding new types, it is strongly recommended to configure their ticket counts explicitly using this approach.

Default value	**Description**
scaling.concurrency	
`cpu`	Allows adjusting the scaling factor used. Various other CPU/throttling dependent properties are defined in terms of this setting, so adjusting this value implicitly adjusts those. Some examples: • event.dispatcher.core.threads • event.dispatcher.max.threads • executor.max.threads • throttle.resource.scm-hosting The default value, `cpu`, resolves to the number of *detected* CPU cores. On hyperthreaded machines, this will be *double* the amount of physical cores.
throttle.resource.git-lfs	
`80`	Limits the number of Git LFS file transfer operations which may be running concurrently. This is primarily intended to prevent Git LFS requests from consuming all available connections thereby degrading UI and Git hosting operation. This should be a fraction of the maximum number of concurrent connections permitted by Tomcat.
throttle.resource.git-lfs.timeout	
`0`	Controls how long threads will wait for Git LFS uploads/downloads to complete when the system is already running the maximum number of concurrent transfers. It is recommended this be set to zero (i.e. don't block) or a few seconds at most. Since waiters still hold a connection, a non-zero wait time defeats the purpose of this throttle. This value is in **seconds**.
throttle.resource.mirror-hosting	

`2*${scaling.concurrency}`	Limits the number of SCM hosting operations served to mirrors, which may be running concurrently. This limit is intended to protect the system's CPU and memory from being consumed excessively by mirror operations. Note that dynamic throttling is not supported for mirror hosting operations.
throttle.resource.mirror-hosting.timeout	
`3600`	Controls how long threads will wait for SCM mirrors hosting operations to complete when the system is already running the maximum number of SCM commands. This value is in **seconds**.
throttle.resource.scm-command	
`50`	Limits the number of SCM commands, such as: `git diff`, `git blame`, or `git rev-list`, which may be running concurrently. This limit is intended to prevent the operations which support the UI from preventing push/pull operations from being run.
throttle.resource.scm-command.timeout	
`2`	Controls how long threads will wait for SCM commands to complete when the system is already running the maximum number of SCM commands. This value is in **seconds**.
throttle.resource.scm-hosting.timeout	
`300`	Controls how long threads will wait for SCM hosting operations to complete when the system is already running the maximum number of SCM hosting operations. This value is in **seconds**.
throttle.resource.scm-hosting.strategy	
`adaptive`	Specifies the strategy for throttling SCM hosting operations. Possible values are 'adaptive' and 'fixed'. If 'fixed' is specified, throttle.resource.scm-hosting.fixed.limit is used as the fixed upper limit on the number of concurrent hosting operations. If 'adaptive' is specified, the maximum number of hosting operations will vary between throttle.resource.scm-hosting.adaptive.min and throttle.resource.scm-hosting.adaptive.max based on how many hosting operations the system believes the machine can support in its current state and given past performance. If any configured adaptive throttling setting is invalid and reverts to a default but this conflicts with other correctly configured or default settings, the throttling strategy will revert to 'fixed'. E.g. this will occur if `throttle.resource.scm-hosting.adaptive.min` is set to the same value as `throttle.resource.scm-hosting.adaptive.max`
throttle.resource.scm-hosting.adaptive.limit.min	
`1*${scaling.concurrency}`	When the adaptive strategy is enabled for throttling SCM hosting operations, this sets the lower limit on the number of SCM hosting operations, meaning pushes and pulls over HTTP or SSH, which may be running concurrently. Setting a lower limit provides a way to specify a minimum service level for SCM hosting operations regardless of what the adaptive throttling heuristic believes the machine can handle. There is limited support for mathematical expressions; +,-,*,/ and () are supported.
throttle.resource.scm-hosting.adaptive.limit.max	

`4*${scaling.concurrency}`	When the adaptive strategy is enabled for throttling SCM hosting operations, this sets the upper limit on the number of SCM hosting operations, meaning pushes and pulls over HTTP or SSH, which may be running concurrently. This is intended primarily to prevent pulls, which can be very memory-intensive, from exhausting a server's resources. Note that if the machine does not have sufficient memory to support this default value or an explicitly configured value, a smaller value will be chosen on startup. Adaptive throttling will vary the total tickets There is limited support for mathematical expressions; +,-,*,/ and () are supported.
throttle.resource.scm-hosting.adaptive.cpu.target	
`0.75`	When the adaptive strategy is enabled for throttling SCM hosting operations, this sets the target CPU utilisation for the machine (across all processors) which the system takes into consideration when calculating the current throttling limit. This value represents a trade-off: higher numbers may boost raw throughput of hosting operations, but at the expense of overall system responsiveness for all users. Increasing the target too high or too low brings diminishing returns. This must be a value between 0.0 and 1.0 and is a percentage of the total available CPU power across all cores
throttle.resource.scm-hosting.fixed.limit	
`1.5 *${scaling.concurrency}`	When the fixed strategy is enabled for throttling SCM hosting operations, this limits the number of SCM hosting operations, meaning pushes and pulls over HTTP or SSH, which may be running concurrently. This is intended primarily to prevent pulls, which can be very memory-intensive, from exhausting a server's resources. There is limited support for mathematical expressions; +,-,*, / and () are supported.
throttle.resource.scm-refs	
`8*${scaling.concurrency}`	Limits the number of ref. advertisement operations, which may be running concurrently. Those are throttled separately from clone operations as they are much more lightweight and much shorter so we can and should allow many more of them running concurrently.
throttle.resource.scm-refs.timeout	
`120`	Controls how long threads will wait for ref. advertisement operations to complete when the system is already running the maximum number of ref. advertisement operations. This value is in **seconds**.

Rest

Default value	Description
plugin.rest.raw.content.markup.max.size	
`${plugin.bitbucket-readme.max.size:5242880}`	Controls the maximum allowed file size when downloading a marked-up file through the raw content REST endpoint This value is in **bytes**. Default is 5 MiB

SCM - Cache

See Scaling for Continuous Integration performance for more information about configuring the SCM Cache.

Note: The settings controlled by these properties can be configured via REST. The REST configuration *takes precedence* over the configuration in `bitbucket.properties`.

Default value	Description
plugin.bitbucket-scm-cache.expiry.check.interval	
`30`	Controls how frequently expired cache entries are invalidated and removed from the cache. This value is in **seconds**.
plugin.bitbucket-scm-cache.eviction.hysteresis	
`1073741824`	When eviction is triggered the amount of disk space requested for eviction is calculated as (eviction.hysteresis + eviction.trigger.free.space - free space under <Bitbucket home directory>/caches) This value is in **bytes**.
plugin.bitbucket-scm-cache.eviction.trigger.free.space	
`6442450944`	Controls the threshold at which eviction is triggered in terms of free space available on disk (specifically under <Bitbucket home directory>/caches) This value is in **bytes**.
plugin.bitbucket-scm-cache.minimum.free.space	
`5368709120`	Controls how much space needs to be available on disk (specifically under <Bitbucket home directory>/caches) for caching to be enabled. This setting ensures that the cache plugin does not fill up the disk. This value is in **bytes**.
plugin.bitbucket-scm-cache.protocols	
`HTTP, SSH`	Controls which protocols caching is applied to. The `HTTP` value includes both `http` and `https`. This property value is a comma-separated list. Valid values are: `HTTP` and `SSH`.
plugin.bitbucket-scm-cache.capabilities.enabled	
`true`	Controls whether git v2 capabilities advertisement is cached.
plugin.bitbucket-scm-cache.capabilities.maxCount	
`1`	The maximum number of git v2 capabilities advertisement to retain *per repository*. If there are more than this configured limit, the least recently accessed entry will be invalidated.
plugin.bitbucket-scm-cache.capabilities.ttl	
`3600`	Controls the 'time to live' for git v2 capability advertisement caches. This value is in **seconds**.
plugin.bitbucket-scm-cache.upload-pack.enabled	
`true`	Controls whether caching is enabled for git-upload-pack (clone operations).
plugin.bitbucket-scm-cache.upload-pack.maxCount	
`20`	The maximum number of upload-pack cache entries to retain *per repository*. If there are more than this configured limit, the least recently accessed entry will be invalidated.

plugin.bitbucket-scm-cache.upload-pack.ttl	
`14400`	Controls how long the caches for clone operations are kept around when there no changes to the repository. Caches are automatically invalidated when someone pushes to a repository or when a pull request is merged. This value is in **seconds**.

SCM - Mesh

The properties in this section are used by Bitbucket to configure its Mesh nodes. If any of these settings are present in `&lt;bitbucket-shared-home&gt;/bitbucket.properties`, they will be sent to all registered Mesh nodes and override Mesh's own default settings.

Mesh logging levels for any number of loggers can be set in `bitbucket.properties` using the following format:

```
mesh.logging.logger.{name}={level}
```

To configure all classes in the `com.atlassian.bitbucket.mesh` package to DEBUG level:

```
mesh.logging.logger.com.atlassian.bitbucket.mesh=DEBUG
```

To adjust the ROOT logger, you use the special name ROOT (case-sensitive):

```
mesh.logging.logger.ROOT=INFO
```

Default value	Description
mesh.profiling.enabled	
`true`	Controls whether profiling should be enabled or not. This property controls the `profiling.enabled` property on Mesh nodes.
mesh.profiling.max-frame-name-length	
`300`	Controls the maximum character length of the frame names that are written to the profiler log. Any characters beyond this maximum are truncated. Ex: [83.0ms] - nio: /usr/bin/git log --format=commit %H%n%H%x02%P%x02%aN%x02%aE%x02%at%x02%cN%x02%cE%x02%ct%n%B%n%x03END%x04 -2 --no-min-parents ... This value is in **number of characters**. This property controls the `profiling.max-frame-name-length` property on Mesh nodes.
mesh.profiling.min-frame-time	
`0`	Defines the threshold time (in milliseconds) below which a profiled event should not be reported. This property controls the `profiling.min-frame-time` property on Mesh nodes.
mesh.profiling.min-trace-time	
`0`	Defines the threshold time (in milliseconds) below which an entire stack of profiled events should not be reported. This property controls the `profiling.min-trace-time` property on Mesh nodes.
mesh.scaling.concurrency	

`cpu`	Allows adjusting the scaling factor used by Mesh. Various of Mesh's CPU/throttling dependent properties are defined in terms of this setting, so adjusting this value implicitly adjusts those. Some examples: • throttling of git hosting operations - the size of the thread pool for asynchronous processing The default value, `cpu`, resolves to the number of *detected* CPU cores. On hyperthreaded machines, this will be *double* the amount of physical cores. This property controls the `scaling.concurrency` property on Mesh nodes.
plugin.bitbucket-git.mesh.authentication.allowed-clock-skew	
`2m`	Defines the clock skew allowed when validation expiry for signed tokens during authentication. This accounts for clock drift between Bitbucket and Mesh nodes. This value is in SECONDS unless a unit (s, m, h, d) is specified. This property controls the `authentication.allowed-clock-skew` property on Mesh nodes.
plugin.bitbucket-git.mesh.authentication.expiry-interval	
`30s`	Defines the amount of time a signed token is valid after it's issued. This only affects outbound requests, such as replication requests from one Mesh node to another. Since tokens are generated right before the RPC they will be used to authenticate, this interval should generally be short. This value is in SECONDS unless a unit (s, m, h, d) is specified. This property controls the `authentication.expiry-interval` property on Mesh nodes.

SCM - Misc

Default value	Description
http.cloneurl.includeusername	
`false`	Controls whether the HTTP clone URL should contain the currently authenticated user's username
http.scmrequest.async.enabled	
`true`	Controls whether asynchronous process is enabled for HTTP SCM requests. Asynchronous processing can significantly increase the server's ability to service UI users while under heavy HTTP hosting load
http.scmrequest.async.keepalive	
`300`	Controls how long asynchronous request threads are allowed to idle before they're terminated. Aggressive timeouts may reduce the number of idle threads, but may also reduce the server's ability to respond to load spikes. This value is in **seconds**.
http.scmrequest.async.queue	
`0`	Do not use. This property is deprecated and, as of 7.4.2, 7.5.1 and 7.6.0 (or newer), it no longer does anything.
http.scmrequest.async.threads	
`250`	Controls how many threads are used to process HTTP SCM requests asynchronously. Asynchronous processing frees up servlet container threads to allow them to handle other requests, like page requests for UI users.
http.scmrequest.process.error.response.status.override	

`true`	Controls if the status code for Git HTTP requests is overridden to be 200, or if the "real" status code is sent. When set to `true` a status code of 200 is always sent. When set to `false` a more accurate status code is sent, for example a 404, if the repository does not exist. This is useful because the standard Git client's behaviour will only process the content of HTTP responses if the status code is 200 OK. This means we can send meaningful error messages to Git, at the expense of sending a more accurate response code.

SCM - git

Default value	Description
plugin.bitbucket-git.path.executable	
`git`	Defines the default path to the git executable. On Windows machines, the .exe suffix will be added to the configured value automatically if it is not present. In general, "git" should be an acceptable default for every platform, here, assuming that it will be available in the runtime user's PATH. With the new path searching performed by DefaultGitBinaryHelper, setting a default value here is unnecessary, as the plugin will quickly discard the value. This is left here purely for documenting how to set an explicit path.
plugin.bitbucket-git.path.libexec	
	Defines the path to the git libexec directory (containing the git-core directory). This path is hard-coded into the git executable and is used for forking processes like git-http-backend. If this value is set, those processes will be forked directly. This eliminates an unnecessary fork (git -> git-http-backend) and may improve scalability.
plugin.bitbucket-git.author.name.type	
`displayname`	Defines whether commits created by the system should use the username (jdoe) or the display name (John Doe) to specify the Git author/committer. By default, the display name will be used. This value can be either `displayname` or `username`.
plugin.bitbucket-git.diff.renames	

`copies`	Defines whether copy and/or rename detection should be performed. By default, both rename *and* copy detection are performed. Only files modified in the same commit are considered as rename or copy origins, to minimize overhead. The possible settings are: • "copy" or "copies" Applies `--find-copies`. • "rename" or "renames" Applies `--find-renames`. • "off" Disables rename *and* copy detection. When using "copy" or "copies", the value may optionally be suffixed with a "+" to use `--find-copies-harder`. This setting should be used with caution, as it can be very expensive. It considers every file in the repository, even files not modified in the same commit, as possible origins for copies. When copy and/or rename detection is enabled `plugin.bitbucket-git.diff.renames.threshold` can be used control the similarity index required for a change to be identified as a copy or rename. This configuration can also be applied at repository level with `plugin.bitbucket-git.diff.renames.KEY.slug` or at project level with `plugin.bitbucket-git.diff.renames.KEY`
plugin.bitbucket-git.diff.renames.threshold	
`50`	Defines the threshold, as a percentage, for a file to be detected as a rename or a copy. This setting is only applied if copy and/or rename detection is enabled. The default threshold applied is 50% similarity (defined in git itself). This configuration can also be applied at repository level with `plugin.bitbucket-git.diff.renames.threshold.KEY.slug` or at project level with `plugin.bitbucket-git.diff.renames.threshold.KEY`
plugin.bitbucket-git.environment.commandsize	
`32000`	Defines the maximum number of characters that can be added to a single command. Different operating systems (and even different versions of the same operating system) have different hard limitations they apply to command line lengths. This default is intended to be low enough to work on all supported platforms out of the box, but still high enough to be usable. It is configurable in case it proves to be too high on some platform. This default is based on Windows, which has a limit of 32768 characters. Testing on Linux (Ubuntu 12.04 running a 3.2 kernel) found that its limit is at least 32x the limit imposed by Windows.
plugin.bitbucket-git.environment.variablesize	
`16000`	Defines the maximum number of characters that can be added to a single environment variable. Different operating systems (and even different versions of the same operating system) have different hard limitations they apply to environment variables. This default is intended to be low enough to work on all supported platforms out of the box, but still high enough to be usable. It is configurable in case it proves to be too high on some platform.
plugin.bitbucket-git.hosting.allow-filter	
`true`	Controls whether partial clones, using --filter, are allowed. Partial clones are not cached, and some of the filters offered by Git can be very resource-intensive for the server to apply, so it can sometimes be more efficient to use a normal clone (or a shallow one) instead. Partial clones are enabled by default.
plugin.bitbucket-git.hosting.http.buffersize	
`8192`	Defines the buffer size in bytes which is used when marshaling data between the git process and the HTTP socket. The default is 8K, with a 1K minimum.

plugin.bitbucket-git.hosting.ssh.buffersize	
`4096`	Defines the buffer size in bytes which is used when marshaling data between the git process and the SSH socket. The default is 4K, with a 1K minimum.
plugin.bitbucket-git.hosting.timeout.execution	
`86400`	Defines the execution timeout for push/pull processes, applying a hard limit to how long the operation is allowed to run even if it is producing output or reading input. The default value is 1 day, with a 5 minute minimum. This value is in **seconds**.
plugin.bitbucket-git.hosting.timeout.idle	
`1800`	Defines the idle timeout for push/pull processes, applying a limit to how long the operation is allowed to execute without either producing output or consuming input. The default value is 30 minutes, with a 2 minute minimum. This value is in **seconds**.
plugin.bitbucket-git.pullrequest.merge.auto.timeout	
`${pullrequest.merge.timeout}`	Defines the maximum amount of time any command used to calculate a pull request's effective diff, or check for conflicts, is allowed to execute *or* idle. Because the commands used generally do not produce output there is no separate idle timeout. **This setting is deprecated.** Use `plugin.bitbucket-git.pullrequest.operation.timeout` instead. See the documentation for that property for additional details about what operations this timeout applies to. This value is in **seconds**.
plugin.bitbucket-git.pullrequest.operation.timeout	
`${plugin.bitbucket-git.pullrequest.merge.auto.timeout}`	Defines the maximum amount of time any command used to calculate a pull request's effective diff, or check for conflicts, is allowed to execute *or* idle. Because the commands used generally do not produce output there is no separate idle timeout. This timeout applies to operations that are run in the background. "Foreground" operations, like showing the file tree or an individual file's diff, do not use this timeout. However, in certain cases, such foreground operations may be blocked if a relevant background operation has not yet completed. For example, if a pull request's effective diff has not been calculated, displaying the file tree will block while the effective diff is calculated. Using an aggressive timeout here may result in pull requests becoming unviewable. For example, if the system times out calculating a pull request's effective diff, it will not be possible to load the file tree and the pull request cannot be reviewed. This value is in **seconds**.
plugin.bitbucket-git.ssh.binary	
`ssh`	Defines the SSH binary to use for *outgoing* SSH commands, i.e. git commands that fetch from or push to external repositories over SSH. This setting does *not* affect incoming SSH requests.
plugin.bitbucket-git.worktree.expiry	
`30`	Defines the amount of time after which a temporary work tree expires and can be cleaned up. A minimum value of 2 minutes and a maximum value of 24 hours is enforced. This value is in **minutes**. The default is 30 minutes.

SMTP

Default value	Description
mail.timeout.connect	
`60`	Controls the timeout for establishing an SMTP connection. This value is in **seconds**.
mail.timeout.send	
`60`	Controls the timeout for sending an e-mail. This value is in **seconds**.
mail.test.timeout.connect	
`30`	Controls the timeout for establishing a test SMTP connection. Shorter timeouts should be applied for when sending test e-mails, as the test occurs in user time. This value is in **seconds**.
mail.test.timeout.send	
`30`	Controls the timeout for sending a test e-mail. Shorter timeouts should be applied for when sending test e-mails, as the test occurs in user time. This value is in **seconds**.
mail.error.pause.log	
`300`	Controls how frequently messages will go to the standard log file about mail sending errors. All errors are logged to `atlassian-bitbucket-mail.log`, but warnings will be added to the standard log periodically if there are errors sending messages. This value is in **seconds**
mail.error.pause.retry	
`5`	Controls how long to wait before retrying to send a message if an error occurs. This value is in **seconds**
mail.threads	
`1`	Controls the number of threads to use for sending emails. Higher values may result in higher mail server load, but may also allow the system to work through its internal queue faster.
mail.max.message.size	
`1048576`	Controls the maximum allowed size of a single mail message in bytes, which is the sum of the subject and body sizes. This value is in **bytes**.
mail.max.queue.size	
`157286400`	Controls the maximum allowed size for the mail queue in bytes (any new message will be rejected if the mail queue reaches that size) This value is in **bytes**.
mail.max.shutdown.wait	

5	Controls the maximum time to wait for the mail queue to empty on shutdown. Once this time elapses, any mail remaining in the queue will be logged as rejected in the mail log and dropped. A value of 0 or less means no waiting will occur, and all mail in the queue will be dropped on shutdown. This value is in **seconds**.
mail.crypto.protocols	
`TLSv1 TLSv1.1 TLSv1.2`	Space-separated list of crypto protocols to use when sending encrypted email. This default value is POODLE-safe. Order does not matter - JavaMail always tries the latest supported protocol first. An empty value causes the product to use all protocols supported by the shipped version of JavaMail which may not be be POODLE-safe
mail.crypto.ciphers	
	Space-separated list of ciphers to use when connecting via SSL or TLS. An empty value causes the product to use all ciphers supported by the JVM

SSH

Default value	Description
plugin.ssh.address	
	Sets the address where the application will listen for SSH connections. By default the application will accept SSH connections on all of its network interfaces. This property can be used to restrict that to specific interfaces, with multiple addresses separated by commas (without spaces).
plugin.ssh.port	
	Sets the port where the application will listen for SSH connections, 7999 by default. This value and the SSH base URL's(`plugin.ssh.baseurl`) port don't need to match, but they often should match. If the SSH base URL and SSH port configurations are modified in the global Server settings page, the configurations specified in the properties file will no longer be used.
plugin.ssh.baseurl	
	Sets the URL on which SSH is accessible, this is used as the base for SSH clone URLs. If SSH is running on a non-standard port, the base URL must start with ssh:// or clones will fail because the port syntax is ambiguous when paired with a path (e.g. host:port/path vs. host:path) and Git does not apply the port. If the SSH base URL and SSH port configurations are modified in the global Server settings page, the configurations specified in the properties file will no longer be used.

SSH command execution

Default value	Description
plugin.ssh.command.timeout.idle	

`7200`	Controls timeouts for all SSH commands, such as those that service git and hg operations over SSH. The idle timeout configures how long the command is allowed to run without writing any output to the client. For SCM commands, the `plugin.*.hosting.timeout.idle` properties defined above will be applied to the underlying process. The default value is 2 hours. This values is in **seconds**.
plugin.ssh.last.authenticated.interval	
`60`	Controls how often the lastAuthenticationTimestamp attribute in SSH_PUBLIC_KEY should be updated. The minimum value applied is 5 seconds. However, a value higher than 5 is strongly recommended to avoid continuously updating the timestamp for sequences of git requests that use SSH authentication on each request. The default value is 60 seconds. This value is in **seconds**
plugin.ssh.nio.workers	
`-1`	Controls the maximum number of NIO worker threads to process incoming SSH commands. The default value is `-1`, which will use a dynamic maximum based on the number of CPU cores + 1 (the default for the Apache SSHD library).
plugin.ssh.auth.timeout	
`30`	Controls the timeout when trying to authenticate the incoming SSH command. If authentication does not complete within this period the SSH command will fail. Using a shorter timeout hastens the rejection SSH commands under heavy load and can help keep open socket/file count down. This values is in **seconds**.
plugin.ssh.session.pending-writes.max	
`3840`	Controls the number of pending writes the throttling mechanism will allow SSH sessions. Throttling works as a flow control mechanism to prevent the system from writing too much data to Apache MINA's WriteRequestQueue. This is particularly helpful when clients (such as TortoiseGit) setup session channels with extremely large window sizes (2GBs) which means Apache MINA's own flow control mechanism will not stop the command from writing data. A default value of 512 means that at any given time the system will only be responsible for, at most, 4 MBs per session (some more data may be written to the queue as part of Apache MINA's own handling of the SSH protocol). Rate limiting will be applied to any SSH session which establishes a channel with a remote window size larger than `${plugin.ssh.session.pending-writes.max}` * 8197 (packet size optimized for Git). A value of 0 or less effectively disables session io rate limiting.
plugin.ssh.session.max	
`250`	Controls the maximum number of concurrent SSH sessions allowed. If this property is removed the system will set the limit at 250. If this property is configured below 100 the system will set the limit at 100. Increasing this will result in additional memory usage during peak load and can lead to out-of-memory errors.
plugin.ssh.haproxy.proxy-enabled	
`true`	Controls whether the system will detect and parse HAProxy's PROXY protocol to expose real client IP addresses in addition to the connecting proxy's IP address.

SSH security

Default value	Description

plugin.ssh.disabled.ciphers	
`arcfour128, arcfour256, aes128-cbc, aes192-cbc, aes256-cbc, 3des-cbc, blowfish-cbc`	Controls which default ciphers are disabled when executing all SSH commands. Non existent ciphers are ignored. Names are case sensitive. If you override this property, the default values will NOT be appended, and should be included explicitly. Example value: `arcfour128`,`3des-cbc` To enable additional ciphers see the KB article Disable default SSH algorithms.
plugin.ssh.disabled.key.exchanges	
	Controls which default key exchange algorithms are disabled when executing all SSH commands. Non existent key exchange algorithms are ignored. Names are case sensitive. If you override this property, the default values will NOT be appended, and should be included explicitly. Example value: `ecdh-sha2-nistp256`,`ecdh-sha2-nistp384` To enable additional key exchange algorithms see the KB article Disable default SSH algorithms.
plugin.ssh.disabled.macs	
`hmac-md5, hmac-sha1-96, hmac-md5-96`	Controls which default macs are disabled when executing all SSH commands. Non existent macs are ignored. Names are case sensitive. If you override this property, the default values will NOT be appended, and should be included explicitly. Example value: `hmac-sha1-96`,`hmac-md5-96`,`hmac-md5` To enable additional macs see the KB article Disable default SSH algorithms.
plugin.ssh.dhgex.allow-sha1	
`false`	Allows the usage of Diffie-Hellman SHA1 key exchange algorithms. If set to `true`, then the Diffie-Hellman SHA1 algorithms are enabled and can be used. Because SHA-1 is considered insecure, this property will have a default value of `false` but will remain configurable in 8.0.
plugin.ssh.dhgex-keysize.min	
`1024`	Controls the minimum supported Diffie-Hellman Group Exchange key size. If unset, 1024 is used as the default value. If set to negative value then Diffie-Hellman Group Exchange is disabled. This corresponds to Apache SSHD's property, `org.apache.sshd.minDHGexKeySize`. Note: The value of 1024 is only being set to avoid breaking compatibility with existing clients in a minor release. The default will be increased to 2048 in 8.0 since 1024 is considered insecure.

Search

Bitbucket 4.6+ ships with a bundled search service.

These properties enable admins to configure Bitbucket search.

Warning: If a search parameter is set in the properties file, it cannot be edited later from the admin UI. Any changes that need to be made to the search configuration must be made within the bitbucket.properties file.

Default value	Description
plugin.search.codesearch.indexing.enabled	
`true`	Controls whether code indexing is enabled. Setting this to `false` prevents repository content from being indexed going forward. Existing repository content will *not* be un-indexed automatically.
plugin.search.indexing.max.batch.size	
	Maximum size of indexing batches sent to the search server. This value should be less than the maximum content length for http request payloads supported by the search server. The default value is 15728640 (=15MB). (Note that for search server instances running on AWS, this value must be less than the Network Limit size of the search server instance). This value is in **bytes**.
plugin.search.codesearch.indexing.exclude	
	Allows configuring strategies for excluding certain repositories from code search indexing. This can be used to reduce disk space requirements for the search index. Valid values are: • `all-forks` excludes all forks from code search indexing • `personal-forks` excludes personal forks from code search indexing • `synced-forks` excludes forks which have ref synchronization enabled from code search indexing • `undiverged-forks` excludes forks from code search indexing which have ref synchronization enabled, and have not had their default branch updated
plugin.search.config.aws.region	
	AWS region Bitbucket is running in. When set, enables request signing for Amazon OpenSearch Service.
plugin.search.config.baseurl	
	Sets the base URL of a search server instance.
plugin.search.config.password	
	Password for connecting to an search server instance.
plugin.search.config.username	
	Username for connecting to an search server instance.
plugin.search.elasticsearch.aws.region	
	This setting is deprecated. Use `plugin.search.config.aws.region` instead
plugin.search.elasticsearch.baseurl	
	This setting is deprecated. Use `plugin.search.config.baseurl` instead
plugin.search.elasticsearch.password	
	This setting is deprecated. Use `plugin.search.config.password` instead
plugin.search.elasticsearch.username	
	This setting is deprecated. Use `plugin.search.config.username` instead

plugin.search.indexing.event.shutdown.timeout	
`2`	Controls how long an search indexing process is given to complete when Bitbucket is shutting down, before it is stopped forcefully. This value is in **seconds**.
plugin.search.pageSize.primary	
`25`	Controls the page size of primary search results (eg. code for code search)
plugin.search.pageSize.secondary	
`10`	Controls the page size of secondary search results (eg. sidebar PRs/repos/etc)

Secret Scanning

Default value	Description
secretscanning.max.threads	
`${scaling.concurrency}`	Controls the maximum number of threads allowed per node to perform secret scanning
secretscanning.scan.timeout	
`1000`	Controls the timeout for streaming the diff for a commit and detecting any secrets. This value is in MILLISECONDS.
secretscanning.scan.batch.size	
`200`	Controls the number of commits sent to the executor to be scanned for secrets. If the number of commits pushed exceeds the batch size, then multiple batches will be sent.
secretscanning.scan.commit.limit	
`10000`	Controls the maximum number of commits to be scanned in a single push.
secretscanning.email.maxsecrets	
`100`	The maximum number of detected secrets that a single email can contain This exists purely to limit the size of the emails Bitbucket sends out

Secret scanning

Default value	Description
secretscanning.email.enabled	
`true`	Controls whether secret scanning will send emails to users who push secrets to Bitbucket

Server

Default value	Description
server.context-path	
`/`	Controls the context path where the application should be published, / by default.
server.display-name	

`Atlassian Bitbucket`	Controls the application's display name.
server.hsts.enabled	
`false`	Controls whether HTTP Strict Transport Security (HSTS) headers are added to HTTPS responses.
server.hsts.max-age	
`31536000`	Controls the max-age directive on HTTP Strict Transport Security (HSTS) headers. This is the period of time, after the reception of the HSTS header field, during which the web browser regards the server as a known HSTS host. A value of 0 instructs the web browser to stop regarding the server as a known HSTS host. This value is in **seconds** and the default value of 31536000 represents 1 year.
server.session.cookie.http-only	
`true`	Controls whether the session cookie should include an HttpOnly restriction, for those browsers that honor it. HttpOnly is enabled by default.
server.session.cookie.max-age	
`1209600`	Controls the value of "Max-Age" attribute in session cookie, for those browsers that honor it. This value is in seconds and the default value is 1209600 seconds i.e. 2 weeks. "Expires" attribute is also set based on this value which is absolute date and time when cookie will expire.
server.session.cookie.name	
`BITBUCKETSESSIONID`	Controls the name used for the session cookie, which is "BITBUCKETSESSIONID" by default. Note that most servlet containers use "JSESSIONID" by default. That is not used here to facilitate installations where multiple applications have the same hostname (typically via reverse proxying) with distinct context paths. In such a setup, using "JSESSIONID" can result in unexpected behavior where logging into one application logs users out of others.
server.session.timeout	
`1800`	Controls the session's timeout, which defaults to 30 minutes. Session timeout *may not* result in a user having to login again; they may automatically receive a new session via a separate remember-me token. This value is in **seconds**.
server.session.tracking-modes	
`cookie`	Controls which mechanisms may be used for tracking sessions. By default, only "cookie" tracking is enabled. Other options are "ssl", to use the SSL session ID, and "url", to append the session ID to the URL after a semi-colon. Multiple values may be specified separated by commas (e.g. "cookie,url")

Server Connectors

These properties control the primary server connector. Additional connectors can be configured using the prefix `server.additional-connector.#`, where # is the connector number. For example: to set a port on the first additional connector, the property would be `server.additional-connector.1.port=7991`. Numbers 1 to 5 are supported, allowing for 5 connectors in addition to the primary connector.

Default value	Description

server.ajp.packet-size	
`0`	Controls the AJP packet size. When using the default value (0), Tomcat's default packet size is applied. The minimum value is 8192, and the maximum is 65536. If this property is overridden, the value set should match the `max_packet_size` directive for `mod_jk`. **Note**: Packet size can only be configured when `server.connector-protocol` is set to AJP/1.3; otherwise it will be ignored. This value is in **bytes**.
server.ajp.secret	
	Controls the secret that is used to secure the AJP connector. By default no secret is used or required. If a secret is configured, by default it will be required.
server.ajp.secret-required	
	Controls whether the configured secret is required when connecting via AJP. If no secret is configured, any value configured here is ignored and the property is always set to `false`. If a secret is configured and this value is not set, it defaults to `true`.
server.address	
	Controls the network address the application will bind to, 0.0.0.0 by default.
server.compression.enabled	
`true`	Controls whether the server will attempt to compress data to reduce network costs. By default, compression is enabled on all HTTP/1.1 connectors. **Note**: Compression cannot be used when `server.connector-protocol` is set to AJP/1.3, and it will be ignored if enabled.
server.compression.excluded-user-agents	
	Controls the list of user-agents to exclude from compression.
server.compression.mime-types	
`text/css,text/html,text/javascript,text/json,text/plain,text/xml,text/x-javascript,application/javascript,application/json,application/x-javascript,application/vnd.git-lfs+json`	Controls which MIME types are compressed, when compression is enabled. CSS, HTML, JavaScript and JSON are compressed by default.
server.compression.min-response-size	
	Controls the minimum response length for the compression to be performed. Only the mime-types specified as part of the `server.compression.mime-types` will be compressed. This value is in **bytes**.
server.connection-timeout	

`20000`	Controls the connection timeout, which defines how long the server will wait for a request after a connection is established. This value is in **milliseconds**.
server.connector-protocol	
`HTTP/1.1`	Controls the wire protocol used by the primary connector, which is HTTP/1.1 by default. The following values are supported: * `HTTP/1.1` or `org.apache.coyote.http11.Http11NioProtocol` (Default): A standard HTTP 1.1 connector, which can be configured with or without SSL. All of the various settings are supported for HTTP 1.1. * `AJP/1.3` or `org.apache.coyote.ajp.AjpNioProtocol`: An AJP connector. Several settings, such as `max-http-header-size` and all of the compression and SSL settings, are not honored when using AJP. *Apache Portable Runtime (APR) and NIO2-based connectors are not supported and may not be used.* Attempting to configure either type will result in the system failing during startup.
server.max-http-header-size	
`0`	Controls the maximum size of the HTTP message header. When using the default value (0), Tomcat's default limit is applied. **Note**: The max HTTP header size cannot be configured when `server.connector-protocol` is set to AJP/1.3, and it will be ignored if set; `server.packet-size` may be the property you're looking for instead. This value is in **bytes**.
server.max-http-post-size	
`0`	Maximum size of the HTTP post or put content. When using the default value (0), Tomcat's default limit is honored. This value is in **bytes**.
server.packet-size	
`0`	Controls the AJP packet size. When using the default value (0), Tomcat's default packet size is applied. The minimum value is 8192, and the maximum is 65536. If this property is overridden, the value set should match the `max_packet_size` directive for `mod_jk`. **Note**: Packet size can only be configured when `server.connector-protocol` is set to AJP/1.3; otherwise it will be ignored. **Deprecated** in 7.14. Use `server.ajp.packet-size` instead. This value is in **bytes**.
server.port	
`7990`	Controls the port where the application will listen for connections, 7990 by default.
server.proxy-name	
	The proxy name, used to construct proper redirect URLs when a reverse proxy is in use.
server.proxy-port	

	The proxy port, used to construct proper redirect URLs when a reverse proxy is in use. If a proxy port is not set, but a name is, the connector's port will be used as the default.
server.redirect-port	
	The redirect port to use when redirecting from non-SSL to SSL. Defaults to 443, the standard SSL port.
server.require-ssl	
`false`	Require an SSL connection when connecting to the server. Setting this to "true" will automatically redirect insecure connections to the configured "redirect-port" for their connectors.
server.scheme	
`http`	The connector scheme, either "http" or "https". Defaults to "http" unless "secure" is set to "true"; then it defaults to "https". In general, this property should not need to be set. **Note**: The scheme cannot be configured when `server.connector-protocol` is set to AJP/1.3, and it will be ignored if set.
server.secure	
`false`	Whether the connector is secured. Note that setting this to "true" does *n ot* enable SSL; SSL is enabled using `server.ssl.enabled` instead. One use case for setting this to "true" is when the system is behind a reverse proxy and SSL is terminated at the proxy. **Note**: The secure flag cannot be configured when `server. connector-protocol` is set to AJP/1.3, and it will be ignored if set.
server.server-header	
	Controls the value to use for the Server response header. If empty, which is the default, no header is sent.
server.ssl.ciphers	
	Controls the supported SSL ciphers for the connector. This property value is a comma-separated list.
server.ssl.client-auth	
	Controls whether the client authentication is wanted ("want") or needed ("need"), this setting directly relates to the `clientAuth` option for Tomcat. Requires a configured trust store. Default is empty, which corresponds to the Tomcat's default value of false.
server.ssl.enabled	
`false`	Controls whether SSL is enabled. By default, SSL is disabled and the primary connector uses unsecured HTTP. **Note**: SSL cannot be used when the `server.connector-protocol` is set to AJP/1.3, and attempting to enable it will prevent the server from starting.
server.ssl.key-alias	

`tomcat`	Controls the alias used when selecting the key to use in the keystore. For compatibility with keys setup for Bitbucket 4.x and earlier, the default is "tomcat".
server.ssl.key-password	
`changeit`	Controls the password used to access the key within the keystore. (`server.ssl.key-store-password` is used to control the password for accessing the keystore itself.) For compatibility with keys setup for Bitbucket Server 4.x and earlier, the default is "changeit".
server.ssl.key-store	
`${bitbucket.shared.home}/config/ssl-keystore`	Controls the location of the keystore, "$BITBUCKET_HOME/shared/config/ssl-keystore" by default.
server.ssl.key-store-password	
`changeit`	Controls the password used to access the keystore. (`server.ssl.key-password` is used to control the password for accessing the specific key within the keystore.) For compatibility with keys setup for Bitbucket 4.x and earlier, the default is "changeit".
server.ssl.key-store-type	
`${keystore.type:jks}`	Controls the keystore type. The JVM's default keystore type as returned by `KeyStore.getDefaultType()`, typically "jks", is used by default.
server.ssl.enabled-protocols	
`all`	Controls which SSL protocols the connector will allow when communicating with clients. This value can be a comma-separated list (without spaces) to allow multiple protocols. Possible values include: * SSLv2Hello * SSLv3 * TLSv1 * TLSv1.1 * TLSv1.2 * TLSv1.3 (Requires a supporting JVM) * all (Default; equivalent to "SSLv2Hello,TLSv1,TLSv1.1,TLSv1.2,TLSv1.3") Note that SSLv2 and SSLv3 are inherently unsafe and should not be used.
server.ssl.protocol	
`TLS`	Controls the SSL protocol the connector will use by default. To control which protocols are *supported*, set `server.ssl.enabled-protocols` instead. Even if the connector defaults to a given protocol, clients can use any *enabled* protocol.
server.ssl.trust-store	
	Controls which trust store holds the SSL certificates
server.ssl.trust-store-password	
	Controls the password to be used to access the trust store.
server.ssl.trust-store-provider	
	Controls the provider for the trust store.
server.ssl.trust-store-type	
	Controls the type for the trust store.

Server busy banners

Default value	Description
server.busy.on.ticket.rejected.within	
5	Controls how long a warning banner is displayed in the UI after a request is rejected due to excessive load. This value is in **minutes**. Using 0, or a negative value, disables displaying the banner.
server.busy.on.queue.time	
`60`	Controls how long requests need to be queued before they cause a warning banner to appear. This value is in **seconds**. Using 0, or a negative value, disables displaying the banner.

Setup automation

If these properties are specified in `bitbucket.properties`, when the Setup Wizard runs after installing Bitbucket Server their values will be used and the Setup Wizard will not display the corresponding configuration screens.

You can use these properties to automate setup and remove the need to interact with the Setup Wizard when provisioning a new server.

See our automated setup documentation for more details.

Default value	Description
setup.displayName	
`Bitbucket`	The display name for the instance.
setup.baseUrl	
	The base URL for the instance.
setup.license	
`AAABa1evaA4N...`	The license.
setup.sysadmin.username	
`admin`	The username for the system admin account.
setup.sysadmin.password	
`password`	The password for the system admin account.
setup.sysadmin.displayName	
`John Doe`	The display name for the system admin account.
setup.sysadmin.emailAddress	
`sysadmin@yourcompany.com`	The email address for the system admin account.

Signed commit

Default value	Description
plugin.signed-commit.batch-size	
`300`	This sets the number of commits we process in a single thread when indexing the commits for their signature state. Increasing this number can make indexing faster, but when this number is too large, it can cause timeouts during indexing. The default value is 300 (the number of commits processed in a single thread)

Sizing Hints

Default value	Description
sizing-hint.cache.users	
`4000`	Sizing hint for a variety of caches that contain per user entries. A reasonable starting point to set this is to set it to between 50-100% of the licensed user count. Increasing this beyond the default may improve performance at the cost of increased Java heap memory usage. Decreasing this below the default is not necessary nor recommended.
sizing-hint.cache.groups	
`2500`	Sizing hint for a variety of caches that contain per group entries. A reasonable starting point to set this is to set it to between 50-100% of group membership, specifically count of distinct groups, of the set of licensed users. Increasing this beyond the default may improve performance at the cost of increased Java heap memory usage. Decreasing this below the default is not necessary nor recommended.

Syntax highlighting

See Configuring syntax highlighting for file extensions for more information.

Default value	Description
syntax.highlighter.<MIME type>.executables	
`exe1,exe2`	Controls the language highlighter used for a given set of hashbang executables. The '<MIME type>' refers to the MIME type CodeMirror uses.
syntax.highlighter.<MIME type>.extensions	
`ext1,ext2`	Controls the language highlighter used for a given set of file extensions. The '<MIME type>' refers to the MIME type CodeMirror uses.
syntax.highlighter.application/json.extensions	
`ipynb`	
syntax.highlighter.text/x-sh.executables	
`sh,bash,zsh`	
syntax.highlighter.text/x-erlang.executables	

`escript`	
syntax.highlighter.text/javascript.executables	
`node`	
syntax.highlighter.text/x-perl.executables	
`perl`	
syntax.highlighter.text/x-python.executables	
`python`	
syntax.highlighter.text/x-ruby.executables	
`ruby`	
syntax.highlighter.text/x-sh.extensions	
`makefile,Makefile`	
syntax.highlighter.text/velocity.extensions	
`vm`	
syntax.highlighter.text/x-objectivec.extensions	
`m`	

Tasks

Default value	**Description**
task.max.anchors.per.request	
`500`	Maximum number of anchors that can be used when counting or searching tasks
task.max.contexts.per.request	
`100`	Maximum number of contexts that can be used when counting or searching tasks
task.max.tasks.per.request	
`500`	Maximum number of tasks that can be retrieved when searching tasks
task.query.disjunction.size	
`100`	Sets the maximum size of the disjunction clause when querying tasks by anchors or contexts

Topic

Default value	**Description**
topic.default.message.max.queue	
`1024`	Controls the default size of a topic's message queue. Messages that arrive for the topic when the message queue is full will be dropped (and an error logged). This default will only apply when the topic is created (by a plugin) without specifying the message queue size.

topic.dispatch.core.threads	
`1`	Controls the minimum number of threads to keep alive for dispatching topic messages to topic subscribers
topic.dispatch.max.threads	
`3`	Controls the maximum number of threads to dispatch topic messages to the topic subscribers

Universal Plugin Manager

Default value	Description
upm.plugin.upload.enabled	
`false`	Controls whether the "Upload App" button is available in UPM, and for the REST API that it uses if plugins can be uploaded from sources other than Atlassian Marketplace. If this is set to `true` then: - The "Upload App" button will be displayed in the web user interface - Uploading a plugin JAR file will be allowed - Installing a plugin from a non-marketplace URL will be allowed WARNING: This should be set to `true` with caution. Allowing the system administrator to install arbitrary plugins will allow the system administrator to execute code in the context of the Java virtual machine which essentially permits an escalation of privileges to "operating system user". When this property is unset it is effectively defaulted to {@code false}, meaning the above will be disallowed and the "Upload App" button will not be displayed.

Webhooks

Default value	Description
plugin.webhooks.http.backoff.interval.exponent	
`1.2`	In the event that a webhook is considered unhealthy and is marked for backoff, it will start by backing off at the initial backoff delay. If the webhook continues to fail, it will back off at a rate of (initial backoff interval) * (backoff exponent ^ (number of failures - backoff trigger count)) up to a configured maximum
plugin.webhooks.http.backoff.interval.initial	
`10`	The initial delay given to a webhook when it fails more than the configured maximum number of times. While in this backoff state, the specific webhook will be skipped This value is in **seconds**
plugin.webhooks.http.backoff.interval.max	
`7200`	The maximum delay given to a webhook when it continually fails. While in this backoff state, the specific webhook will be skipped This value is in **milliseconds**, default 2 hours.
plugin.webhooks.http.ip.blacklist	

`169.254.169.254`	This value controls a banned set of IPs that webhooks cannot connect to. Doing so will cause an exception. By default the AWS metadata endpoint is banned to avoid leaking data about the machine that the application is running on This value is a comma separated list of IPv4/6 addresses or CIDR ranges.
plugin.webhooks.http.backoff.trigger.count	
`5`	The maximum number of failures in a row before a webhook is considered unhealthy and will be skipped. The time skipped will continue to rise as per the delay exponent until the webhook is healthy once again. A single success will clear all instances of failures from the count.
plugin.webhooks.signature.algorithm	
`sha256`	The algorithm to use for signing the outgoing request body, e.g. sha1 or sha256. The resulting signature will be sent in the X-Hub-Signature header for webhooks that have a secret configured.
plugin.webhooks.connection.timeout	
`20000`	The timeout given for a single webhook request to receive a TCP connection This value is in **milliseconds**
plugin.webhooks.socket.timeout	
`20000`	Controls how long requests to external services can continue without producing any data before webhooks gives up. This value is in **milliseconds**
plugin.webhooks.dispatch.queue.size	
`250`	The maximum size of the queue used to transform webhook publishing events into HTTP events.
plugin.webhooks.dispatch.queue.timeout	
`250`	The maximum amount of time allowed to be placed on the dispatch queue. This time is only utilised if the dispatch queue is filled. The application will wait this amount of time to attempt to be placed onto the queue. If unsuccessful, the webhook will be skipped. This value is in **milliseconds**
plugin.webhooks.io.threads	
`3`	Number of threads to be used to process HTTP IO.
plugin.webhooks.callback.thread.count	
`10`	Number of threads used to process callbacks to Bitbucket with results of the HTTP requests.
plugin.webhooks.http.connection.max	
`200`	Maximum number of concurrent outgoing connections. Further connections will be placed upon the dispatch queue until they are able to be processed.
plugin.webhooks.http.connection.host.max	
`5`	Maximum number of connections to the same HTTP host.
plugin.webhooks.statistics.flush.interval	

30	The interval in seconds at which webhooks statistics are written to the database. A longer interval is more efficient, but results in slightly outdated invocation details in the webhooks administration pages. This value should not be 0 This value is in **seconds**
plugin.webhooks.response.header.line.size.max	
8192	Maximum allowed size for response header lines in bytes. Responses with headers that have a line size exceeding this limit will fail with an exception. This value is in **bytes**
plugin.webhooks.response.http.body.size.max	
16384	Maximum size in bytes for a webhook response body. Any larger bodies will be truncated at this length before being provided to callbacks and/or persisted for historical tracking. This value is in **bytes**
plugin.webhooks.dispatch.inflight.max	
500	Maximum number of webhooks requests able to be either - Currently in progress - waiting for a HTTP connection any further connection requests will be skipped
plugin.webhooks.push.event.commits.limit	
5	Maximum number of commits to be included in the payload of a webhook push event. If the number of commits pushed is greater than the limit, the payload will include only the most recent commits. Significantly increasing this number may negatively impact server performance.

X.509 Certificate Signing

Default value	Description
x509.certificate.remote.connection.timeout	
60000	The HTTP connection timeout used for communication with external servers that provide certificate revocation lists. This value must be between 2000 and 60000, which are imposed as lower and upper bounds on any value specified here. This value is in **milliseconds**.
x509.certificate.remote.socket.timeout	
60000	The socket timeout. This value must be between 2000 and 60000, which are imposed as lower and upper bounds on any value specified here. This value is in **milliseconds**.
x509.certificate.signing.certificate.matching.issuer.cache.max	
25	Controls the maximum number of signing certificates matching an issuer certificate known to the system based on their given fingerprint for the duration of a push. Note that this is a request level cache. Setting this number too low increases the overhead to X.509 certificate signature validation. Setting it too high increases memory consumption.
x509.certificate.signing.certificate.revoked.cache.max	

250	Controls the maximum number of signing certificates that we know are revoked based on their given fingerprint for the duration of a push. Note that this is a request level cache. Setting this number too low increases the overhead to X.509 certificate signature validation. Setting it too high increases memory consumption.
x509.certificate.signing.certificate.user.cache.max	
150	Controls the maximum number of signing certificates matching the application user known to the system based on their given email address for the duration of a push. Note that this is a request level cache. Setting this number too low increases the overhead to X.509 certificate signature validation. Setting it too high increases memory consumption.

Zero downtime backup/disaster recovery

Default value	Description
disaster.recovery	
`false`	When set to true repair jobs are triggered on startup
integrity.check.pullRequest.batchSize	
`1000`	Maximum number of results returned in each database call used by integrity checking tasks
integrity.check.pullRequest.updatedSinceDays	
7	Controls the date range used to filter merged pull requests for integrity checking. This property defines the number of days to go back since the most recent pull request update
integrity.check.repository.batchSize	
`1000`	Maximum number of results returned in each database call used by repository check tasks

Change Bitbucket's context path

There are various reasons why you might need to change the context path for Bitbucket Data Center. Two of those are:

- You are running Bitbucket behind a proxy.
- You have another Atlassian application, or Java web application, available at the same hostname and context path as Bitbucket, and are experiencing login problems (see Login and session conflicts with multiple Atlassian applications).

Related pages

- Integrate Bitbucket with Apache HTTP Server
- Login and session conflicts with multiple Atlassian applications

To change the context path:

1. Navigate to your home directory.
2. Stop Bitbucket. See Start and stop Bitbucket.
3. Open the `shared/bitbucket.properties` file, and add the `server.context-path` property. Set it to reflect the context path that you want Bitbucket to be accessible at. For example, to set the context path to `/bitbucket` you would add:

   ```
   server.context-path=/bitbucket
   ```

   Then save the file.
4. Start Bitbucket. See Start and stop Bitbucket.

   Bitbucket is now available at the same host as before, but under the new context path. For example, a server that was at `http://localhost:7990` will now be reachable at `http://localhost:7990/bitbucket`.
5. Once started, go to ⚙ > **Server settings.**
6. Append the new context path to your base URL:

   ```
   https://localhost:7990/bitbucket
   ```

7. Select **Save**.

Important considerations

If you're running Bitbucket behind Apache,

- You need to make sure the host or context path that Bitbucket is exposed on is not also being used by another web application that is listening on a different port.
- If you updated the Bitbucket context path using the steps outlined above, you need to also update your Apache configuration, as described in Integrating Bitbucket with Apache HTTP Server.

If you had Application Links set up before changing the context path in Bitbucket, you have to recreate those using the new Bitbucket URL. See Link Bitbucket with Jira.

If you use SSH, the context path does not affect the URL at which SSH operations occur. After changing the context path so that Bitbucket is accessible at `https://localhost:7990/bitbucket`, SSH operations occur without the context path at `ssh://my-bitbucket-hostname:7999`.

Data recovery and backups

This page provides an overview of the backup and restore options available for use with Bitbucket Data Center:

Questions? Check out FAQ - Data recovery and backup.

Related pages

- Connect Bitbucket to an external database
- Supported platforms
- Bitbucket DIY Backup
- Bitbucket zero downtime backup
- Disaster recovery guide for Bitbucket Data Center

Bitbucket backup essentials

An effective backup strategy is essential:

- for avoiding data loss in the event of any system breakdown,
- for restoring Bitbucket after any system breakdown,
- as part of the Bitbucket upgrade process.

We highly recommend that you establish a data recovery plan that is aligned with your company's policies. At the very least, you should consider these aspects:

- How frequently should Bitbucket be backed up? We recommend that backups are made at least daily.
- How much downtime is acceptable? When using a backup strategy with any downtime we recommend scheduling backups at a time of day that minimizes impact on users, e.g., out of office hours.
- How long should backups be retained for? We recommend that backups be retained for at least one month.
- Where should the backups be stored? We recommend that backups are stored at an offsite location.
- How quickly and easily can you restore your data in an emergency? We recommend restoring your backups in a staging environment on a regular basis to ensure that your backup strategy works in the event of a *real* emergency scenario.

The importance of being consistent

All backup strategies for Bitbucket need to capture the state of three fundamental data sources:

- The **home directory** on the file system, which contains your repository data, log files, plugins, and so on (see Set the home directory for more detail).
- If you're using Mesh to manage your repositories, each Mesh node's **home directory**, which contains your repository data and Mesh log files.
- The **database**, which contains data about pull requests, comments, users, groups, permissions, and so on.

These data sources hold the entire state of a Bitbucket instance. To backup the complete state of your instance, you need to take *consistent* snapshots of each using one of the strategies below. If you attempt to restore snapshots containing inconsistencies then there is a risk of corruption or data loss in your repositories and pull requests.

(In addition, if you have a remote Elasticsearch instance then search indexes are maintained in Elasticsearch's data directory, but you don't have to include this in your backup as it can be completely rebuilt if necessary from the data in your home directory and database.)

Bitbucket backup strategies

Bitbucket provides multiple strategies for taking backups free of inconsistencies, and each are summarized in the table below. Each option has tradeoffs between technical requirements and the amount of downtime involved. Which strategy you choose depends on the scale of your instance, your file system and database technologies, your recovery point objective, and your users' tolerance of downtime when backups are taken.

	Zero Downtime Backup	**DIY Backup**
Summary	A technique that eliminates downtime completely using internally consistent database snapshots and block-level filesystem snapshots	A technique that minimizes downtime using incremental copy or vendor-specific snapshot technology
Downtime	✓ Zero at backup time.	⚠ Low. Only needs to lock Bitbucket briefly to create a consistent snapshot. Downtime can be as low as a few seconds.
Minimum product version	Bitbucket 4.8+	Stash 2.12+ Bitbucket 4.0+
Bitbucket Data Center	✓ Supported. Bitbucket can perform an integrity check at restore time to scan for inconsistencies between the home directory and database, and resolve them.	✓ Supported
Minimum requirements	• Requires you to use the snapshot tools of your file system and database vendor. Example scripts are provided. • Requires your home directories to be on a file system volume capable of atomic (block level) snapshots, for example, Amazon EBS, LVM, NetApp, XFS, or ZFS. • Minimizing the time between database and filesystem snapshots (or using vendor-specific point-in-time recovery) reduces the chances of inconsistencies occurring	Requires you to use the snapshot tools of your file system and database vendor. Example scripts are provided.
Backup format	Vendor-specific database snapshot and block level file system snapshot of the entire disk volume.	Vendor-specific database dump and file system snapshot.
Documentation	Bitbucket zero downtime backup	Bitbucket DIY Backup

Further information

Bitbucket zero downtime backup

Bitbucket DIY Backup

Bitbucket DIY Backup

This article explains use of the Bitbucket DIY Backup scripts for use with Bitbucket Server and Data Center 4.x+. If you are running an earlier version of this product, formerly known as Stash, please see Using Stash (3.11) DIY Backup.

The Bitbucket DIY Backup allows you to:

- significantly reduce the downtime needed to create a consistent backup
- use the vendor-specific database backup tool appropriate to your back end database, for example:
    - `pg_dump` if your back end database is PostgreSQL
    - `sqlcmd` with an appropriate command for differential backup, if your back end database is MS SQL Server
- use the optimal file system backup tool for your Bitbucket Data Center home directory, for example:
    - an LVM snapshot logical volume if your Bitbucket Data Center home directory uses LVM
    - a SAN-based backup if your Bitbucket Data Center home directory uses a Storage Area Network
    - `rsync`, if available
- take backups of Bitbucket Data Center and Bitbucket Mesh instances without having to bring nodes down manually.

On this page:

Related pages:

- Data recovery and backups
- Scheduling tasks on Linux
- Scheduling tasks on Windows

Download the worked example scripts from Bitbucket:

Download

The key to reducing downtime is the use of optimal, vendor-specific database and file system backup tools. B itbucket DIY Backup does require you to write some code in a language of your choice to perform the required backup steps, using the REST API available for Bitbucket Server and Data Center 4.0.

DIY Backup supports Windows and Linux platforms, and Bitbucket version 4.0 and higher. DIY Backup supports Bitbucket Data Center and Bitbucket Mesh instances equally – any DIY Backup solution that works on one should work on the other without modification.

For information about other backup strategies for Bitbucket Data Center, see Data recovery and backups. That page also discusses the tight coupling between the Bitbucket Data Center file system on disk and the database that the application uses.

Please note that the examples on this page are provided as guidance for developing a DIY Backup solution. As such, the third-party tools described are for example only – you will need to choose the tools that are appropriate to your own specific installation of Bitbucket Data Center.

Consult the vendor documentation for the third-party tools you choose – unfortunately, Atlassian can not provide support for those tools.

This page:

- Describes a complete DIY Backup solution for a PostgreSQL database and local filesystem, using `bash` shell scripts.
- Provides background information about how the Bitbucket Data Center REST API can be used for DIY Backups.

You can use this solution directly if your Bitbucket Data Center instance has the same or similar configuration, or use this as a starting point to develop your own DIY Backup solution tailored to your hardware configuration.

How it works

When you use DIY Backup, you have complete control over the backup steps, and can implement any custom processes you like in the language of your choice. For example, you can use your database's incremental or fast snapshot tools and/or your file server's specific tools as part of a DIY Backup.

The DIY Backup does the following:

1. Prepares the Bitbucket Data Center instance for backup. This happens before Bitbucket Data Center is locked, so we want to do as much processing as possible here in order to minimize downtime later. For example, we can take an initial snapshot using incremental database and filesystem utilities. These do not have to be 100% consistent as Bitbucket Data Center is still running and modifying the database and filesystem. But taking the initial snapshot now may reduce the amount of work done later (while the application is locked), especially if the amount of data modified between backups is large. The steps include:
    - Taking an initial backup of the database (if it supports progressive/differential backups).
    - Doing an initial `rsync` of the home folder to the backup folder.
2. Initiates the backup, which will:
    - Lock the Bitbucket Data Center instance.
    - Drain and latch the connections to the database and the filesystem.
    - Wait for the drain/latch step to complete.
3. Once the instance is ready for backup we can start with the actual DIY Backup. This will include steps to:
    - Make a fully consistent backup of the database, using `pg_dump`.
    - Make a fully consistent backup of the filesystem, using `rsync`.

    ⓘ If you're using Bitbucket Mesh for storing your repositories, you will need to run the DIY backup scripts on each of them at this stage

4. Notify the Bitbucket Data Center instance once the backup process finishes and unlock it.
5. Archive all files created during the backup into one big archive.

A user will get an error message if they try to access the web interface, or use the hosting services, when the application is in maintenance mode.

As an indication of the unavailability time that can be expected, in Atlassian's internal use we have seen downtimes of less than a minute.

What is backed up

The Bitbucket DIY Backup backs up the following data:

- the database the instance is connected to (either the internal or external database)
- managed Git repositories
- the Bitbucket Data Center logs
- installed plugins and their data

DIY Backups using Bash scripts

This section presents a complete DIY Backup solution that uses the following tools:

- `bash` - for scripting
- `jq` - an open source command line JSON processor for parsing the REST responses from Bitbucket Data Center
- `pg_dump` (or `sqlcmd`) - for backing up a PostgreSQL database
- `rsync` - for backing up the filesystem
- `tar` - for making a backup archive

This approach (with small modifications) can be used for running DIY Backups on:

- Linux and Unix
- macOS
- Windows with cygwin.

Bash scripts

You can download the example scripts from Bitbucket or simply clone the repository.

Running the Bash script

Once you have downloaded the Bash scripts, you need to create one file:

- `bitbucket.diy-backup.vars.sh` (you can copy `bitbucket.diy-backup.vars.sh.example` to start)

For example, here's how you might configure `bitbucket.diy-backup.vars.sh` if:

- your Bitbucket Data Center server is called `bitbucket.example.com`, uses port 7990, and has its home directory in `/bitbucket-home`
- you want to generate the backup in `/bitbucket-backup`, and store your `.tar.gz` backups in `/bitbucket-backup-archives`,
- you have a System Administrator in Bitbucket with the username "admin" and password "admin", and you run Bitbucket (and the backup scripts) as the OS user "atlbitbucket"

bitbucket.diy-backup.vars.sh

```
#!/bin/bash

CURL_OPTIONS="-L -s -f"
INSTANCE_NAME=bitbucket

BITBUCKET_URL=http://bitbucket.example.com:7990
BITBUCKET_HOME=/bitbucket-home/
BITBUCKET_UID=atlbitbucket
BITBUCKET_GID=atlbitbucket

BACKUP_HOME_TYPE=rsync
BACKUP_DATABASE_TYPE=postgresql
BACKUP_ARCHIVE_TYPE=tar

BITBUCKET_BACKUP_USER=admin
BITBUCKET_BACKUP_PASS=admin
BITBUCKET_BACKUP_EXCLUDE_REPOS=()

BITBUCKET_DB=bitbucket
POSTGRES_HOST=localhost
POSTGRES_USERNAME=dbuser
export PGPASSWORD=dbpass
POSTGRES_PORT=5432

# Make use of PostgreSQL 9.3+ options if available
psql_version="$(psql --version | awk '{print $3}')"
psql_majorminor="$(printf "%d%03d" $(echo "${psql_version}" | tr "." "\n" | head -n 2))"
if [[ ${psql_majorminor} -ge 9003 ]]; then
 PG_PARALLEL="-j 5"
 PG_SNAPSHOT_OPT="--no-synchronized-snapshots"
fi

BITBUCKET_BACKUP_ROOT=/bitbucket-backup
BITBUCKET_BACKUP_DB=${BITBUCKET_BACKUP_ROOT}/bitbucket-db/
BITBUCKET_BACKUP_HOME=${BITBUCKET_BACKUP_ROOT}/bitbucket-home/

BITBUCKET_BACKUP_ARCHIVE_ROOT=/bitbucket-backup-archives

# Used by the scripts for verbose logging. If not true only errors will be shown.
BITBUCKET_VERBOSE_BACKUP=TRUE

HIPCHAT_URL=https://api.hipchat.com
HIPCHAT_ROOM=
HIPCHAT_TOKEN=

KEEP_BACKUPS=0
```

The supplied `bitbucket.diy-backup.vars.sh` is written to use PostgreSQL, rsync, and tar by default. But if you want to use different tools, you can also customize the top section of this file:

Example usage:

```
# Strategy for backing up the Bitbucket home directory:
# - amazon-ebs - Amazon EBS snapshots of the volume containing the home
directory
# - rsync - "rsync" of the home directory contents to a temporary location.
NOTE: This can NOT be used
# with BACKUP_ZERO_DOWNTIME=true.
BACKUP_HOME_TYPE=rsync


# Strategy for backing up the database:
# - amazon-rds - Amazon RDS snapshots
# - mysql - MySQL using "mysqldump" to backup and "mysql" to restore
# - postgresql - PostgreSQL using "pg_dump" to backup and "pg_restore" to
restore
# - postgresql93-fslevel - PostgreSQL 9.3 with data directory located in the
file system volume as home directory (so
# that it will be included implicitly in the home volume snapshot)
BACKUP_DATABASE_TYPE=postgresql



# Strategy for backing up Elasticsearch:
# - <leave blank> - No separate snapshot and restore of Elasticsearch state
(default).
# - s3 - Amazon S3 bucket - requires the Elasticsearch Cloud plugin to be
installed.
# - fs - Shared filesystem - requires all data and master nodes to mount a
shared file system to the same mount point.
BACKUP_ELASTICSEARCH_TYPE=
```

You also need to create two directories for DIY Backup to work:

1. `${BITBUCKET_BACKUP_ROOT}` is a working directory (`/bitbucket-backup` in our example) where copies of Bitbucket Data Center home directory and database dump are built during the DIY Backup process.
2. `${BITBUCKET_BACKUP_ARCHIVE_ROOT}` is the directory (`/bitbucket-backup-archives` in our example) where the final backup archives are saved.

The Bash scripts may be run on any host, provided it has:

- read/write access to the above `${BITBUCKET_BACKUP_ROOT}` and `${BITBUCKET_BACKUP_ARCHIVE_ROOT}` directories,
- read access to the `${BITBUCKET_HOME}` directory,
- read access to the database, and
- network access to run `curl` commands on the Bitbucket Data Center server.

It doesn't matter whether the filesystem access is direct or over NFS, or whether the network access is direct to a node or to a load balancer / reverse proxy.

Once your `bitbucket.diy-backup.vars.sh` is correctly configured, run the backup in a terminal window:

```
$ ./bitbucket.diy-backup.sh
```

The first time you run the backup, `rsync` will do most of the work since the `/bitbucket-backup` working directory is initially empty. This is normal. Fortunately, this script performs one `rsync` before locking Bitbucket Data Center, followed by a second `rsync` while Bitbucket Data Center is locked to minimize downtime.

On second and subsequent backup runs, `/bitbucket-backup` is already populated so the backup process should be faster. The output you can expect to see looks something like this:

```
$ ./bitbucket.diy-backup.sh
[http://localhost:7990/bitbucket]  INFO: Prepared backup of DB bitbucket in /bitbucket-backup/bitbucket-
db/
building file list ... done.
sent 4.17M bytes  received 484 bytes  2.78M bytes/sec
total size is 121.12M  speedup is 29.06
[http://localhost:7990/bitbucket]  INFO: Prepared backup of /bitbucket-home to /bitbucket-backup
/bitbucket-home/
[http://localhost:7990/bitbucket]  INFO: locked with '7187ae1824ce1ede38a8e7de4bccf58d9a8e1a7a'
[http://localhost:7990/bitbucket]  INFO: backup started with '82c73f89e790b27fef3032e81c7071388ae4e371'
[http://localhost:7990/bitbucket]  INFO: Waiting for DRAINED state....... done
[http://localhost:7990/bitbucket]  INFO: db state 'DRAINED'
[http://localhost:7990/bitbucket]  INFO: scm state 'DRAINED'
[http://localhost:7990/bitbucket]  INFO: Performed backup of DB bitbucket in /bitbucket-backup/bitbucket-
db/
[http://localhost:7990/bitbucket]  INFO: Backup progress updated to 50
building file list ... done.
sent 4.87M bytes  received 484 bytes  3.25M bytes/sec
total size is 121.82M  speedup is 24.99
[http://localhost:7990/bitbucket]  INFO: Performed backup of /bitbucket-home to /bitbucket-backup
/bitbucket-home/
[http://localhost:7990/bitbucket]  INFO: Backup progress updated to 100
[http://localhost:7990/bitbucket]  INFO: Bitbucket instance unlocked
[http://localhost:7990/bitbucket]  INFO: Archiving /bitbucket-backup into /bitbucket-backup-archives
/bitbucket-20150917-082818-498.tar.gz
[http://localhost:7990/bitbucket]  INFO: Archived  /bitbucket-backup into /bitbucket-backup-archives
/bitbucket-20150917-082818-498.tar.gz
```

Restoring a DIY Backup

When restoring Bitbucket Data Center, you must run the `bitbucket.diy-restore.sh` script on the machine that Bitbucket Data Center should be restored to. In order to ensure accidental restores do not delete existing data, you should never restore into an existing home directory.

The new database should be configured following the instructions in Connect Bitbucket to an external database and its sub-page that corresponds to your database type.

To see the available backups in your `${BITBUCKET_BACKUP_ARCHIVE_ROOT}` directory, just type:

```
$ ./bitbucket.diy-restore.sh
```

You should see output similar to this:

```
$ ./bitbucket.diy-restore.sh
Usage: ./bitbucket.diy-restore.sh <backup-file-name>.tar.gz
Available backups:
bitbucket-20150917-082818-498.tar.gz  bitbucket-20150918-083745-001.tar.gz
```

To restore a backup, run `bitbucket.diy-restore.sh` with the file name as the argument:

```
$ ./bitbucket.diy-restore.sh bitbucket-20150917-082818-498
```

You should see output like this:

```
$ ./bitbucket.diy-restore.sh bitbucket-20150917-082818-498.tar.gz
[http://localhost:7990/bitbucket]  INFO: Extracted /bitbucket-backup-archives/bitbucket-20150917-082818-
498.tar.gz into /tmp/bitbucket.diy-restore.dQsbzU
[http://localhost:7990/bitbucket]  INFO: Performed restore of /tmp/bitbucket.diy-restore.dQsbzU
/bitbucket-db to DB bitbucket2
[http://localhost:7990/bitbucket]  INFO: Performed restore of /tmp/bitbucket.diy-restore.dQsbzU
/bitbucket-home to /bitbucket-home2
```

Canceling the backup

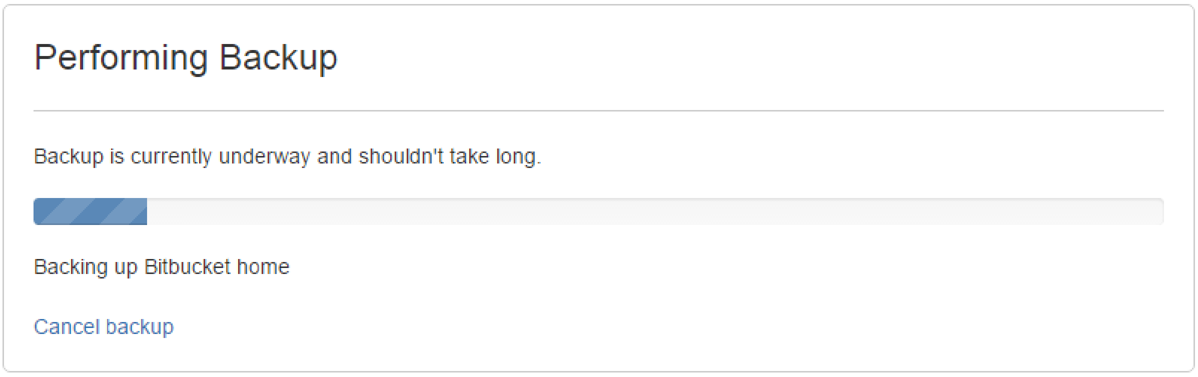
You can cancel the running backup operation if necessary.

To cancel the backup:

1. Copy the cancel token echoed in the terminal (or the Command Prompt on Windows). Look for the line "backup started with `token`"

```
$ ./bitbucket.diy-backup.sh
[http://localhost:7990/bitbucket]  INFO: Prepared backup of DB bitbucket in /bitbucket-backup
/bitbucket-db/
building file list ... done.
sent 4.17M bytes  received 484 bytes  2.78M bytes/sec
total size is 121.12M  speedup is 29.06
[http://localhost:7990/bitbucket]  INFO: Prepared backup of /bitbucket-home to /bitbucket-backup
/bitbucket-home/
[http://localhost:7990/bitbucket]  INFO: locked with '7187ae1824ce1ede38a8e7de4bccf58d9a8e1a7a'
[http://localhost:7990/bitbucket]  INFO: backup started with
'82c73f89e790b27fef3032e81c7071388ae4e371'
[http://localhost:7990/bitbucket]  INFO: Waiting for DRAINED state....... done
[http://localhost:7990/bitbucket]  INFO: db state 'DRAINED'
[http://localhost:7990/bitbucket]  INFO: scm state 'DRAINED'
```

   E.g. use "82c73f89e790b27fef3032e81c7071388ae4e371"
2. Go to the Bitbucket Data Center interface in your browser. Bitbucket Data Center will display this screen:

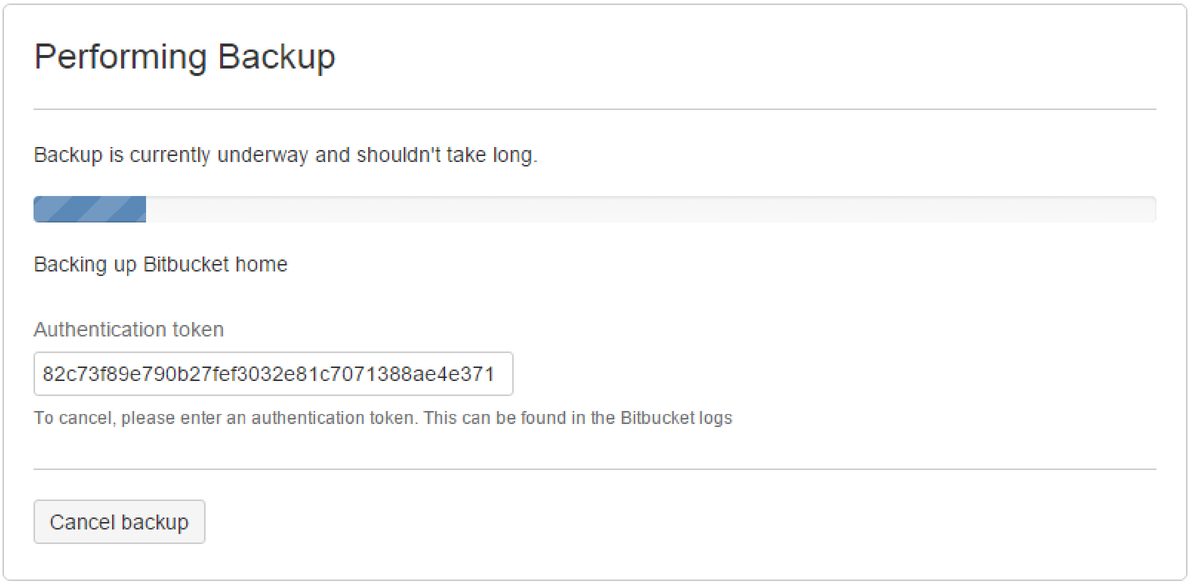


Performing Backup

Backup is currently underway and shouldn't take long.

Backing up Bitbucket home

3. Click **Cancel backup**, and enter the cancel token:


Performing Backup

Backup is currently underway and shouldn't take long.

Backing up Bitbucket home

Authentication token

82c73f89e790b27fef3032e81c7071388ae4e371

To cancel, please enter an authentication token. This can be found in the Bitbucket logs

4. Click **Cancel backup**.

Note that Bitbucket Data Center will still be locked in maintenance mode. Repeat these steps using the "locked with" token (e.g. "7187ae1824ce1ede38a8e7de4bccf58d9a8e1a7a") to exit maintenance mode as well, and unlock Bitbucket Data Center.

Advanced – writing your own DIY Backup using the REST APIs

This section is optional and provides background information about how you might use the Bitbucket Data Center REST APIs if you need to rewrite the DIY Backup scripts described above in your preferred language or to customize them heavily.

Note that this discussion shows `curl` commands in Bash, however you can use any language.

The following steps are involved:

Preparation

Before you lock Bitbucket Data Center, you can perform any preparation you like. It makes sense to perform as much processing as possible before you lock the application, to minimize downtime later. For example, you could perform an `rsync`:

```
rsync -avh --delete --delete-excluded --exclude=/caches/ --exclude=/data/db.* --exclude=/export/ --
exclude=/log/ --exclude=/plugins/.*/ --exclude=/tmp --exclude=/.lock ${BITBUCKET_HOME}
${BITBUCKET_BACKUP_HOME}
```

Lock the Bitbucket Data Center instance

The next step in making a backup of a Bitbucket Data Center instance is to lock the instance for maintenance. This can be done using a POST request to the `/mvc/maintenance/lock` REST point (where `BITBUCKET_URL` points to the Bitbucket Data Center instance, `BITBUCKET_BACKUP_USER` is a Bitbucket Data Center user with backup permissions, and `BITBUCKET_BACKUP_PASS` is this user's password).

REQUEST

```
curl -s \
         -u
${BITBUCKET_BACKUP_USER}:${BITBUCKET_BACKUP_PASS}
\
         -X POST \
```

RESPONSE

```
{
        "unlockToken":"
0476adeb6cde3a41aa0cc19fb394779191f5d306",
        "owner": {
                "displayName":"admin",
         -H "Content-type: application/json" \
     "${BITBUCKET_URL}/mvc/maintenance/lock"
```

```
                "name":"admin"
        }
}
```

If successful, the Bitbucket Data Center instance will respond with a 202 and will return a response JSON similar to the one above. The `unlockToken` should be used in all subsequent requests where `$BITBUCKET_LOCK_TOKEN` is required. This token can also be used to manually unlock the instance.

Start the backup process

Next, all connections to both the database and the filesystem must be drained and latched. Your code must handle backing up of *both* the filesystem and the database.

At this point, you should make a `POST` request to `/mvc/admin/backups`. Notice that the `curl` call includes the `?external=true` parameter:

REQUEST

```
curl -s \
         -u
${BITBUCKET_BACKUP_USER}:${BITBUCKET_BACKUP_PASS}
\
         -X POST \
         -H "X-Atlassian-Maintenance-Token:
${BITBUCKET_LOCK_TOKEN}" \
         -H "Accept: application/json" \
         -H "Content-type: application/json" \
         "${BITBUCKET_URL}/mvc/admin/backups?
external=true"
```

RESPONSE

```
{
        "id":"
d2e15c3c2da282b0990e8efb30b4bffbcbf09e04",
        "progress": {
                "message":"Closing connections
to the current database",
                "percentage":5
        },
        "state":"RUNNING",
        "type":"BACKUP",
        "cancelToken":"
d2e15c3c2da282b0990e8efb30b4bffbcbf09e04"
}
```

If successful the instance will respond with 202 and a response JSON similar to the one above will be returned. The `cancelToken` can be used to manually cancel the back up process.

Wait for the instance to complete preparation.

Part of the back up process includes draining and latching the connections to the database and the filesystem. Before continuing with the back up we have to wait for the instance to report that this has been done. To get details on the current status we make a `GET` request to the `/mvc/maintenance` REST point.

REQUEST

```
curl -s \
         -u
${BITBUCKET_BACKUP_USER}:${BITBUCKET_BACKUP_PASS}
\
         -X GET \
         -H "X-Atlassian-Maintenance-Token:
${BITBUCKET_LOCK_TOKEN}" \
         -H "Accept: application/json" \
         -H "Content-type: application/json" \
         "${BITBUCKET_URL}/mvc/maintenance"
```

RESPONSE

```
 {
        "task":{
                "id":"
0bb6b2ed52a6a12322e515e88c5d515d6b6fa95e",
                "progress":{
                        "message":"Backing up
Bitbucket home",
                        "percentage":10
                },
                "state":"RUNNING",
                "type":"BACKUP"
        },
        "db-state":"DRAINED",
        "scm-state":"DRAINED"
}
```

This causes the Bitbucket Data Center instance to report its current state. We have to wait for both `db-state` and `scm-state` to have a status of `DRAINED` before continuing with the backup.

Perform the actual backup

At this point we are ready to create the actual backup of the filesystem. For example, you could use rsync again:

```
rsync -avh --delete --delete-excluded --exclude=/caches/ --exclude=/data/db.* --exclude=/export/ --
exclude=/log/ --exclude=/plugins/.*/ --exclude=/tmp --exclude=/.lock ${BITBUCKET_HOME}
${BITBUCKET_BACKUP_HOME}
```

The rsync options shown here are for example only, but indicate how you can include only the required files in the backup process and exclude others. Consult the documentation for `rsync`, or the tool of your choice, for a more detailed description.

When creating the database backup you could use your vendor-specific database backup tool, for example `pg_dump` if you use PostgreSQL:

```
pg_dump -Fd ${BITBUCKET_DB} -j 5 --no-synchronized-snapshots -f ${BITBUCKET_BACKUP_DB}
```

While performing these operations, good practice is to update the instance with progress on the backup so that it's visible in the UI. This can be done by issuing a `POST` request to `/mvc/admin/backups/progress/client` with the token and the percentage completed as parameters:

REQUEST

```
curl -s \
         -u ${BITBUCKET_BACKUP_USER}:${BITBUCKET_BACKUP_PASS} \
         -X POST \
         -H "Accept: application/json" \
         -H "Content-type: application/json" \
         "${BITBUCKET_URL}/mvc/admin/backups/progress/client?token=${BITBUCKET_LOCK_TOKEN}
&percentage=${BITBUCKET_BACKUP_PERCENTAGE}"
```

Bitbucket Data Center will respond to this request with an empty 202 if everything is OK.

When displaying progress to users, Bitbucket Data Center divides the 100 percent progress into 90 percent user DIY Backup, and 10 percent application preparation. This means, for example, if your script sends `percentage=0`, Bitbucket Data Center may display up to 10 percent progress for its own share of the backup work.

(Optional) Run the backup scripts for each Bitbucket Mesh node that's connected to your instance

If you're using Bitbucket Mesh to store your repositories, you will need to repeat the above process by setting the appropriate options and running the backup script on each Mesh node *individually*.

Inform the Bitbucket Data Center instance that the backup is complete

Once we've finished the backup process we must report to the Bitbucket Data Center instance that progress has reached 100 percent. This is done using a similar request to the progress request. We issue a `POST` request to `/mvc/admin/backups/progress/client` with the token and 100 as the percentage:

REQUEST

```
curl -s \
         -u ${BITBUCKET_BACKUP_USER}:${BITBUCKET_BACKUP_PASS} \
         -X POST \
         -H "Accept: application/json" \
         -H "Content-type: application/json" \
         "${BITBUCKET_URL}/mvc/admin/backups/progress/client?token=${BITBUCKET_LOCK_TOKEN}
&percentage=100"
```

Bitbucket Data Center will respond with an empty 202 if everything is OK. The back up process is considered completed once the percentage is 100. This will unlatch the database and the filesystem for this Bitbucket Data Center instance.

Unlock the Bitbucket Data Center instance

The final step we need to do in the back up process is to unlock the instance. This is done with a `DELETE` request to the `/mvc/maintenance/lock` REST point:

REQUEST

```
curl -s \
         -u ${BITBUCKET_BACKUP_USER}:${BITBUCKET_BACKUP_PASS} \
         -X DELETE \
         -H "Accept: application/json" \
         -H "Content-type: application/json" \
         "${BITBUCKET_URL}/mvc/maintenance/lock?token=${BITBUCKET_LOCK_TOKEN}"
```

The Bitbucket Data Center instance will respond to this request with an empty 202 if everything is OK, and will unlock access.

Bitbucket zero downtime backup

This page describes how to back up Bitbucket Data Center without downtime, and restoring the backups correctly.

On this page

About zero downtime backup

Zero downtime backup is a technique introduced in Bitbucket 4.8 which backs up a Bitbucket instance without requiring it be locked for maintenance. It requires:

1. your shared home directory to be on a file system volume capable of atomic (block level) snapshots, and
2. your database to be capable of either taking atomic snapshots or restoring a snapshot at the same point in time as the home directory snapshot was taken.

Use of these technologies allows you to take backups as often as you need (e.g., hourly), without inconveniencing your users and build agents with frequent downtimes.

Prerequisites

Block level file system snapshots

Your shared home directory must be on a file system volume capable of atomic (block level) snapshots, for example, Amazon EBS, LVM, NetApp, XFS, or ZFS. These technologies are becoming increasingly common in modern operating systems and storage solutions. If your shared home directory volume pre-dates these technologies, then you must first move your shared home directory onto one that supports block level snapshots before using zero downtime backup. You also need to script the steps to snapshot the volume in the backup process. The atlassian-bitbucket-diy-backup script does not include fully worked examples for every vendor technology. If you are unable to create such a snapshot, please consider another backup strategy.

Block level snapshots ensure your repository data will have full internal consistency when restored, even if taken without a maintenance lock under heavy load. Which block level snapshot technology you use depends on your choice of infrastructure for your shared home directory volume:

- **File server which provides block level snapshots** (for example, NetApp Snapshots): Refer to your vendor's documentation on how to script the snapshot and restore process. Atlassian does not provide examples or support for the use of these vendor tools.
- **Linux file system:** LVM, XFS, and ZFS are all capable of taking block level snapshots. Refer to the documentation with your Linux distribution on how to script the snapshot and restore process. Atlassia n does not provide examples or support for their use.
- **Amazon Web Services (AWS) Elastic Block Store (EBS) volume:** You can use Amazon EBS Snapshots to take block level snapshots. The EBS volume may be formatted with any file system type, but note that Linux typically requires the filesystem to be "frozen" with `fsfreeze` while the snapshot is taken, for its own internal consistency. The atlassian-bitbucket-diy-backup script has a worked example of using EBS Snapshots.

Whichever file system snapshot technology you ultimately choose, you will need to refer to your vendor's documentation to script the snapshot and restore process. The only fully worked examples currently included in the atlassian-bitbucket-diy-backup script are for Amazon EBS and ZFS.

Database snapshot technology

Your database must be capable of restoring a snapshot close to the same point in time as the home directory snapshot. The easiest way to do this is by taking database snapshots close to the home directory backup time. Alternatively, some databases support a vendor-specific "point-in-time recovery" feature at restore time. All database vendors supported by Bitbucket provide tools for taking fast snapshots and point-in-time recovery.

Which technology you choose is a tradeoff between how much work you need to do at backup and restore time.

- **Vendor dump and restore utilities**: This option needs you to dump your database to a file at backup time, in parallel with the home directory snapshot. This can generally achieve a database snapshot that is within a few seconds of your home directory snapshot. The atlassian-bitbucket-diy-backup script includes a worked example of using PostgreSQL's `pg_dump` and `pg_restore` with zero downtime backup.
- **Point-in-time recovery:** Alternatively if you enable the point-in-time recovery feature of your database vendor, then you don't have to dump the database explicitly at backup time. Instead you can recover a snapshot of the database state at the same time as the home directory snapshot, at restore time. This saves you from having to do database dumps during backup, at the cost of a slightly longer restore time. The atlassian-bitbucket-diy-backup script does *not* include a worked example of using point-in-time recovery, you need to refer to your vendor's documentation on how to script this process.
- **Amazon Web Services (AWS) Relational Database Service (RDS) instance:** You can use the RDS Backup and Restore feature to take snapshots at backup time. The atlassian-bitbucket-diy-backup script includes a worked example of using RDS snapshots with zero downtime backup.
- **Block level snapshot of the database's data volume:** If your database's data directory is located on a file system volume that is capable of block level snapshots, then most databases support backup and restore at the file system level. The atlassian-bitbucket-diy-backup script includes a worked example of using block level snapshots where the database is on the same volume as your shared home directory.

Whichever database backup technology you choose, you will need to refer to your vendor's documentation to script the snapshot and restore process.

Bitbucket Server and Data Center 4.8 or later

You must be running Bitbucket 4.8 or higher to use zero downtime backup. See the Bitbucket Data Center upgrade guide.

Configure the example DIY Backup script for zero downtime backup

With the above prerequisites, you can create backups with any method that performs home directory and database snapshots simultaneously. Atlassian provides an example atlassian-bitbucket-diy-backup script which can automate the process, and can be used as a starting point for you to configure and customize your own backup procedures.

Step 1: Get the script

Clone or pull the latest version of the sample atlassian-bitbucket-diy-backup script, for example:

```
git clone https://bitbucket.org/atlassianlabs/atlassian-bitbucket-diy-backup.git
cd atlassian-bitbucket-diy-backup
```

Step 2: Configure the script

Create the file `bitbucket.diy-backup.vars.sh` by copying the appropriate `bitbucket.diy-backup.vars.sh.example`, and edit it to match your environment. For example, to use Amazon EBS snapshots of the volume containing your shared home directory and Amazon RDS snapshots of your database, you might configure it as follows:

```
BACKUP_DATABASE_TYPE=amazon-rds
BACKUP_HOME_TYPE=amazon-ebs
BACKUP_ZERO_DOWNTIME=true
BITBUCKET_URL=https://your-bitbucket-url
```

If your shared home directory is not on Amazon EBS, then you must define a new BACKUP_HOME_TYPE for your chosen file system technology. Give it a name (e.g., **myhome**) that will identify the snapshot script to run in the next step.

```
BACKUP_HOME_TYPE=myhome
```

BACKUP_HOME_TYPE=**rsync** is ***not*** a valid option to use with zero downtime backup.

Refer to Bitbucket DIY Backup and Using Bitbucket DIY Backup in AWS for more information on the configurable options in the DIY Backup example script.

Step 3: (If necessary) Script the snapshot process

If you have chosen BACKUP_HOME_TYPE and BACKUP_DATABASE_TYPE values that both already have worked examples included in the atlassian-bitbucket-diy-backup repository (e.g., **ebs-home** and **rds**), then you can just configure the appropriate variables in bitbucket.diy-backup.vars.sh to match your environment, and skip this step.

If your shared home directory is not one of the worked examples provided in atlassian-bitbucket-diy-backup, then you must script the process of taking and restoring snapshots of your home directory volume.

Create a script called bitbucket.diy-backup.**myhome**.sh (where **myhome** is the value of BACKUP_HOME_TYPE that you set in the previous step), defining the following BASH functions:

```
#!/bin/bash

function bitbucket_prepare_home {
# you can optionally do any backup-time validation you need to do here
}

function bitbucket_backup_home {
# this is where you freeze, snapshot, and unfreeze your home directory volume
}

function bitbucket_restore_home {
# this is where you restore a snapshot of your home directory volume
}
```

Similarly if you wish to use the point-in-time recovery feature of your database with zero downtime backup (or some other functionality that does not have a fully worked example provided in atlassian-bitbucket-diy-backup), then you must script the process.

Create or modify a script bitbucket.diy-backup.**mydb**.sh (where **mydb** is the value of BACKUP_DATABASE_TYPE that you set in the previous step), defining the following BASH functions:

```
#!/bin/bash

function bitbucket_prepare_db {
# you can optionally do any backup-time validation you need to do here
}

function bitbucket_backup_db {
# this is where you can snapshot your database, if necessary
}

function bitbucket_prepare_db_restore {
# this is where you can do any restore-time validation, if necessary
}

function bitbucket_restore_db {
# this is where you restore a snapshot of your database
}
```

Back up your instance

Once your `bitbucket.diy-backup.vars.sh` is correctly configured, SSH to the appropriate node in a Data Center instance (typically, the file server) and run the backup script from the `atlassian-bitbucket-diy-backup` directory.

```
./bitbucket.diy-backup.sh
```

This script can also be run on a regular schedule (e.g., hourly), from `cron`.

Restore from a backup

Step 1: Stop Bitbucket

The restore process only works while Bitbucket is stopped. Stop the Bitbucket services (on all nodes if your instance is a clustered Data Center instance).

```
sudo service atlbitbucket stop
sudo service atlbitbucket_search stop
```

See Start and stop Bitbucket for more information.

Step 2: Run the restore script

To restore, SSH to the appropriate node in a Data Center instance (typically, the file server) and run the restore script from the `atlassian-bitbucket-diy-backup` directory.

```
./bitbucket.diy-restore.sh
```

Step 3: Start Bitbucket

Data Center customers at this point may enable integrity checking to scan for potential inconsistencies between the database and home directory, and resolve them if necessary so that your pull request and repository state are completely consistent with each other. See Running integrity checks in Bitbucket Data Center for further information.

Start the Bitbucket services (on all nodes if your instance is a clustered Data Center instance).

```
sudo service atlbitbucket start
sudo service atlbitbucket_search start
```

See Start and stop Bitbucket for more information.

Running integrity checks in Bitbucket Data Center

This page describes how to run integrity checks in a Bitbucket Data Center instance, for example, after restoring from backups.

On this page

About integrity checks

Bitbucket Data Center allows you to perform an integrity check that scans for potential inconsistencies between the database and home directory, and resolves them if necessary so that your pull request and repository state are completely consistent with each other. You can perform an integrity check in any situation where you suspect your database and home directory may contain inconsistencies, for example, after restoring from a backup.

Running integrity checks

To run integrity checks, add this line to your `${BITBUCKET_HOME}/shared/bitbucket.properties`:

```
disaster.recovery=true
```

Then start Bitbucket. You can start Bitbucket on all cluster nodes if you wish.

After starting, Bitbucket will run integrity checks on one cluster node only. Integrity checks may take several minutes to complete, but run in the background. While integrity checks are running users can still log in, interact with the system, and perform hosting operations on repositories.

Disabling integrity checks

After you have restored Bitbucket, integrity checks have run, and you have resumed normal operation, turn off the `disaster.recovery` property in your `bitbucket.properties` file so integrity checks won't run unnecessarily the next time your instance is restarted.

```
disaster.recovery=false
```

What integrity checks look for

Integrity checks (which run when `disaster.recovery` is set to `true)` scan your instance for inconsistencies between the database and home directory that can occur when snapshots of your database and file system were taken at slightly different times.

Why integrity checks are needed

When Bitbucket is running it is constantly modifying its database and home directory, but under almost all circumstances the two data sources will be consistent with each other (even if the UI is slow to catch up).

However, when database and home directory snapshots are taken independently, and updates that affect the database and home directory happen between the two snapshots, integrity checks may find inconsistencies. An example of when this could happen is if a pull request is merged between snapshots. When snapshots of your database and home directory are taken close enough together the chance of inconsistencies arising are small.

What integrity checks cannot detect

Inconsistencies in Git: It's important to note that integrity checks *only detect inconsistencies between your database and home directory*, not internal inconsistencies within the repositories themselves.

If you suspect repositories in your Bitbucket instance have become corrupted in some other way, you may need to manually run `git fsck` to diagnose and restore individual repositories. See Recommended action plan if a repository becomes corrupted on a Bitbucket Server for more information, or contact Atlassian Support.

Information not in your database/home directory when the backup was taken: The Integrity Checker can detect mismatches between the state of a repository or pull request in the database and file system and make adjustments to restore integrity, but it cannot reconstruct information not in your database or home directory when the backup was taken.

This means if your backups are taken hourly, when restoring from your latest backup your users may lose up to an hour worth of work. In addition, if your latest database and file system snapshots were taken a minute apart, changes to pull requests made in this time may be lost and cannot be reconstructed by the Integrity Checker.

The best way to ensure inconsistencies don't occur in your backups is to ensure your file system and database snapshots are taken as close together in time as possible, or use the "point-in-time recovery" feature of your database vendor to restore the database to when the file system snapshot was taken.

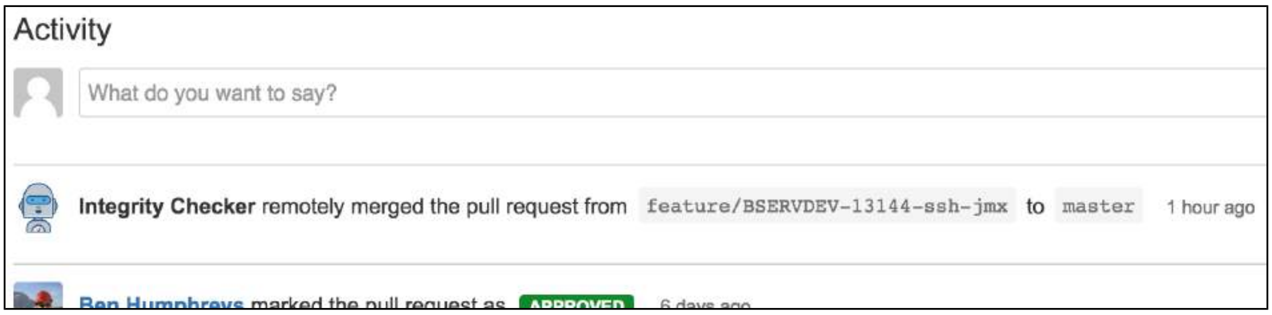
Feedback from the integrity check process

A warning ⚠ or information ℹ banner will be displayed to system administrator to indicate the state/outcome of the integrity check process. This banner can be in one of four states.

- Integrity checks are running, no inconsistencies have been found ℹ
- Integrity checks are running, at least one inconsistency has been found ⚠
- Integrity checks complete, no inconsistencies found ℹ
- Integrity checks complete, inconsistencies found ⚠

When an integrity check finds an inconsistency

If an integrity check finds an inconsistency between the database and home directory, it will automatically perform adjustments to restore integrity between the two. For example, if during your backup process someone merges a pull request *after* a database snapshot, but *before* the file system snapshot, and that backup is restored. In this case the integrity checks will find the pull request is in an inconsistent state and adjust the pull request in the database to match the actual state on disk. When this happens the adjustment is shown in the Activity tab of the pull request, and is attributed to the Integrity Checker service user. Any activity to your pull requests performed by the Integrity Checker also generates the usual notifications.


Activity

What do you want to say?

Integrity Checker remotely merged the pull request from `feature/BSERVDEV-13144-ssh-jmx` to `master` 1 hour ago

Ben Humphreys marked the pull request as APPROVED 6 days ago

An example of an adjustment made by the Integrity Checker on the Activity tab

The Integrity Checker will write a message to the application log whenever it encounters an inconsistency. Filtering the atlassian-bitbucket.log for *DefaultIntegrityCheckReporter* will return all relevant log entries.

You should read the Integrity Checker log entries to understand why the inconsistency occurred. Inconsistency error messages will read:

```
The repository PROJ/repo[1] exists but the directory /repositories/1 is missing. To restore integrity,
an empty repository directory was created.
```

or

```
PROJ/repo[1]: Pull request #1 is marked merged but the merge commit could not be found on the target
ref. Trying to restore integrity by reopening
```

or

```
PROJ/repo[1]: Pull request #1 could not be reopened, declining instead. (Reason: REASON)
```

Where *REASON* can be one of

- *an open pull request with the same to and from refs already exists*
- *unexpected missing commit*
- *fromRef could not be resolved*

If you find many inconsistencies from a larger range of time, this may indicate that your database and home directory snapshots were taken further apart in time than you intended. To ensure these inconsistencies don't arise, **test your disaster recovery plan regularly**, and ensure that your backup and restore processes capture database and home directory snapshots as close together in time as possible.

Pull requests updated by rescoping.

The standard Bitbucket server rescoping process will normalize a large number of pull request inconsistencies in these cases the integrity check reporter will *not* log a message to the application log but rather send a notification to all pull request collaborators.

Example Scenarios

Here are a few example scenarios that the 'Integrity Checker' can detect and resolve:

Integrity Check	Filesystem state	Database state	Result
Recently merged pull requests	Pull request is merged	Pull request is marked as 'open'	'Integrity Checker' will mark pull request as remotely merged. *Note*: only the merge activity will be attributed to the 'Integrity Checker' user, the merge commit will remain authored by the original merger.
	Pull request is not merged	Pull request is marked as 'merged'	'Integrity Checker' will re-open the pull request.
Repository creation	Repository #2 does not exist	Repository #2 exists	An empty repository will be created on the filesystem.

Disable HTTP(S) access to Git repositories

Administrators can disable HTTP(S) access to Git repositories in Bitbucket Data Center. This removes the ability to push to or clone Git repositories over HTTP(S).

Related pages:

- Enable SSH access to Git repositories

To disable HTTP(S) access:

1. Go to ⚙ > **Server settings**.
2. Uncheck **HTTP(S) enabled**.
3. Select **Save**.

Mirrors

As your team grows, more tests and builds are required to ensure high quality and security of code. Heavy CI/CD load on Bitbucket can degrade the user experience. As a result, we recommend that you redirect CI/CD load to a mirror farm so your primary Bitbucket Data Center can focus on serving real users.

You can provision a mirror or a mirror farm (cluster of mirrors) to serve repositories for CI/CD and release the system resources of your primary Bitbucket Data Center instance.

On this page:

Related pages:

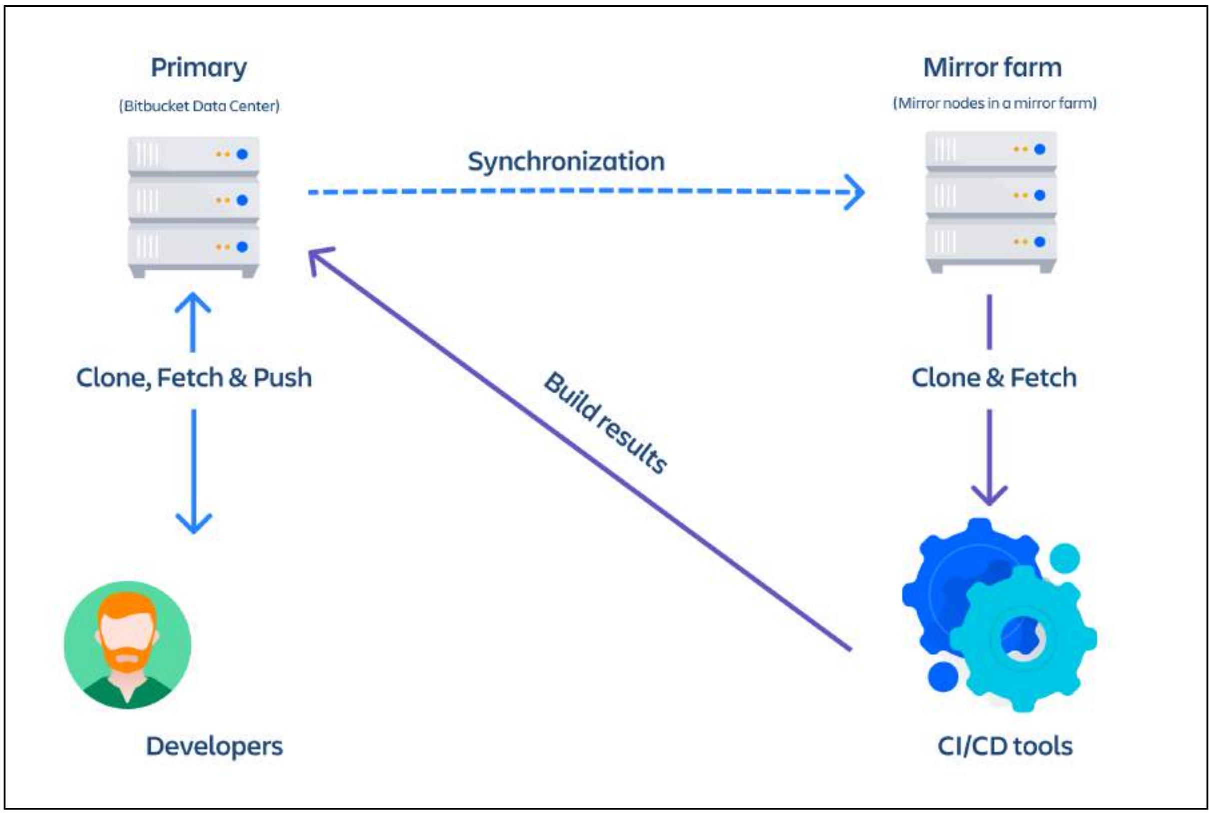
- Set up a mirror
- Set up and configure a mirror farm

Also:

Check out the latest on-demand webinar, How to support your geo-distributed teams with Atlassian Data Center.

In this webinar, learn how Atlassian Data Center provides performance at scale for your distributed teams and get access to:

- Best practices on instance setup and configuration for distributed team work
- A deep dive on some of the latest geo-performance features like CDN and mirror farms
- Tips for scaling teamwork globally



Mirrors to serve high CI/CD loads

Mirrors can also greatly improve Git clone speeds for distributed teams working with large repositories. Large repositories that take hours to clone from a Bitbucket instance over the Internet from the other side of the world can take minutes when cloned from a local mirror on a fast network.

Many software development teams using Git have large repositories. This is a result of either storing lots of historical information, using monolithic repositories, or storing large binary files (sometimes all three). Companies with distributed software development teams often have little control over the network performance available to them between sites. In combination, this leads to a loss of development time when developers have to wait long periods to clone a large repository from across the world.

Mirroring prevents this lost development time by allowing you to set up live mirrors that host copies of repositories in remote locations. These mirrors automatically keep any repository hosted on them in sync with the primary Bitbucket Data Center instance. Users in those remote locations may clone and fetch repositories from the mirror and get identical content, only faster. You can choose to mirror a selection of projects, or mirror *all* repositories in *all* projects from the primary instance.

If you're ready to start mirroring your repositories, you can jump straight to the Set up a mirror or Set up and configure a mirror farm page and follow the steps there, or read on to learn more about the benefits of using a mirror. If you have mirrors already configured, you might be searching for instructions on how to Clone a mirror repository.

How it works

Mirrors are configured to mirror a primary Bitbucket Data Center instance, where the primary copy of all your repositories is hosted. When a user clones or fetches from a mirror, the mirror automatically delegates the authentication and authorization of their credentials back to the primary server. No extra user management is required on standalone mirrors or mirror nodes in a farm. All the users, groups, and permissions of the primary Bitbucket instance (whether provided by the built-in user directory and permission system or by your own user directories and/or custom extensions) are always replicated *exactly* on all mirrors. When a user pushes to a mirror, the mirror chooses two routes based on the push protocol. If the user pushes via the SSH protocol, the request is proxied and a new SSH connection is opened directly from the mirror to the upstream server. If the user pushes via the HTTP(S) protocol, the request is redirected to the upstream server and the user must have access to the upstream.

Self-healing

Self-healing is one of the main design principles for mirroring. Mirrors have the ability to detect and recover from a number of error scenarios, while all operations retry with exponential backoff. Mirroring also includes an anti-entropy system (the farm vet) which verifies the consistency of a mirror against the primary every 3 minutes. For more information and help with monitoring the health of your mirror farm, see Monitoring your mirror farm.

Ready to get started setting up a mirror?

Be sure to read Set up a mirror or Set up and configure a mirror farm for detailed instructions on installing a mirror or mirror farm.

Don't have Bitbucket Data Center yet? Purchase a Data Center license, or get an evaluation license to try it out.

Set up a mirror

Smart Mirroring can drastically improve Git clone speeds for distributed teams working with large repositories. This page describes how to install a mirror and troubleshoot any issues you might encounter.

For an overview of the benefits of using mirrors and how mirror farms can help your organization, see Mirrors. These instructions assume you already have a fully licensed Bitbucket Data Center instance up and running.

On this page

Before you start

You must also meet the following requirements:

- **Your primary Bitbucket instance *must* be a fully licensed Bitbucket Data Center instance** - You do not have to run your Bitbucket Data Center instance as a multi-node cluster to use smart mirroring, but you must have an up-to-date Data Center license.

- **The primary instance and all mirror(s) *must* have HTTPS with a valid (i.e., signed by a Certificate Authority anchored to the root and not expired) SSL certificate** - This is a strict requirement of smart mirroring on both the primary instance and all mirror(s), and cannot be bypassed. The mirror setup wizard will not proceed if either the mirror or the primary instance does not have a valid SSL certificate.
- **The primary Bitbucket instance *must* have SSH enabled** - Mirrors keep their repositories synchronized with the primary instance over SSH and cannot use HTTP or HTTPS for this. See Enable SSH access to Git repositories for instructions on enabling SSH access on your primary instance.
- **Each mirror is considered a unique Bitbucket instance** - Home directories of mirrors should not be shared with the upstream or with other mirrors.

- **The platform the mirrors are running on *must* meet the same minimum requirements for Bitbucket Data Center** - Check the Supported platforms for detailed requirements, including those for Java and Git, that apply to each mirror.
- **By design, each mirror (standalone or in a mirror farm) must run with an internal H2 database** - Using an external database is highly discouraged for mirrors and will compromise performance significantly.
- **The platform the mirrors are running on *must* have an OpenSSH client installed** - The mirror will need an OpenSSH client installed to fetch changes from the primary Bitbucket Server.

  > ⓘ If you are using Bitbucket version 7.9 or higher, then you must use OpenSSH version 7.2 or higher to avoid sync failures for repositories.

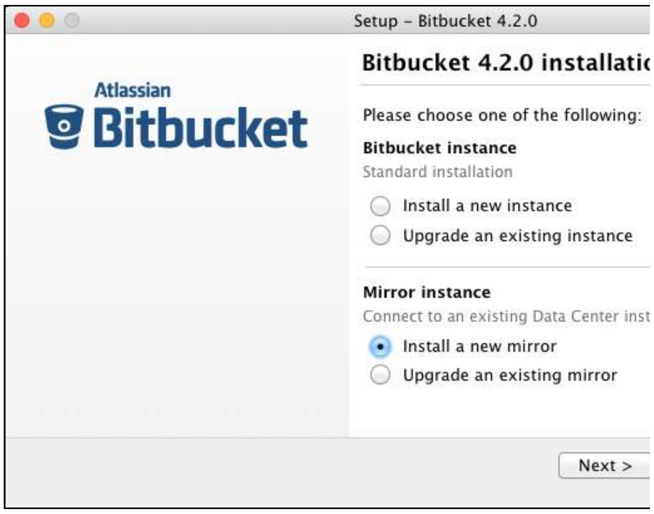
- **The platform the mirrors are running on *should not* be under-provisioned** - Just as with your primary Bitbucket Data Center instance, your mirrors need to be provisioned with enough CPU, memory, and I/O resources to handle their peak workload. See Scaling Bitbucket Data Center for more information.

- **Running your mirror behind a reverse proxy server and terminating SSL at the proxy is highly recommended -** See Proxy and secure Bitbucket.
- **The ports of communication between the primary instance and the mirror should be opened** - The mirror host should be able to connect the primary on HTTPS (443) and SSH (7999) ports. Also, the primary needs to reach the mirror on the HTTPS (443) port.

1. Install Bitbucket on the mirror

The easy way to install a mirror is to download and run the Bitbucket installer and select the **Install a new mirror** option.

This is the same installer that you use for standard Bitbucket Server and Data Center instances. The mirroring functionality is included in the same distribution.



Bitbucket 4.2.0 installatic

Please choose one of the following:

Bitbucket instance
Standard installation
Install a new instance
Upgrade an existing instance

Mirror instance
Connect to an existing Data Center inst
[✓ Install a new mirror]
Upgrade an existing mirror

1. Go to Download Bitbucket Data Center and download the latest version of the Bitbucket installer to the server where the mirror will run.
2. Run the installer, and be sure to select **Install a new mirror**.
3. Complete the rest of the installation wizard.

Installing from an archive file

Alternatively, If you prefer not to use the Bitbucket installer, you can:

1. Install Bitbucket Data Center from an archive file but **do not start it**.
2. Add the following line to your `${BITBUCKET_HOME}/shared/bitbucket.properties`:

```
application.mode=mirror
```

2. Set up HTTPS on the mirror

You *must* configure your mirror to use HTTPS with a valid SSL certificate, and make secure access mandatory.

SSL certificates are issued by a trusted third party Certificate Authority (CA), such as VeriSign, DigiCert or Thawte, which provide such services on a commercial basis. Atlassian does not provide such services or support their use.

Once you have an SSL certificate, you can configure your mirror to use it by following one of the options in Securing a reverse proxy using HTTPS.

You can choose whether to install your SSL certificate in a reverse proxy server or directly into Tomcat, either approach will work. But for performance, running your mirror behind a reverse proxy server such as nginx or HAproxy and terminating SSL at the proxy is highly recommended. See Proxy and secure Bitbucket for more information.

Both your mirror *and* your primary (upstream) instance must be configured for HTTPS. The mirror setup wizard will not proceed if either the mirror or the primary instance does not have a valid SSL certificate.

3. Start the mirror

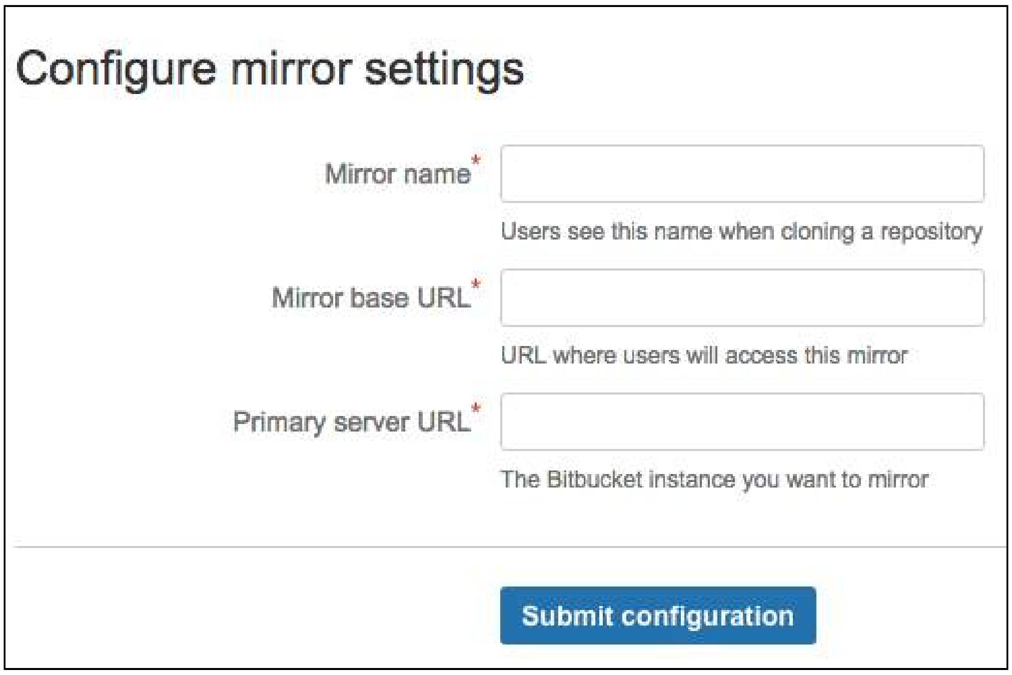
Start your mirror.

```
sudo service atlbitbucket start
```

See Start and stop Bitbucket for more information on starting and stopping mirrors with the `service` command.

4. Set up the mirror

Once your mirror has started, you can go to the setup wizard by navigating to https://*<mirror-full-name>* in your browser, where *<mirror-full-name>* is your mirror's fully qualified name in the DNS. This name will be pre-filled as the **Mirror base URL** and cannot be changed after you click **Submit configuration**, so make sure your primary Bitbucket instance is able to reach the mirror with this name.


Configure mirror settings

Mirror name*
Users see this name when cloning a repository

Mirror base URL*
URL where users will access this mirror

Primary server URL*
The Bitbucket instance you want to mirror

Submit configuration

Descriptions of the fields:

Mirror name	The human-readable name of the instance. Users will see this name when selecting a mirror to clone from. Choose a name that your users will recognize and understand which name is the closest and fastest one for them.
Mirror base URL	The URL where the mirror can be accessed.
Primary server URL	The URL of the primary Bitbucket Data Center instance.

After configuring your details, click **Submit configuration**.

The setup wizard fields cannot be changed after you click **Submit configuration**, so fill them in carefully. If you do make a mistake and need to change a mirror's setup after it has been submitted, you need to stop the mirror, delete its home directory completely, and go back to step 2, Set up SSL on the mirror.

Advanced: Automated setup

As an alternative to the setup wizard, you can automate the setup process without needing to navigate to the mirror in a browser. You can supply the `<Mirror name>`, `<Mirror base URL>`, and `<Primary server URL>` to your new mirror by adding the following properties to your `${BITBUCKET_HOME}/shared/bitbucket.properties` file. These properties can only be applied on the initial start of a new mirror, not after the mirror has already been set up.

```
setup.displayName=<Mirror name>
setup.baseUrl=<Mirror base URL>
plugin.mirroring.upstream.url=<Primary server URL>
plugin.mirroring.upstream.type=server
```

This can be useful if you deploy new mirrors using an automated process such as Puppet. See Automated setup for Bitbucket for more information.

Once you have successfully set up your mirror, it will guide you to log into the primary instance as an administrator to approve it.

5. Approve a mirror request

Once a mirror has been installed and configured, a request is sent to the primary Bitbucket Data Center instance.

An approved mirror will have access to all projects and repositories in the primary Bitbucket Data Center instance. Smart Mirroring has been designed to require secure communication throughout and restrict all functionality to the appropriate privilege level (e.g., system administrator) to ensure the security of all your sensitive information. It is still *your* responsibility to set up mirrors with the same stringent security practices as your primary Bitbucket Data Center instance. See the FAQ How secure is Smart Mirroring? for more information.

To approve a mirror request

1. In your primary Bitbucket Data Center instance, go to **Admin** > **Mirrors**. The authorization request will appear.
2. Click **Authorize** to approve the mirror request and start syncing the projects and repositories of the primary Bitbucket Data Center instance.

6. Decide which projects to mirror

Once a mirror instance is approved you need to decide which projects to mirror. Go to **Admin > Mirrors** and type in the name of a project in the search box. Do this for each project you want to mirror. You can also choose to mirror all projects.

If you choose to mirror all projects, you will not be able to select individual projects. This can't be undone. If you decide you no longer want to mirror all projects, you'll need to completely remove and then reinstall the mirror.

Troubleshooting

This section contains guidance on troubleshooting problems with installing a mirror. For further reference, read the Bitbucket Data Center FAQ, which covers the most frequently asked questions about Bitbucket Data Center.

No valid HTTPS configuration

- Your primary Bitbucket Data Center instance and the mirror server must be configured for HTTPS access in order to use a mirror instance. See Proxy and secure Bitbucket for more information.
- The value for the `Primary server URL` field must include the "https://" prefix.

Synchronizing projects stays stuck on "Retrieving project information..."

- Ensure SSH is enabled and usable on the primary instance. See Enable SSH access to Git repositories.
- Ensure your SSH base URL is set correctly in Server settings on the primary instance. See Enable SSH access to Git repositories#SSHbaseURL.
- If appropriate, see Setting up SSH port forwarding.

Incorrectly set Mirror base URL

- The property `Mirror base URL` can only be set once. If configured incorrectly you will need to delete your mirror and set it up again.

"No response was received from the URL you entered" when adding an application link to Bitbucket

Currently, when Bamboo connects to a Bitbucket Data Center instance, it uses the Base URL to perform any Git operations. To make the URL available also for mirrored instances, you must use the Generic Git for mirrored repositories.

Set up and configure a mirror farm

Mirror farms allows you to set up a cluster of mirrors to cover the load in a local region. This page walks you through how to install and configure a mirror farm. Included are requirements you should meet before starting as well as the information you'll need for your load balancer configuration.

For an overview of the benefits of using mirrors and how mirror farms can help your organization, see Mirrors. These instructions assume you already have a fully licensed Bitbucket Data Center instance up and running.

On this page

Before you start

We recommend you use real-time synchronization on all mirrors to keep clocks in sync. Also, while mirror farms can be in different locations, they must be able to talk to their peers quickly.

You must also meet the following requirements:

- **Your primary Bitbucket instance *must* be a fully licensed Bitbucket Data Center instance** - You do not have to run your Bitbucket Data Center instance as a multi-node cluster to use smart mirroring, but you must have an up-to-date Data Center license.

- **Your mirror farm has to be accessible over HTTPS with a valid certificate.** This configuration uses the same properties as the primary Bitbucket instance. See Proxy and secure Bitbucket.
- **You should have one dedicated load balancer per mirror farm.** Running your mirrors behind a load balancer is necessary and terminating SSL at the proxy is highly recommended. See Proxy and secure Bitbucket.
- **You need to have set up a host name for your mirror farm (this relates to the load balancer and the SSL certificate)**. This is so users can connect to the mirror farm. Configurations for your mirror farm and load balancer must be in sync, having the same hostname.
- **Each node of a mirror farm is considered unique** - While there is some internode communication in a mirror farm, nodes of a single mirror farm should not use shared storage for their home directory.
  - It is recommended that each node has its home directory on a local disk as opposed to having it on a shared NFS store.
  - Home directories of mirrors should not be shared with the upstream or with other mirror farms.
- **The primary Bitbucket Data Center instance *must* have SSH enabled.**
- **You must have a minimum version of Git 2.11.1 installed.** See Supported platforms for more details.

- **The platform the mirrors are running on *must* meet the same minimum requirements for Bitbucket Data Center** - Check the Supported platforms for detailed requirements, including those for Java and Git, that apply to each mirror.
- **By design, each mirror (standalone or in a mirror farm) must run with an internal H2 database** - Using an external database is highly discouraged for mirrors and will compromise performance significantly.
- **The platform the mirrors are running on *must* have an OpenSSH client installed** - The mirror will need an OpenSSH client installed to fetch changes from the primary Bitbucket Server.

  If you are using Bitbucket version 7.9 or higher, then you must use OpenSSH version 7.2 or higher to avoid sync failures for repositories.

- **The platform the mirrors are running on *should not* be under-provisioned** - Just as with your primary Bitbucket Data Center instance, your mirrors need to be provisioned with enough CPU, memory, and I/O resources to handle their peak workload. See Scaling Bitbucket Data Center for more information.

- **Minimum version of Bitbucket -** The primary instance and mirrors do not need to be running identical Bitbucket versions, but a mirror running Bitbucket 6.7 or later, can only point to a primary running Bitbucket 6.7 or later. An existing mirror running Bitbucket 6.6 or earlier can point to a primary running any supported Bitbucket version. These details are shown in the table below:

Mirror	Primary instance
Bitbucket 6.7 or above	Bitbucket 6.7 or above (does not have to match the mirror's version)
Bitbucket 6.6 or below	Any supported version of Bitbucket that supports smart mirrors.

1. Set up the load balancer for your mirror farm

Your load balancer must:

- run on a dedicated machine
- have a high-speed LAN connection to the Bitbucket cluster nodes (that is, high bandwidth and low latency)
- support ***both*** HTTPS (for web traffic) ***and*** TCP (for SSH traffic)
- use HTTPS with a valid SSL certificate (signed by a Certificate Authority anchored to the root and not expired)
- have the mirrors running behind it all belong to the same mirror farm

> You can use either a load balancer that supports session affinity ("sticky sessions") using the `BITBUCKETSESSIONID` cookie *or* you can set the `hazelcast.http.sessions=replicated` and sticky sessions are not required.

We also recommend that you terminate SSL (HTTPS) at your load balancer and use a HTTP connection from the load balancer to Bitbucket for better performance.

> For more details on installing and configuring your load balancer, head to the Install Bitbucket Data Center page. If you don't have a preference for your load balancer, we also provide instructions here for `haproxy`, a popular open source software load balancer.

2. Install Bitbucket on the mirror node

The easy way to install a mirror is to download and run the Bitbucket installer and select the **Install a new mirror** option.

> This is the same installer that you use for standard Bitbucket Server and Data Center instances. The mirroring functionality is included in the same distribution.

1. Go to www.atlassian.com/software/bitbucket/download and download the latest version of the Bitbucket installer.
2. Run the installer, and be sure to select **Install a new mirror**.
3. Do not start Bitbucket.
4. Add the following properties to your `${BITBUCKET_HOME}/shared/bitbucket.properties file:`

```
application.mode=mirror
setup.displayName=<Mirror name>
setup.baseUrl=<Mirror base URL>
plugin.mirroring.upstream.url=<Primary server URL>
```

5. Configure Hazelcast so that your mirror nodes talk to one another. For details, follow the instructions in the step, 4. *Start the first cluster node* in the Install Bitbucket Data Center page.

6. To add additional mirror nodes, repeat the above steps for installing a new mirror. There is no need to authorize the additional mirrors on your primary (upstream) instance if the properties match.

3. Start the mirror

Start your mirror:

```
sudo service atlbitbucket start
```

See Start and stop Bitbucket for more information on starting and stopping mirrors with the `service` command.

4. Approve the mirror farm request

Once a mirror farm has been installed and configured, a request is sent to the primary Bitbucket Data Center instance. From this page, it's recommended that you verify the mirror farm ID against the one displayed at the mirror's base URL.

To approve a mirror farm request:

1. In your primary Bitbucket Data Center instance, go to **Admin** > **Mirrors**.
2. Click **Authorize** to approve the mirror request and start syncing the projects and repositories of the primary Bitbucket Data Center Instance.

If the authorization request is declined, you'll return to the Mirrors page and there will be no pending mirror.

If the properties of additional mirrors don't match, it could stop your farm from starting. The new mirror could also start its own farm if it can't find other mirrors.

An approved mirror farm will have access to all projects and repositories in the primary Bitbucket Data Center instance. Smart Mirroring has been designed to require secure communication throughout, and to restrict all functionality to the appropriate privilege level (such as system administrator) to ensure the security of all your sensitive information. It is still *your* responsibility to set up mirrors with the same stringent security practices as your primary Bitbucket Data Center instance. See the FAQ How secure is Smart Mirroring? for more information.

5. Decide which projects to mirror

Once a mirror farm is approved, you need to decide which projects to mirror. In the **Admin** > **Mirrors** page, type in the name of a project in the search box. Do this for each project you want to add. You can also choose to mirror all projects.

If you choose to mirror all projects, you will not be able to select individual projects. This can't be undone. If you decide you no longer want to mirror all projects, you'll need to completely remove and then reinstall the mirror.

For further reference and troubleshooting, read the Bitbucket Data Center FAQ, which covers the most frequently asked questions about Bitbucket Data Center.

Monitoring your mirror farm

There are a number of helpful tools and techniques you can use to monitor the health of your mirror farm.

- JMX metrics
- Endpoints
- Webhook
- Load balancer configurations

Performance monitoring using JMX metrics

Java Management eXtensions (JMX) is a technology used for monitoring and managing Java applications. JMX can be used to determine the overall health of each mirror node and the mirror farm. The following statistics are most important to monitor:

- Hosting tickets on mirror nodes
- Mirror hosting tickets on the primary
- Incremental sync time on mirror nodes
- Snapshot sync time on mirror nodes
- As always its important to monitor your nodes for disk space, CPU and memory.

For more information and a complete list of JMX metrics, see Enabling JMX counters for performance monitoring.

Synchronization and consistency

A **repo-hash** endpoint is provided on both the mirror farm and the primary server. It's used to check the consistency of a mirror farm and nodes with respect to the primary. This is the same endpoint that Mirror farm vet uses to repair any inconsistencies that come up, such as the result of a missing a webhook. There are some important considerations to keep in mind when using this endpoint:

- The endpoint, `rest/mirroring/latest/repo-hashes`, is available on both the primary and the mirror nodes. It returns a stream of JSON containing a `content` and `metadata` hash for each repository. The `content` hash is a digest of the Git repository itself, while the `metadata` hash is a digest of the metadata that Bitbucket holds concerning the repository, such as the repository name.
- Content hashes or just metadata hashes are individually requested by calling `rest/mirroring/latest/repo-hashes/content` or `rest/mirroring/latest/repo-hashes/metadata`.

- This is what the payload looks like:

```
{
  "projects": [
    {
      "id": 1,
      "public": false,
      "repositories": [
        {
          "id": 1,
          "hashes": {
            "content": "082a2ffa1520447bb6c0072f9f9d850c76f111c0ff9a08cca8838b12b0ccc31a",
            "metadata": "b8fae6cb4704174f8dafae601355279950f921ba55b7620f4bdaa1280e735d14"
          }
        },
        {
          "id": 2,
          "hashes": {
            "content": "0000000000000000000000000000000000000000",
            "metadata": "e80aeaf459a69e7000b9e785eb39640a5d929f7ec4f09512a9ab6fabf4a0c80a"
          }
        }
      ]
    }
  ]
}
```

- The process to generate content hashes while reasonably fast needs to run against every repository on the instance, for larger instances this could take quite some time so we make an optimisation. When a upstream is first upgraded to a mirror farm capable version a “empty” content hash is generated for each repository this appears as `0000000000000000000000000000000000000000` as can be seen in the `content` attribute of the second repository above. When the farm vet encounters a repository with a content hash of `0000000000000000000000000000000000000000` it considers that repository up to date.
- A mirror will only return entries for the project or repository it’s mirroring. While the content returned from a mirror and the primary will be the same, the order of entries could be different. One way to sort the order consistently for diffing is to use the JQ query `jq '.projects | sort | .[].repositories |= sort_by(.id)'`

Webhook

The mirror synchronized webhook can be used to trigger builds as soon as the mirror has finished synchronizing. It’s also useful for monitoring the repository in your mirror farm. Details of this repository event can be found in the Event payload page.

Monitoring the status of your mirrors

You can configure your load balancer to check the node’s status using the `/status` endpoint. A response code of `200` is returned if the mirror node is in a `SYNCHRONIZED` state. If there are no nodes in the `SYNCHRONIZED` state, a `200` response code will be returned for any mirror that is in one of the following states:

- `BOOTSTRAPPED`
- `BOOTSTRAPPING`
- `METADATA_SYNCHRONIZED`

For customers who want a “strict” status endpoint we provide a plugin.mirroring.strict.hosting.status configuration property that when set to true, the /status endpoint returns a 200 response code only if the mirror is in the SYNCHRONIZED state. The setup for this configuration is outside the scope of the document. It is important to note that at least one mirror node should be accessible from the upstream server.

The table below displays each state and it’s description:

State	Description
`STARTING`	A Bitbucket application is starting.
`STOPPING`	A Bitbucket application is stopping.
`BOOTSTRAPPING`	The mirror component is started.
`BOOTSTRAPPED`	The mirror has joined the cluster. If this is the first time the mirror farm has been connected to a primary, this is the state the application will wait in until it has been authorized.
`METADATA_SYNCHRONIZED`	Project or repository metadata has been synchronized from the primary and Git repositories have started synchronization.
`SYNCHRONIZED`	The mirror farm has synchronized all Git repositories from the primary. If new projects or repositories are added to the mirror farm this state will not change. It indicates that the initial set of projects or repositories that where configured at startup time have been synchronized.
`ERROR`	There was an error starting the application node.

When performing a `GET` operation against the `/status` endpoint, the returned data is made up of JSON with two properties, `status` and `nodeCount`.

For example; `{"state":"SYNCHRONIZED","nodeCount":"4"}`

Bitbucket Mesh

About Bitbucket Mesh

Bitbucket Mesh is a distributed, replicated, and horizontally scalable Git repository storage system, which increases performance, scalability, and improves the resilience of Bitbucket.

On this page

Performance

Since clustering was introduced in Bitbucket Data Center, Git repositories have been hosted on a shared file system (specifically as NFS based filesystem), which often becomes a performance bottleneck. NFS introduces additional latency, which isn't significant for large operations, like streaming a pack file, but can be extremely punishing for small operations, like accessing refs or loose objects. Bitbucket Mesh utilizes local disks for fast read/write access and moves Git processing closer to the storage for reduced I/O latency. As a result, it greatly improves the performance of Bitbucket.

Resilience

Bitbucket Data Center is designed for high availability. However, not all the elements are truly HA. The shared file system can become a single point of failure. Bitbucket Mesh offers a solution to this problem. When repositories are migrated to Mesh, they are replicated to multiple Mesh nodes. That ensures the loss of any single node has no impact on the availability of the repositories it hosted because each still has replicas available on other nodes. When Mesh nodes are brought back online, they automatically repair their replicas and are returned to service.

Scalability

Bitbucket Mesh architecture allows horizontal scaling of Git storage and processing. Repositories are replicated to multiple Mesh nodes, and each replica is capable of actively serving both read and write traffic. Each replica adds capacity and does so more efficiently than adding Bitbucket Data Center cluster nodes because each has independent storage in addition to its own CPUs and RAM.

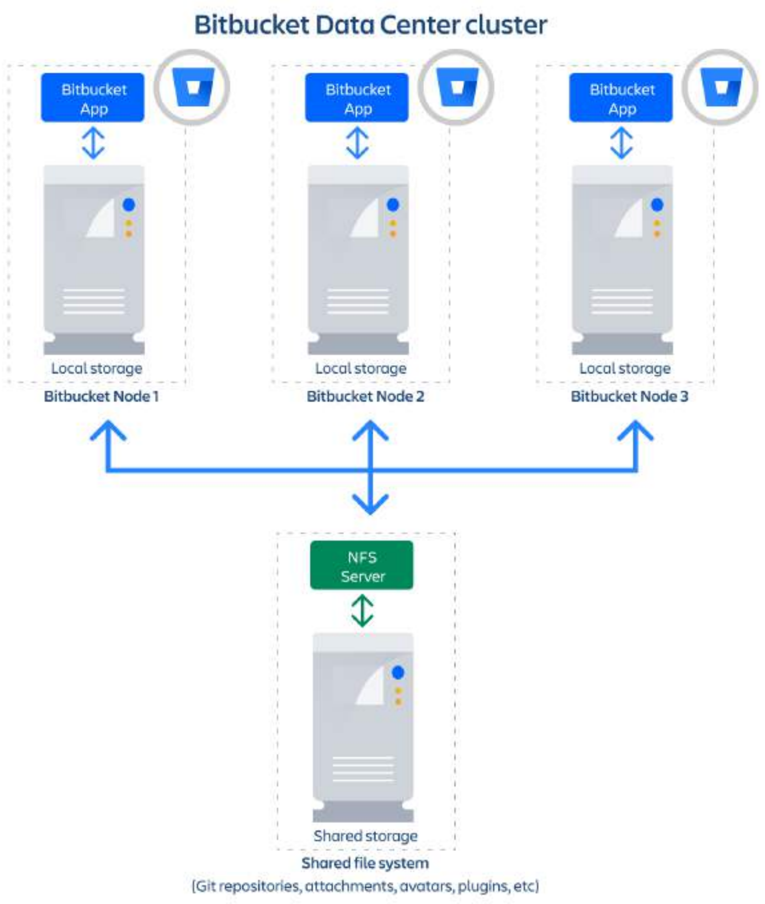
For more detail about Bitbucket Mesh, refer to Bitbucket Mesh whitepaper.

What does Mesh look like?

Mesh is most easily understood through two diagrams.

Before

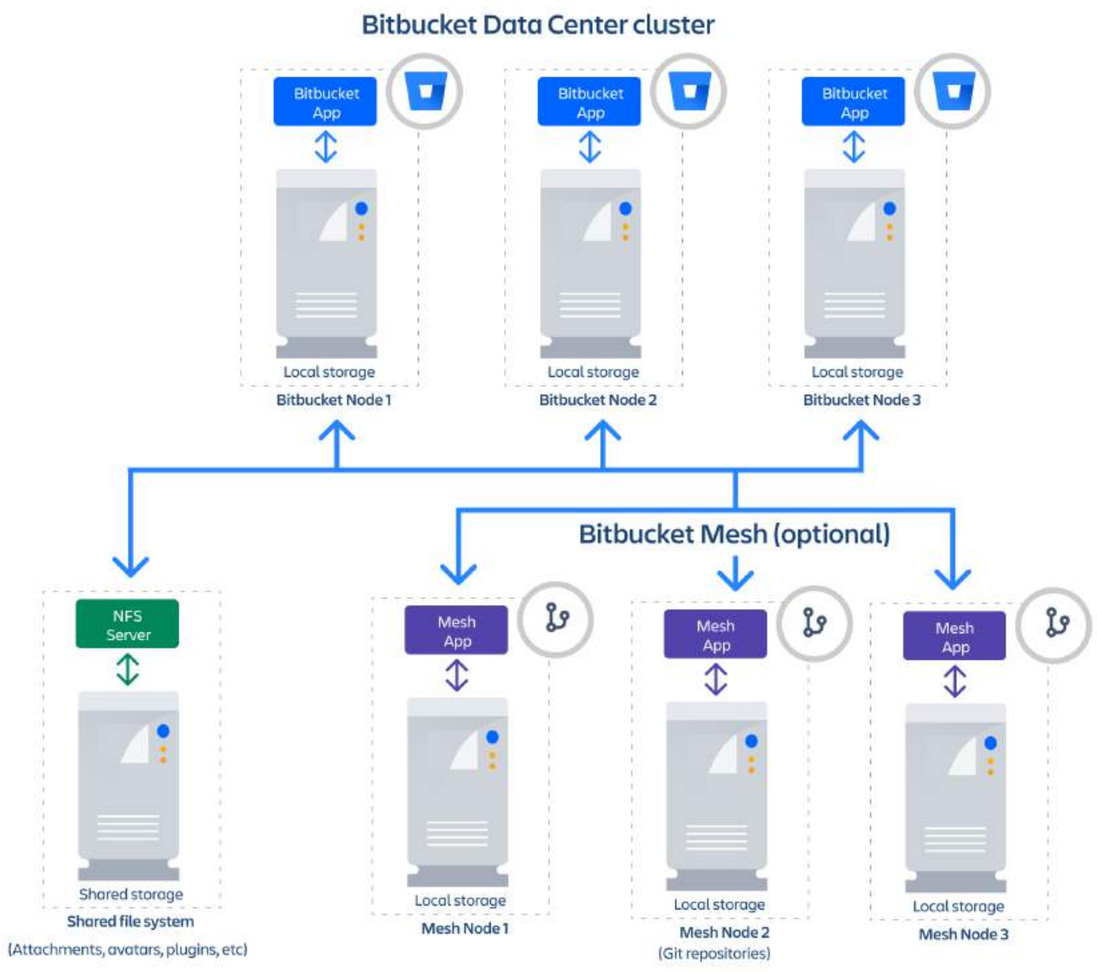
The image below represents a three-node cluster deployed with NFS-based Git repository storage. This is, in principle, how Bitbucket Data Center is deployed on all versions before 8.0.



Bitbucket DC 7.x with 3 cluster nodes and NFS storage

After

Now observe the architecture of a Bitbucket Data Center 8.0 instance with Bitbucket Mesh. Mesh replaces NFS as storage for Git repositories, bringing Git processing closer to the storage. Distribution and replication of data also improves availability and prevents the NFS Server from being a single point of failure.



Bitbucket DC 8.x with 3 cluster nodes and 3 Mesh nodes

Ready to get started setting up Mesh?

Be sure to read Set up and configure Mesh nodes and Migrate repositories to Bitbucket Mesh for detailed instructions.

ⓘ Got other questions on Mesh? Check out these FAQs

Set up and configure Mesh nodes

Bitbucket Mesh allows you to set up a group of nodes that work as distributed, replicated, and horizontally scalable Git repository storage for Bitbucket Data Center. This page shows you how to install and configure Mesh nodes and connect them to your Bitbucket Data Center instance.

For an overview of the benefits of using Bitbucket Mesh and how moving Git repositories to Mesh nodes can help your organization, see Bitbucket Mesh.

On this page

Before you start

Before you attempt to set up and configure Mesh nodes, make sure you've noted the considerations and completed all the prerequisites described in this section.

We recommend that you use Network Time Protocol (NTP) to synchronize the time on all nodes and keep clocks in sync. Also, while Mesh nodes can be in different locations, they require a fast, low latency connection to each other.

Prerequisites and system requirements

Make sure that:

- **Your primary Bitbucket instance is a fully licensed Bitbucket Data Center instance** – You don't need to run your Bitbucket Data Center instance as a multi-node cluster to use Bitbucket Mesh, but you must have an up-to-date Data Center license.
- **You have the minimum version of Bitbucket 8.9 and Mesh 2.0** – The versions of the Bitbucket instance and Mesh nodes are independent of each other; however, each Bitbucket version is compatib le with a specific Mesh version.
- **You have a separate home directory for each Mesh node** – You'll be configuring multiple Bitbucket Mesh nodes and as each node is unique they should not use a shared storage for their home directory. Do not share the home directories of the Mesh nodes with the Bitbucket Data Center instance or with other Mesh nodes.
- **You've installed a minimum version of Git 2.31 on your Bitbucket Data Center instance and the Mesh nodes** – For more details, see Supported platforms.
- **You have the same platform on all your Mesh nodes** - For more details, see Supported platforms, including those for Java and Git, which apply to each Mesh node.
- **The platform that the Mesh nodes are running on have sufficient provisioning** – Just as your primary Bitbucket Data Center instance, your Mesh nodes need to be provisioned with enough CPU, memory, and I/O resources to handle their peak workload. We recommend that Mesh nodes be sized similar to the your Bitbucket Data Center instance. Learn more about Mesh requirements

Installing and starting a Bitbucket Mesh node

1. Download Bitbucket Mesh

Refer to the compatibility matrix and download the compatible version of Mesh that suits your Bitbucket version.

2. Create the installation directory

1. Create your installation directory (with full control permission) on the Mesh node – this is where Bitbucket Mesh installation files will be stored. Avoid using spaces or special characters in the path. We'll refer to this directory as your `<installation-directory>` in the below steps.
2. Extract the Mesh `.zip` file you've downloaded to your `<installation-directory>`.

3. Create the Mesh home directory

1. Create your home directory (with full control permission) on the Mesh node – your Bitbucket Mesh data will be stored here. Note that this should be separate to your installation directory. We'll refer to this directory as your `<home-directory>` in the below steps.
2. Edit `<installation-directory>/bin/set-mesh-home.sh` file – uncomment the `MESH_HOME` line and add the absolute path to your home directory.

4. (Optional) Configure SSL

Depending on your security requirements, you may want to encrypt the communications between Bitbucket Data Center and Mesh. If the network between Bitbucket Data Center and Mesh is fully trusted, you can skip this step.

Bitbucket Data Center communicates with Mesh over gRPC. To configure Mesh to expose its gRPC services over HTTPS:

1. Generate/obtain a private key and certificate chain file for the SSL certificate that Mesh should use. The certificate must be signed by a trusted Certificate Authority (CA) such as Let’s Encrypt, VeriSign, DigiCert or Thawte. If your Certificate Authority provides you with an intermediate certificate, you can create a `.pem` file containing the full certificate chain by appending the intermediate certificate to the certificate that receive from your Certificate Authority.

```
-----BEGIN CERTIFICATE-----
(Your Primary SSL certificate: your_domain_name.crt)
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
(Your Intermediate certificate: intermediate.crt)
-----END CERTIFICATE-----
```

2. Copy the certificate and private key file to a directory that Mesh can access, for example, `<mesh-home>/config/ssl`

```
mkdir -p <mesh-home>/config/ssl
cp key.pem cert.pem <mesh-home>/config/ssl
```

3. Create a `<mesh-home>/mesh.properties` file with the following contents:

```
grpc.server.ssl.cert-chain-path=<mesh-home>/config/ssl/cert.pem
grpc.server.ssl.private-key-path=<mesh-home>/config/ssl/key.pem
```

5. (Optional) Customize Mesh configuration

If you need to change the port Mesh will run on, or some other Mesh configuration, you can create or edit `<mesh-home>/mesh.properties` to customize the configuration.

6. Start Bitbucket Mesh

1. Change directory to the <installation-directory> and run the below command:

```
bin/start-mesh.sh
```

2. Observe the logs and confirm that Bitbucket Mesh has started successfully. You should see something similar to below:

```
2022-03-11 08:56:42,170 INFO [main] - c.a.bitbucket.mesh.grpc.GrpcServer gRPC server started
(port: 7777, SSL: false, maxDirectMemory: 7029 MB)
2022-03-11 08:56:42,175 INFO [main] - c.a.b.mesh.boot.MeshApplication Started MeshApplication in
3.085 seconds (JVM running for 3.732)
2022-03-11 08:56:42,177 INFO [main] - c.a.b.mesh.boot.StandaloneRunner Ready to serve
```

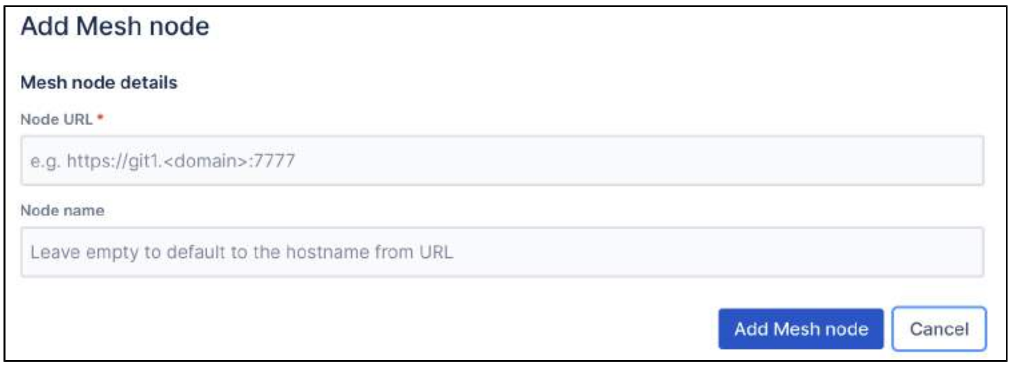
Connecting the Mesh node to Bitbucket

Once Bitbucket Mesh has started, you can connect it to your Bitbucket Data Center instance.

To connect the mesh node:

1. In your Bitbucket Data Center instance, navigate to **Administration > Git** > **Bitbucket Mesh**.
2. Enter the URL of the Mesh node you've created earlier in the **Node URL** field. If you've secured communications between Bitbucket Data Center and Mesh, make sure you use https here.
3. (Optional) Enter a name for the Mesh node in the **Node name** field.
4. Select **Add Mesh** node.

You've now successfully added a Mesh node to your Bitbucket Data Center instance. Once you've connected at least 3 Mesh nodes, you can migrate your Git repositories to Mesh.


Add Mesh node

Mesh node details

Node URL *

e.g. https://git1.<domain>:7777

Node name

Leave empty to default to the hostname from URL

Remove a Mesh node

Before you take out a Mesh node:

- note that you can remove a Mesh node only if you have more than 3 nodes. If you need to replace a node, add a new node first
- make sure that the other Mesh nodes have enought disk space to host the data from the Mesh node you're removing

To remove a Mesh node:

1. In your Bitbucket Data Center instance, navigate to **Administration** > **Git** > **Bitbucket Mesh**.
2. Select **Delete**.

The node will remain in deleting state until all the data has been moved to the other Mesh nodes before it disappears.

Migrate repositories to Bitbucket Mesh

Bitbucket Mesh is a distributed, replicated, and horizontally scalable Git repository storage system. It offers better resiliency when compared to a clustered Data Center deployment backed by Network File System (NFS). Additionally, as it moves the processing closer to the storage, it leads to decreased I/O latency and increased performance for repositories hosted on it. This page shows you how to migrate repositories from your existing Bitbucket Data Center instance to Mesh.

On this page

Before you start

Before you attempt to migrate your repositories to Bitbucket Mesh, make sure you've noted the considerations and completed all the prerequisites described in this section.

We strongly recommend that you test the migration process in a staging environment first. If you have any questions about the migration process, reach out to support.

Prerequisites

Make sure that you have:

- **Connected at least 3 Mesh nodes to your Bitbucket Data Center instance** – Bitbucket Mesh is a replicated system built to provide resiliency. It is required that you connect a minimum of 3 Mesh nodes to your Bitbucket DC instance before attempting to migrate any repositories to it. Learn more about setting up and configuring Mesh nodes.
- **Configure all additional Mesh nodes before you migrate** – If you're planning to have more than 3 Mesh nodes, we suggest that you configure all the Mesh nodes before you start migrating repositories as migrated repositories are not replicated on the nodes you add later.

Other considerations

The preview REST endpoint

You can use the preview function to review the repositories included in the migration, before kicking it off. The preview takes into account fork hierarchies, which are always migrated fully.

Git LFS objects

For now, LFS objects in your Git repositories are not migrated over to Mesh – they will stay on the shared home of your instance even after you migrate your repositories to Mesh.

Disk space requirements and garbage collection

Always make sure you have enough disk space for the files you're migrating. The space required on disk during export is roughly the size of the Git data being exported. If you are unsure of how much space you have available, you can check the available disk space by referring to how to identify a repository ID in Bitbucket.

Mesh performs garbage collection differently from Bitbucket. After repositories are migrated, Mesh garbage collection may unpack a significant number of unreachable objects to prepare for them to be pruned. This can significantly increase disk usage and inode usage and, in extreme cases, may exhaust the file system. You should test migrations for large repositories in a staging environment before attempting them in production, and should closely monitor filesystem usage after migrating.

Note: When preparing to test a migration in a staging environment, ensure all of the objects and packs in the test repository have a recent last modified timestamp. Many staging environments are populated with demotions of production data, and may be stale. Git’s garbage collection is sensitive to modification times, which means performing garbage collection in a stale repository can result in very different behavior compared to performing it in an active repository – even if they contain the same data.

We recommend that you proceed with your migration in batches and give each batch some time to rest so that garbage collection can run and settle before the next migration.

Time needed for migration

There is no real way to predict the exact time required for the migration to complete, it is impacted by your data set, individual load, and traffic.

Some tests have shown that a migration of 10GB can take around 10-15 minutes, but each case is unique and times may vary.

Repository creation on Mesh

You can choose to create new repositories on Mesh automatically using the **Create new repositories on Mesh** toggle. When this toggle is off, repositories are created in the shared home.

Related repositories are migrated together

If you migrate a repository that has forks, note that all related repositories are migrated together. If any fork in the hierarchy fails to migrate, migration for the entire hierarchy fails.

Migrating a repository back to the shared file system

Once a repository has been migrated to Mesh, you can’t migrate it back to the shared file system. However, if you’ve accidentally migrated a repository and need to reverse a migration, contact support.

Migrating repositories to Mesh

Decide which project or repositories you want to migrate only after you’ve carefully reviewed the above perquisites. A good strategy may involve migrating smaller/less busy repositories first, followed by bigger/busier repositories. We strongly recommend that you test the migration process in a staging environment first.

> As soon as you select one repository in a fork hierarchy, every repository in that fork hierarchy will be migrated, including personal forks and origins of the repository.

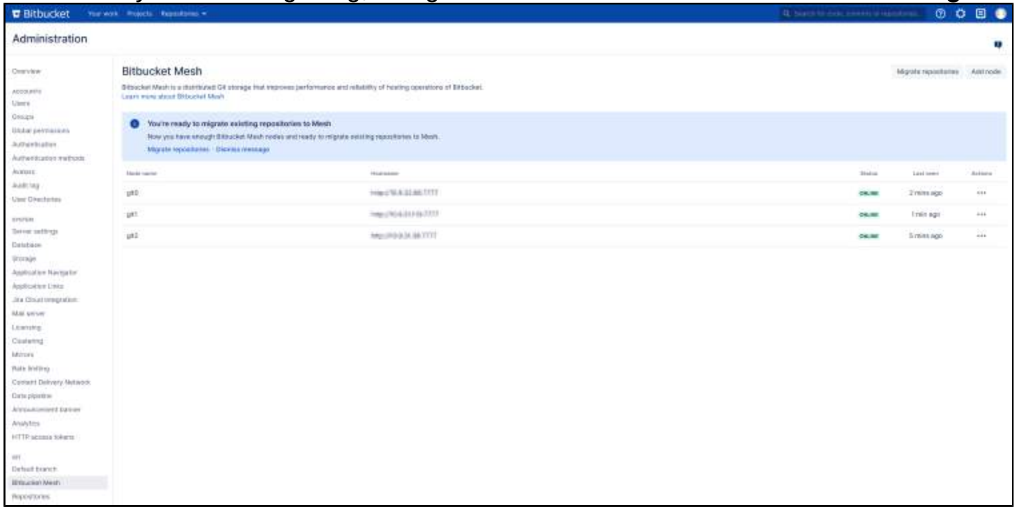
You can perform a migration using the UI or the REST API.

From the user interface

Start and monitor the migration

After adding a minimum of 3 Mesh nodes, you’ll be able to migrate repositories to Bitbucket Mesh:

1. From the System Settings cog, navigate to **Git** > **Bitbucket Mesh** and select **Migrate repositories**.



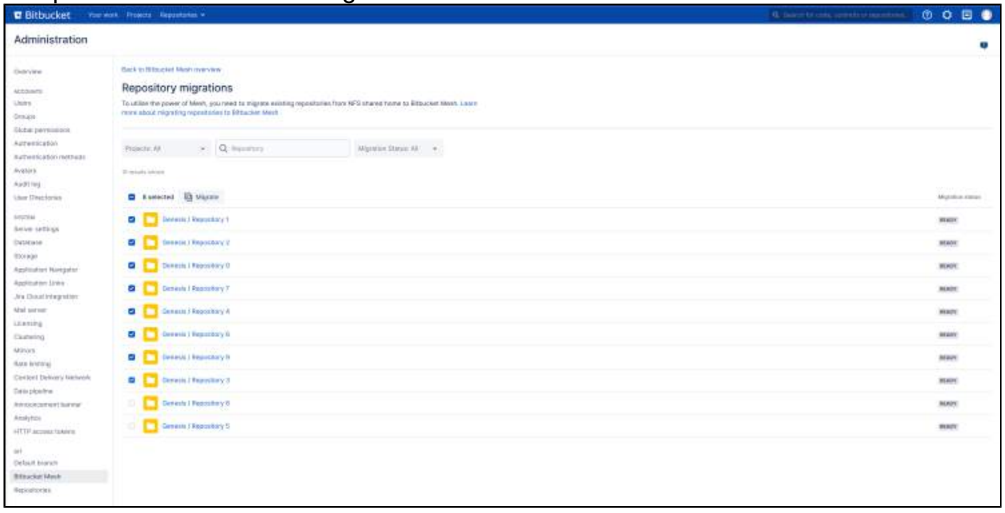
Bitbucket Mesh

Bitbucket Mesh is a distributed Git storage that improves performance and reliability of hosting operations of Bitbucket.
Learn more about Bitbucket Mesh

You're ready to migrate existing repositories to Mesh
Now you have enough Bitbucket Mesh nodes and ready to migrate existing repositories to Mesh.
Migrate repositories · Dismiss message

Node name	Hostname	Status	Last seen	Actions
git0	[illegible]	ONLINE	2 mins ago	•••
git1	[illegible]	ONLINE	1 min ago	•••
git2	[illegible]	ONLINE	5 mins ago	•••

2. From the **Repository migrations** page, select the repositories you wish to migrate and select **Migrate**. Repositories that can be migrated are in READY status.



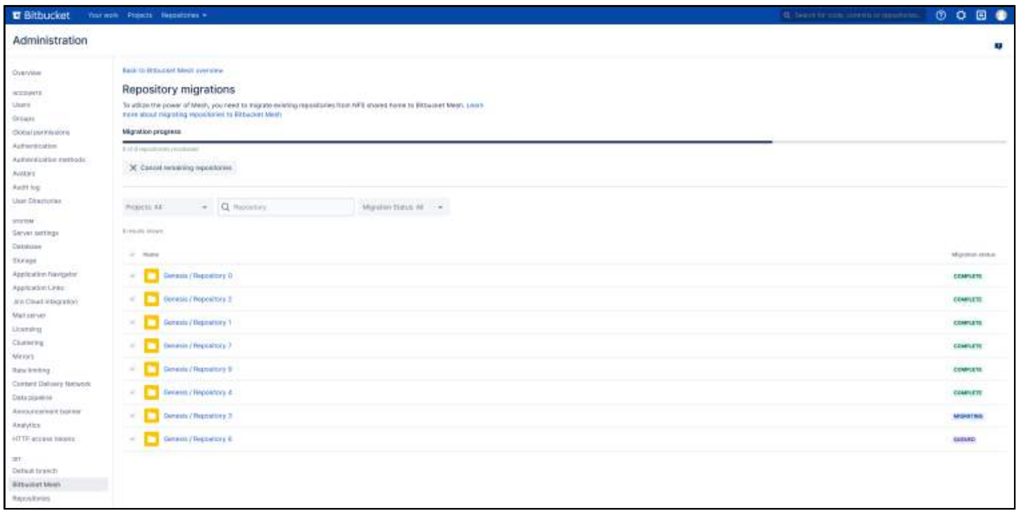
Back to Bitbucket Mesh overview

Repository migrations

To utilize the power of Mesh, you need to migrate existing repositories from NFS shared home to Bitbucket Mesh. Learn more about migrating repositories to Bitbucket Mesh

Name	Migration status
Genesis / Repository 1	READY
Genesis / Repository 2	READY
Genesis / Repository 0	READY
Genesis / Repository 7	READY
Genesis / Repository 4	READY
Genesis / Repository 6	READY
Genesis / Repository 9	READY
Genesis / Repository 3	READY
Genesis / Repository 8	READY
Genesis / Repository 5	READY

A progress bar indicates progress of the migration:



Back to Bitbucket Mesh overview

Repository migrations

To utilize the power of Mesh, you need to migrate existing repositories from NFS shared home to Bitbucket Mesh. Learn more about migrating repositories to Bitbucket Mesh

Migration progress

Name	Migration status
Genesis / Repository 0	COMPLETE
Genesis / Repository 2	COMPLETE
Genesis / Repository 1	COMPLETE
Genesis / Repository 7	COMPLETE
Genesis / Repository 9	COMPLETE
Genesis / Repository 4	COMPLETE
Genesis / Repository 3	MIGRATING
Genesis / Repository 6	QUEUED

Migration progress is indicated by the following statuses:

- **QUEUED**: The repository is queued for migration.
- **MIGRATING**: Mesh is migrating the repository.
- **FAILED**: The repository couldn't be migrated to Mesh.
- **COMPLETE**: The repository is successfully migrated to Mesh.

To see which Mesh nodes a repository is migrated to, navigate to Repository Settings > Repository details.

Cancel the migration?

You can cancel the migration using the **Cancel** button while a migration is in progress but note that this only cancels the migration of repositories that haven't been migrated yet – the repository hierarchies that have already been fully migrated to Mesh will stay on it and will not be reverted to the shared home.

You may notice a small delay between the time you select the **Cancel** button and the actual cancellation. In most cases, this delay is inconsequential.

Using the REST API

To perform the migration using the REST API, you'll need to either use your favorite tool to make REST calls or refer to the sample cURL commands provided for migration.

If you plan to use cURL commands, we recommend you set up a `.netrc` file (sample commands use the `-n` flag) and install `jq` on your machine.

You can migrate all repositories in a project, multiple projects, multiple repositories, or a combination of projects and repositories using project or repository IDs. Learn more about identifying a repository ID in Bitbucket. The project ID can be retrieved from the project's key using the Project Resource REST API.

Preview the migration

Previewing allows you to experiment with the migration request and returns a list of repositories that would be included with a given request.

To preview, use the below command:

```
curl -u <adminuser> -s -n -X POST -H 'Content-type: application/json' -d '{"projectIds":[1, 2, 3],
"repositoryIds":[1, 2, 3]}' http://localhost:7990/rest/api/latest/migration/mesh/preview | jq .
```

The following request values are required for preview:

Description	Value
URL	`/rest/api/latest/migration/mesh/preview`
HTTP verb	POST
HTTP header	`Content-type: application/json`
Authentication	Basic

You can specify multiple repositories in the body of the request. Here are some examples:

To preview all repositories:

```
{
    "projectIds"    : [],
    "repositoryIds" : []
}
```

To preview one full project and a specific repository:

```
{
    "projectIds"    : [1],
    "repositoryIds" : [42]
}
```

You can specify as many project repository Ids as necessary, and the selection would be additive. For instance, the above request includes all repositories in the project with Id 1, and also a repository with Id 42, unless the repository is already a part of the project with Id 1.

Start the migration

When you start the migration, all repositories included in the migration are queued in the database, and are migrated to the Mesh individually. At a given point, note that only one migration is active.

You can perform the migration using the below command:

```
curl -u <adminuser> -s -n -X POST -H 'Content-type: application/json' -d '{"projectIds":[1, 2, 3],
"repositoryIds":[1, 2, 3]}' http://localhost:7990/rest/api/latest/migration/mesh | jq .
```

The following values are required for migration:

Description	Value
URL	`/rest/api/latest/migration/mesh`
HTTP verb	POST
HTTP header	`Content-type: application/json`
Authentication	Basic

Use the same request body as in the Previewing the migration section.

The response contains the job ID – you can use this to query the status of the job later.

Monitor the progress of the migration

You can query the following specific REST endpoint to check the progress:

```
watch -n30 'curl -u <adminuser> -s -n -X GET http://localhost:7990/rest/api/latest/migration/mesh/<jobId>
/summary | jq .'
```

Replace `<jobId>` with the **Id** value returned in the request from the migration job.

The following values are required to query the progress:

Description	Value
URL	`/rest/api/latest/migration/mesh/<jobId>/summary`
HTTP verb	GET
Authentication	Basic

Cancel the migration?

When you place a cancellation request, you may notice a small delay before the job gets cancelled. In most cases, this delay is inconsequential. Note that this only cancels the migration of repositories that haven't been migrated yet – the repository hierarchies that have already been fully migrated to Mesh will stay on it and will not be reverted to the shared home.

```
curl -u <adminuser> -s -n -X POST -H 'Content-type: application/json' http://localhost:7990/rest/api
/latest/migration/mesh/<jobId>/cancel
```

Replace `<jobId>` with the **Id** value returned in the request from the migration job.

The following values are required to cancel the migration (REST Documentation):

Description	Value
URL	`/rest/api/latest/migration/mesh/<jobId>/cancel`
HTTP verb	POST
Authentication	Basic

Enable performance monitoring for Bitbucket Mesh

This article describes how to enable performance monitoring in Bitbucket Mesh and export performance metrics to various backends.

Why would I want to enable performance monitoring within Bitbucket Mesh?

With performance monitoring, you can easily monitor the application resources consumed by Bitbucket Mesh, enabling you to make better decisions about maintaining and optimizing machine resources.

What can I monitor?

It is possible to monitor various statistics by enabling performance monitoring within Bitbucket Mesh. Below are some examples of some statistics that can be monitored.

gRPC calls statistics

Statistic	Description
Failed	Number of failed gRPC calls since start
Running	Number of active gRPC calls
Successful	Number of successful gRPC calls since start
Total	Total number of gRPC calls since start

Mesh nodes

Statistic	Description
InconsistentCount	The number of Mesh nodes that host inconsistent replicas
OfflineCount	The number of Mesh nodes that are offline
TotalCount	The total number of Mesh nodes
UnavailableCount	The number of Mesh nodes that are either disabled or offline

Partition migration

Statistic	Description
FailedMigrations	The number of migrations that are in a failed state
InProgressMigrations	The number of migrations that are in progress
LongRunningMigrationsFor1h	The number of migrations that have been running for longer than one hour
LongRunningMigrationsFor8h	The number of migrations that have been running for longer than 8 hours
LongRunningMigrationsFor24h	The number of migrations that have been running for longer than 24 hours

Repair operation statistics

These statistics represent statistics of repair operations initiated by Mesh.

Repair operation duration

A repair operation for Mesh takes place in distinct phases, and statistics for each phase are available.

Statistic	Description
CompareReflogs	Duration of the reflog comparison phase of repair
CompareRefs	Duration of the ref comparison phase of repair
FetchObjects	Duration of the fetch objects phase of repair
Total	Total time taken for repair operations

Repair operation calls

Statistic	Description
Failed	Number of failed repair operations since start
Running	Number of active repair operations
Successful	Number of successful repair operations since start
Total	Total number of repair operations since start

Ticket statistics

Mesh uses **tickets** as a mechanism for creating back pressure to prevent the system from being overloaded with requests. The following types of tickets are available:

Hosting tickets: Limits the number of SCM hosting operations, meaning pushes and pulls, which may be running concurrently.

Mirror Hosting tickets: Limits the number of SCM hosting operations served to mirrors, which may be running concurrently. This limit is intended to protect the system's CPU and memory from being consumed excessively by mirror operations.

Command tickets: Limits the number of SCM commands, such as: `git diff`, `git blame`, or `git rev-list`, which may be running concurrently.

Ref Advertisement tickets: Limits the number of SCM Ref Advertisement operations that may be running concurrently. These are throttled separately from hosting operations as they are much more lightweight and much shorter, so many more of them can run concurrently.

LFS tickets: Limits the number of Git LFS file transfer operations that may be running concurrently. This is primarily intended to prevent Git LFS requests from consuming all available connections, thereby degrading Git hosting operations.

Mesh supports the following metrics for each ticket type:

Statistic	Description
Available	Number of tickets currently available for use
Used	Number of tickets currently in use
Total	Total number of tickets configured

Expose performance metrics within Bitbucket Mesh

The above metrics above can be published to the following supported backends:

- Datadog

- Dynatrace
- InfluxDB
- JMX (Java Management Extensions)
- New Relic
- SignalFX
- StatsD

You can publish metrics to a backend by setting the corresponding `management.metrics.export.<backend>.enabled` property to `true`.

For example, to enable publishing of the metrics to SignalFX, the following property needs to be set in `mesh.properties`:

```
management.metrics.export.signalfx.enabled = true
```

Further configuration may be required based on the backend you chose. Refer to the configuration properties for more information.

You can also attach tags to metrics published from a given node by specifying them as a suffix of the `metrics.tag` property.

For example, to attach a tag called `application=Mesh` to the published metrics, set the the following property in `mesh.properties`:

```
metrics.tags.application=Mesh
```

Mesh configuration properties

This page describes the configuration properties that can be used to control behavior in Bitbucket Mesh. Create the `mesh.properties` file, in the home directory, and add the system properties you need, use the standard format for Java properties files.

Bitbucket Mesh must be restarted for changes to become effective.

Default values for system properties, where applicable, are specified in the tables below.

Authentication

Default value	Description
authentication.allowed-clock-skew	
`2m`	Defines the clock skew allowed when validation expiry for signed tokens during authentication. This accounts for clock drift between Bitbucket and Mesh nodes. This value is in SECONDS unless a unit (s, m, h, d) is specified.
authentication.expiry-interval	
`30s`	Defines the amount of time a signed token is valid after it's issued. This only affects outbound requests, such as replication requests from one Mesh node to another. Since tokens are generated right before the RPC they will be used to authenticate, this interval should generally be short. This value is in SECONDS unless a unit (s, m, h, d) is specified.

Commits

Default value	Description
commit.message.max	
`262144`	Controls the maximum length of the commit message to be loaded when retrieving one or more commits. Commit messages longer than this limit will be truncated. The default limit is high enough to not affect processing for the general case, but protects the system from consuming too much memory in exceptional cases.
commit.message.bulk.max	
`16384`	Controls the maximum length of the commit message to be loaded when retrieving commits in bulk. Commit messages longer than this limit will be truncated. The default limit is high enough to not affect processing for the common case, but protects the system from consuming too much memory when many commits have long messages.

Database

Default value	Description
database.pool.idle-size	
`5`	Defines the number of connections the pool tries to keep idle. *The system can have more idle connections than the value configured here.* As connections are borrowed from the pool, this value is used to control whether the pool will eagerly open new connections to try and keep some number idle, which can help smooth ramp-up for load spikes.

database.pool.max-size	
`50`	Defines the maximum number of connections the pool can have open at once.
database.pool.connect-timeout	
`15`	Defines the amount of time the system will wait when attempting to open a new connection before throwing an exception. The system may hang, during startup, for the configured number of seconds if the database is unavailable. As a result, the timeout configured here should *not* be generous. If no unit is specified (ms, s, m, h) this value is in **seconds**.
database.pool.idle-timeout	
`30`	Defines the maximum period of time a connection may be idle before it is closed. In general, generous values should be used here to prevent creating and destroying many short-lived database connections (which defeats the purpose of pooling). If no unit is specified (ms, s, m, h) this value is in **minutes**.
database.pool.leak-timeout	
`0`	Defines the maximum period of time a connection may be checked out before it is reported as a potential leak. *By default, leak detection is not enabled*. Long-running tasks can easily exceed this threshold and trigger a false positive detection. If no unit is specified (ms, s, m, h) this value is in **minutes**.
database.pool.lifetime-timeout	
`60`	Defines the maximum *lifetime* for a connection. Connections which exceed this timeout are closed the first time they become idle and fresh connections are opened. If no unit is specified (ms, s, m, h) this value is in **minutes**.

Executor

Controls the thread pool for general asynchronous processing.

Default value	Description
executor.max-threads	
`${scaling.concurrency}`	Controls the maximum number of threads allowed in the common `ExecutorService`. This `ExecutorService` is used by for background tasks. When more threads are required than the configured maximum, the thread attempting to schedule an asynchronous task to be executed will block for up to executor.timeout until a thread in the pool becomes available. By default, the pool size scales with the number of reported CPU cores. Note: A minimum of 4 is enforced for this property. Setting the value to a lower value will result in the default 4 threads being used.
executor.timeout	
`60`	Controls how long a thread submitting a task to the common `ExecutorService` should block when all threads in the pool are busy before giving up and rejecting the task. This value is in **seconds**.

Git

Default value	Description
git.path.executable	
	Defines the path to the git executable. If no value is set, the system searches the runtime user's PATH and standard system paths to find a suitable git executable. Setting a value here is usually not necessary. This is left here purely for documenting how to set an explicit path.

Git Hooks

Default value	Description
hooks.callback.timeout	
`240`	Controls the maximum time a git hook callback is allowed to execute before being aborted, thereby rejecting the request if the hook can reject the request. When one or more refs are updated and a pre-receive or post-receive request is sent back to the RPC client, this setting controls how long the application will wait for the RPC client to respond. This value is in **seconds**.

Git signing

Default value	Description
git.signing.enabled	
`false`	Controls whether system created Git objects (such as pull request merge commits) are signed. When this feature is enabled the application will sign and verify system created Git objects using a GPG signing key-pair provided by the control plane.

Home directory layout overrides

Default value	Description
layout.caches-dir	
	Controls the directory used to store caches, including the pack-objects caches used to cache clones. Files in this directory do not need to be retained across restarts. In cloud deployments, it's perfectly acceptable to use an ephemeral drive for the caches directory. Using a drive that provides good read performance for the caches directory will greatly benefit clone performance. Use an absolute path when configuring this property.
layout.tmp-dir	
	Controls the directory used to store temporary files. Files in this directory do not need to be retained across restarts. In cloud deployments, it's perfectly acceptable to use an ephemeral drive for the tmp directory. Use an absolute path when configuring this property.

Hook Scripts

Default value	Description
hookscripts.gc.interval	
`24`	Defines the number of hours to wait between garbage collection runs for hook scripts. This unit is in hours. The default is 24 hours (1 day).
hookscripts.gc.prune	
`168`	Defines the minimum age of a hook script before it can be considered for garbage collection. This unit is in hours. The default is 1 week.

Hosting

Default value	Description
hosting.allow-filter	
`true`	Controls whether partial clones, using --filter, are allowed. Partial clones are not cached, and some of the filters offered by Git can be very resource-intensive for the server to apply, so it can sometimes be more efficient to use a normal clone (or a shallow one) instead. Partial clones are enabled by default.
hosting.atomic-initial-push	
`true`	Controls whether initial pushes are treated as an atomic push by the system. This option is enabled by default because it significantly reduces the overhead of coordinating and replicating the initial push. Only disable this option in case of issues with initial pushes.

Hosting Cache (Pack Cache)

See Scaling for Continuous Integration performance for more information about configuring the Git Cache.

Note: The settings controlled by these properties can be dynamically updated using REST. The REST configuration *takes precedence* over the configuration in `mesh.properties`.

Default value	Description
hosting.cache.expiry.check.interval	
`30`	Controls how frequently expired cache entries are invalidated and removed from the cache. This value is in **seconds**.
hosting.cache.eviction.hysteresis	
`1073741824`	When eviction is triggered the amount of disk space requested for eviction is calculated as (eviction.hysteresis + eviction.trigger.free.space - free space under <Mesh home directory>/caches) This value is in **bytes**.
hosting.cache.eviction.trigger.free.space	

`6442450944`	Controls the threshold at which eviction is triggered in terms of free space available on disk (specifically under <Mesh home directory>/caches) This value is in **bytes**.
hosting.cache.minimum.free.space	
`5368709120`	Controls how much space needs to be available on disk (specifically under <Mesh home directory>/caches) for caching to be enabled. This setting ensures that the cache plugin does not fill up the disk. This value is in **bytes**.
hosting.cache.pack.enabled	
`true`	Controls whether caching is enabled for git-upload-pack (clone operations).
hosting.cache.pack.fetch	
`false`	Controls whether fetches should be cached in addition to clones.
hosting.cache.pack.maxCount	
`20`	The maximum number of upload-pack cache entries to retain *per repository*. If there are more than this configured limit, the least recently accessed entry will be invalidated.
hosting.cache.pack.partial	
`false`	Controls whether partial clones or fetches should be cached.
hosting.cache.pack.ttl	
`14400`	Controls how long the caches for clone operations are kept around when there no changes to the repository. Caches are automatically invalidated when someone pushes to a repository or when a pull request is merged. This value is in **seconds**.
hosting.cache.protocol.http.enabled	
`true`	Controls which whether caching over HTTP(S) is enabled.
hosting.cache.protocol.ssh.enabled	
`true`	Controls which whether caching over SSH(S) is enabled.

Merges

Default value	Description
merge.merge-tree	
`true`	Whether to perform merges using `git merge-tree`. This can have significant performance benefits over the alternative of using `git merge`.

Metrics

Default value	Description

metrics.tags.application	
`Mesh`	Any metrics tags that should be added to all metrics reported from this node can be added as properties under `metrics.tags`. For instance, if metrics reported by this node should be tagged with `region=us-east-1`, this node is running under, add `metrics.tags.region=us-east-1`
management.metrics.export.datadog.enabled	
`false`	Datadog metrics configuration. Please set `enabled=true` to enable publishing of metrics to Datadog and uncomment and update the relevant Datadog configuration properties in the section below.
management.metrics.export.datadog.api-key	
`YOUR_API_KEY`	
management.metrics.export.datadog.step	
`30s`	
management.metrics.export.dynatrace.enabled	
`false`	Dynatrace metrics configuration. Please set `enabled=true` to enable publishing of metrics to Dynatrace and uncomment and update the relevant Dynatrace configuration properties in the section below.
management.metrics.export.dynatrace.api-token	
`YOUR_TOKEN`	
management.metrics.export.dynatrace.device-id	
`YOUR_DEVICE_ID`	
management.metrics.export.dynatrace.uri	
`YOUR_URI`	
management.metrics.export.influx.enabled	
`false`	InfluxDB metrics configuration. Please set `enabled=true` to enable publishing of metrics to InfluxDB and uncomment# and update the relevant InfluxDB configuration properties in the section below.
management.metrics.export.influx.auto-create-db	
`true`	Whether to create the Influx database if it does not exist before attempting to publish metrics to it. (Default: true)
management.metrics.export.influx.batch-size	
`10000`	Number of measurements per request to use for this backend. If more measurements are found, then multiple requests will be made. (Default: 10000)
management.metrics.export.influx.batch-size.compressed	
`true`	Whether to enable GZIP compression of metrics batches published to Influx. (Default: true)
management.metrics.export.influx.batch-size.connect-timeout	

1s	Connection timeout for requests to this backend. (Default: 1s)
management.metrics.export.influx.batch-size.consistency	
one	Write consistency for each point. (Default: one)
management.metrics.export.influx.batch-size.db	
mydb	Tag that will be mapped to "host" when shipping metrics to Influx. (Default: mydb)
management.metrics.export.influx.batch-size.enabled	
true	Whether exporting of metrics to this backend is enabled. (Default: true)
management.metrics.export.influx.batch-size.num-threads	
2	Number of threads to use with the metrics publishing scheduler. (Default: 2)
management.metrics.export.influx.batch-size.password	
mysecret	Login password of the Influx server.
management.metrics.export.influx.batch-size.read-timeout	
10s	Read timeout for requests to this backend. (Default: 10s)
management.metrics.export.influx.batch-size.retention-policy	
my_rp	Retention policy to use (Influx writes to the DEFAULT retention policy if one is not specified).
management.metrics.export.influx.batch-size.step	
1m	Step size (i.e. reporting frequency) to use. (Default: 1m)
management.metrics.export.influx.batch-size.uri	
http://localhost:8086	URI of the Influx server. (Default: http://localhost:8086)
management.metrics.export.influx.batch-size.user-name	
myusername	Login user of the Influx server.
management.metrics.export.jmx.enabled	
${jmx.enabled}	Configures whether metrics should be exposed over JMX
management.metrics.export.jmx.domain	
metrics	
management.metrics.export.jmx.step	
5s	
management.metrics.export.newrelic.enabled	
false	NewRelic metrics configuration. Please set `enabled=true` to enable publishing of metrics to NewRelic and uncomment# and update the relevant NewRelic configuration properties in the section below.

management.metrics.export.newrelic.account-id	
`YOUR_ACCOUNT_ID`	
management.metrics.export.newrelic.api-key	
`YOUR_API_KEY`	
management.metrics.export.newrelic.step	
`1m`	The interval at which metrics are sent to New Relic. See Duration.parse for the expected format. The default is 1 minute.
management.metrics.export.signalfx.enabled	
`false`	SignalFX metrics configuration. Please set `enabled=true` to enable publishing of metrics to SignalFX and uncomment# and update the relevant SignalFX configuration properties in the section below.
management.metrics.export.signalfx.access-token	
`YOUR_ACCESS_TOKEN`	
management.metrics.export.statsd.enabled	
`false`	StatsD metrics configuration. Please set `enabled=true` to enable publishing of metrics to StatsD and uncomment# and update the relevant StatsD configuration properties in the section below.
management.metrics.export.statsd.host	
`statsd.example.com`	
management.metrics.export.statsd.port	
`9125`	
management.metrics.export.statsd.protocol	
`udp`	

Process execution

Controls timeouts for external processes, such as `git`.

Default value	**Description**
process.timeout.execution	
`120`	Configures a hard upper limit on how long the command is allowed to run even if it is producing output. This value is in **seconds**. Using 0, or a negative value, disables the timeout completely.
process.timeout.idle	

`60`	The idle timeout configures how long the command is allowed to run without producing any output. This value is in **seconds**. Using 0, or a negative value, disables the timeout completely.

Profiling

Default value	Description
profiling.enabled	
`${atlassian.profile.activate:false}`	Controls whether profiling should be enabled or not
profiling.min-frame-time	
`${atlassian.profile.mintime:1}`	Defines the threshold time (in milliseconds) below which a profiled event should not be reported.
profiling.min-trace-time	
`${atlassian.profile.mintotaltime:0}`	Defines the threshold time (in milliseconds) below which an entire stack of profiled events should not be reported.
profiling.max-frame-name-length	
`${atlassian.profile.maxframenamelength:300}`	Defines the maximum length of a profiling frame in the profiling log. Setting this value too high can lead to out of memory issues because profiling frames are kept in memory until the request ends. Longer frames will be abbreviated.

Repair

Exponential backoff between (failed) attempts to repair a repository replica

Default value	Description
repair.backoff.initial-delay	
`30`	Configures the delay between the first repair failure and the next attempt to repair the replica. This value is in **seconds**.
repair.backoff.jitter	
`0.05`	Configures the fraction of jitter to apply to the next delay to help spread out delays of concurrent repair operations. The default is 5%, which results in the next calculated delay being increased or decreased by up to 2.5%
repair.backoff.max-delay	
`1800`	Configures the maximum delay between two repair attempts. This value is in **seconds**. The default is 30 minutes.
repair.backoff.multiplier	
`1.2`	Configures the factor by which the delay between two repair attempts should be increased The default value is 1.2, for a ~20% increase between attempts (+/- jitter).

repair.max-attempts	
`25`	Configures the maximum amount of times repair is attempted if the replica does not become consistent after repair completes, or repair fails because no consistent replicas are available to repair from.
repair.throttle.limit	
`10`	Configures the maximum number of concurrent repair operations
repair.throttle.timeout	
`30`	Configures a hard upper limit on how long repair will wait for a repair slot to become available This value is in **seconds**. Using 0, or a negative value, disables the timeout completely. The default is 30 seconds.
repair.timeout.execution	
`86400`	Configures a hard upper limit on how long repository repair is allowed to run. This value is in **seconds**. Using 0, or a negative value, disables the timeout completely. The default is 24 hours.
repair.update-ref.batch-size	
`20000`	Configures the maximum amount of refs to update in a single git update-ref operation as part of repair. If repair needs to update more than the configured limit, multiple git update-ref operations will be used.

Replication

Default value	Description
replication.quorum-mode	
`majority`	Controls how replica votes are applied when replicating transactions. Available modes are: - `always`: If the leader prepares the transaction successfully, it is *always* committed--even if every other replica votes no. This mode makes write operations more likely to succeed, but may result in more frequent inconsistencies between nodes. - `majority`: Transactions are only committed if the majority (more than half) of replicas vote yes. Otherwise, the transaction is rolled back. Any replicas that voted no for a transaction that is still committed are marked as inconsistent and scheduled for repair. They will not process requests for the repository until repairs have completed. This mode balances consistency with availability. - `unanimous`: Transactions are only committed if every replica votes yes. Otherwise, the transaction is rolled back. This mode offers the best consistency, at the expense of making writes more fragile since a single replica failing will trigger a rollback. The default is to require a majority vote.

Storage Management

Default value	Description
storage.partition-cleanup-delay	

`3600`	Determines the delay between when a topology update occurs and the storage cleanup job running. The cleanup job will delete partitions on disk that are not hosted by this Mesh node anymore. The default delay is 1 hour specified in seconds. This value is in **seconds**.
storage.temp-cleanup-interval	
`24`	Determines the interval used for how frequent the clean up of the tmp directory on the Mesh node job is run. The default interval is 1 day specified in hours.
storage.temp-expiry	
`72`	Determines the interval used to calculate whether a file or directory is stale for it to be deleted on the Mesh node in the tmp directory. The default interval is 3 days specified in hours.

Throttling

These properties define concurrent task limits for the ThrottleService, limiting the number of concurrent operations of a given type that may be run at once. This is intended to help prevent overwhelming the server hardware with running processes. Two settings are used to control the number of processes that are allowed to process in parallel: one for the web UI and one for 'hosting' operations (pushing and pulling commits, cloning repositories).

When the limit is reached for the given resource, the request will wait until a currently running request has completed. If no request completes within a configurable timeout, the request will be rejected.

The underlying machine-level limits these are intended to prevent hitting are very OS- and hardware-dependent, so you may need to tune them for your instance. When hyperthreading is enabled for the server's CPUs, for example, it is likely that the default settings will allow sufficient concurrent operations to saturate the I/O on the machine. In such cases, we recommend starting off with a less aggressive default on multi-cored machines; the value can be increased later if hosting operations begin to back up.

Additional resource types may be configured by defining a key with the format `throttle.resource.&lt; resource-name&gt;`. When adding new types, it is strongly recommended to configure their ticket counts explicitly using this approach.

Default value	**Description**
scaling.concurrency	
`cpu`	Allows adjusting the scaling factor used. Various other CPU/throttling dependent properties are defined in terms of this setting, so adjusting this value implicitly adjusts those. Some examples: • event.dispatcher.core.threads • event.dispatcher.max.threads • executor.max.threads • throttle.resource.git-hosting The default value, `cpu`, resolves to the number of *detected* CPU cores. On hyperthreaded machines, this will be *double* the amount of physical cores.
throttle.resource.git-lfs	
`80`	Limits the number of Git LFS file transfer operations which may be running concurrently. This is primarily intended to prevent Git LFS requests from consuming all available connections thereby degrading UI and Git hosting operation. This should be a fraction of the maximum number of concurrent connections permitted by Tomcat.
throttle.resource.git-lfs.timeout	

`0`	Controls how long threads will wait for Git LFS uploads/downloads to complete when the system is already running the maximum number of concurrent transfers. It is recommended this be set to zero (i.e. don't block) or a few seconds at most. Since waiters still hold a connection, a non-zero wait time defeats the purpose of this throttle. This value is in **seconds**.
throttle.resource.mirror-hosting	
`2*${scaling.concurrency}`	Limits the number of SCM hosting operations served to mirrors, which may be running concurrently. This limit is intended to protect the system's CPU and memory from being consumed excessively by mirror operations. Note that dynamic throttling is not supported for mirror hosting operations.
throttle.resource.mirror-hosting.timeout	
`3600`	Controls how long threads will wait for mirrors hosting operations to complete when the system is already running the maximum number of git commands. This value is in **seconds**.
throttle.resource.scm-command	
`50`	Limits the number of git commands, such as: `git diff`, `git blame`, or `git rev-list`, which may be running concurrently. This limit is intended to prevent the operations which support the UI from preventing push/pull operations from being run.
throttle.resource.scm-command.timeout	
`2`	Controls how long threads will wait for SCM commands to complete when the system is already running the maximum number of SCM commands. This value is in **seconds**.
throttle.resource.scm-hosting.timeout	
`300`	Controls how long threads will wait for SCM hosting operations to complete when the system is already running the maximum number of SCM hosting operations. This value is in **seconds**.
throttle.resource.scm-hosting.strategy	
`adaptive`	Specifies the strategy for throttling SCM hosting operations. Possible values are 'adaptive' and 'fixed'. If 'fixed' is specified, throttle.resource.scm-hosting.fixed.limit is used as the fixed upper limit on the number of concurrent hosting operations. If 'adaptive' is specified, the maximum number of hosting operations will vary between throttle.resource.scm-hosting.adaptive.min and throttle.resource.scm-hosting.adaptive.max based on how many hosting operations the system believes the machine can support in its current state and given past performance. If any configured adaptive throttling setting is invalid and reverts to a default but this conflicts with other correctly configured or default settings, the throttling strategy will revert to 'fixed'. E.g. this will occur if `throttle.resource.scm-hosting.adaptive.min` is set to the same value as `throttle.resource.scm-hosting.adaptive.max`
throttle.resource.scm-hosting.adaptive.limit.min	

`1*${scaling.concurrency}`	When the adaptive strategy is enabled for throttling SCM hosting operations, this sets the lower limit on the number of SCM hosting operations, meaning pushes and pulls over HTTP or SSH, which may be running concurrently. Setting a lower limit provides a way to specify a minimum service level for SCM hosting operations regardless of what the adaptive throttling heuristic believes the machine can handle. There is limited support for mathematical expressions; +,-,*,/ and () are supported.
throttle.resource.scm-hosting.adaptive.limit.max	
`4*${scaling.concurrency}`	When the adaptive strategy is enabled for throttling SCM hosting operations, this sets the upper limit on the number of SCM hosting operations, meaning pushes and pulls over HTTP or SSH, which may be running concurrently. This is intended primarily to prevent pulls, which can be very memory-intensive, from exhausting a server's resources. Note that if the machine does not have sufficient memory to support this default value or an explicitly configured value, a smaller value will be chosen on startup. Adaptive throttling will vary the total tickets There is limited support for mathematical expressions; +,-,*,/ and () are supported.
throttle.resource.scm-hosting.adaptive.cpu.target	
`0.75`	When the adaptive strategy is enabled for throttling SCM hosting operations, this sets the target CPU utilisation for the machine (across all processors) which the system takes into consideration when calculating the current throttling limit. This value represents a trade-off: higher numbers may boost raw throughput of hosting operations, but at the expense of overall system responsiveness for all users. Increasing the target too high or too low brings diminishing returns. This must be a value between 0.0 and 1.0 and is a percentage of the total available CPU power across all cores
throttle.resource.scm-hosting.fixed.limit	
`1.5 *${scaling.concurrency}`	When the fixed strategy is enabled for throttling SCM hosting operations, this limits the number of SCM hosting operations, meaning pushes and pulls over HTTP or SSH, which may be running concurrently. This is intended primarily to prevent pulls, which can be very memory-intensive, from exhausting a server's resources. There is limited support for mathematical expressions; +,-,*, / and () are supported.
throttle.resource.scm-refs	
`8*${scaling.concurrency}`	Limits the number of ref. advertisement operations, which may be running concurrently. Those are throttled separately from clone operations as they are much more lightweight and much shorter so we can and should allow many more of them running concurrently.
throttle.resource.scm-refs.timeout	
`120`	Controls how long threads will wait for ref. advertisement operations to complete when the system is already running the maximum number of ref. advertisement operations. This value is in **seconds**.

gRPC

Default value	Description
grpc.server.address	

`0.0.0.0`	The address the gRPC services should bind to. The default value binds to all hosts.
grpc.server.port	
`7777`	The port to use for the gRPC services
grpc.server.ssl.cert-chain-path	
	The location of the file containing the full certificate chain, when SSL/TLS is used. Default is empty, which means SSL is disabled. Setting a value for this property will only have an effect if `grpc.server.ssl.private.key.path` is also defined.
grpc.server.ssl.private-key-path	
	The location of the file containing the private key, when SSL/TLS is used. Default is empty, which means SSL is disabled. Setting a value for this property will only have an effect if `grpc.server.ssl.chain.path` is also defined.

Bitbucket Mesh whitepaper

Overview

Bitbucket Mesh is a distributed, replicated, and horizontally scalable Git repository storage subsystem designed for high performance, scalability, and resilience. It's intended as an alternative to the existing Network Filesystem (NFS) based Git repository storage subsystem that Bitbucket Data Center has shipped with since its inception.

On this page

Benefits of Bitbucket Mesh

Bitbucket Mesh has a number of benefits compared to the NFS-based Git repository storage subsystem. These benefits particularly improve the experience of larger Bitbucket instances that service large numbers of users, host large or very active repositories, or require a high degree of redundancy and resilience.

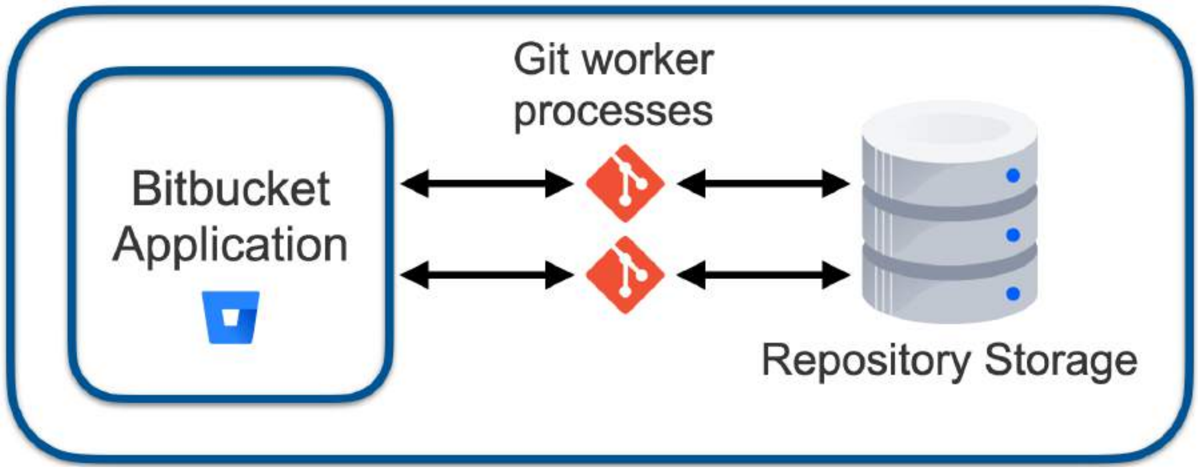
Performance

When moving from a single node to a clustered deployment, Bitbucket instances often see a decrease in performance. Moving from a single node to a multinode (clustered) deployment does provide increased scalability, due to the additional CPU and memory available to service user requests. So, such a system can sustain more concurrent users successfully.

However, individual requests can become slower. This occurs as a side-effect of moving the repository storage from a local filesystem to a network-attached filesystem, specifically NFS. In effect, this **moves the storage further away from the processing**, increasing filesystem input and output (I/O) operation latency.

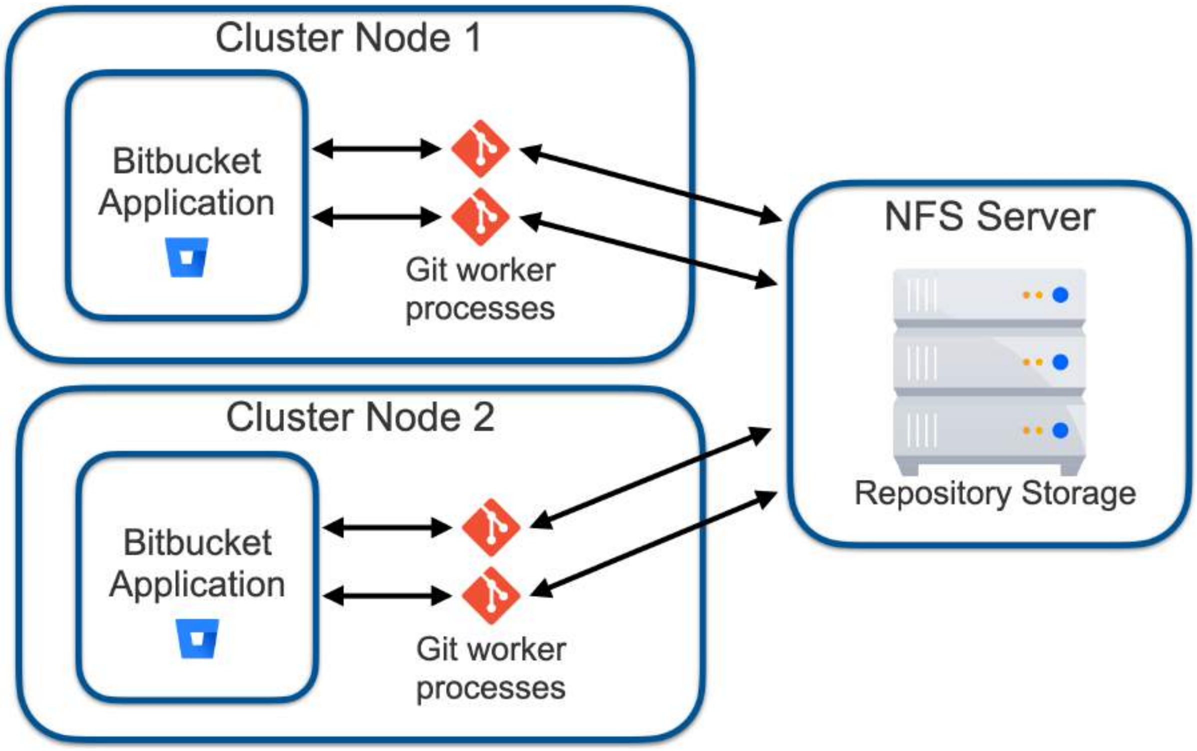
In a single-node Bitbucket deployment, the repository storage is hosted on a local filesystem (see Figure 1). In such a system, I/O latency for obtaining the size of a file, reading a block of data, and other operations is fast, often taking a few microseconds where data is cached, or on the order of 100 microseconds for a disk read.

Figure 1 – Bitbucket with local repository store



In a multinode Bitbucket cluster deployment, the repository storage is hosted on a remote NFS (see Figure 2). In such a system, I/O latency for similar operations is 10 to 1000 times slower due to the necessity of requests transiting the network, and due to the shared nature of the filesystem, many things can't be cached on the NFS client (that is the cluster node) but can only be cached on the NFS server, thus still incurring network latency overheads.

Figure 2 – Bitbucket cluster with NFS-based repository store

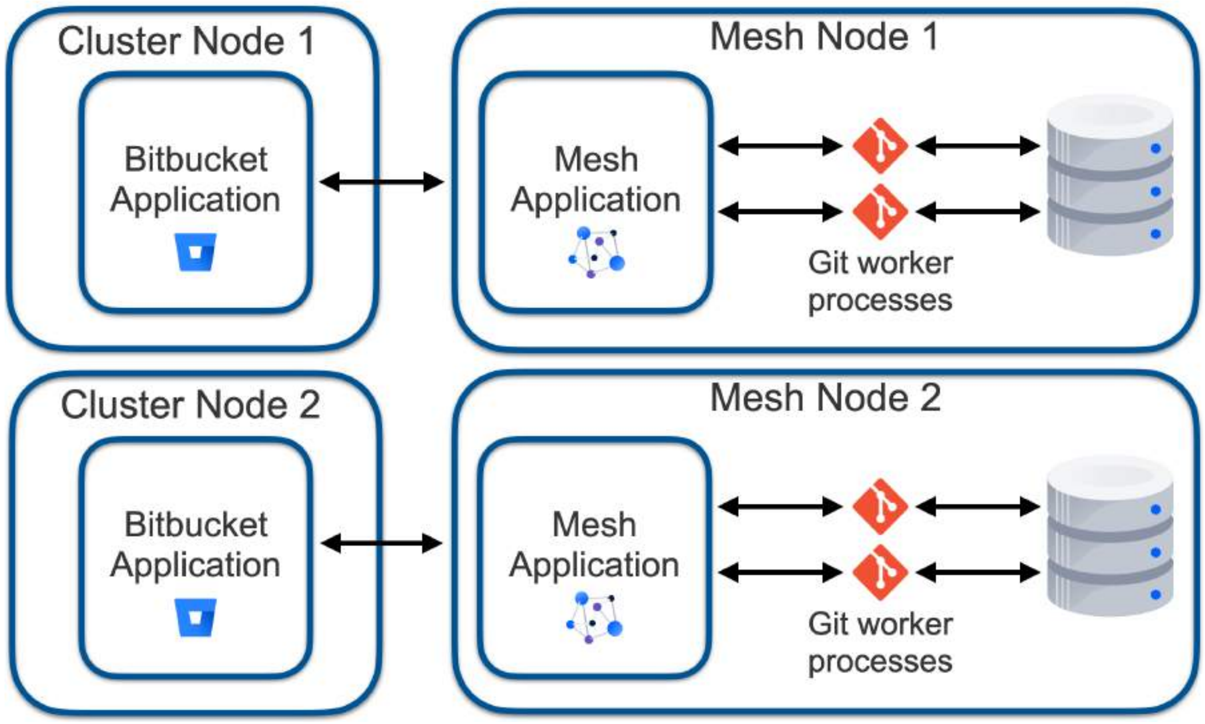


This increase in I/O operation latency is particularly harmful to Git as it relies on low-latency filesystems for high performance. To illustrate this, we can take a user request to list all branches or tags in a repository. This would result in Bitbucket forking a git-for-each-ref process to obtain the list from the repository on disk. For a repository with many branches, particularly if git-pack-refs hasn't run recently, such a request may require, for example, 5000 individual I/O operations. On a local filesystem where operation latency is 10 ms, this request would take 50 ms to complete, appearing almost instantaneous to a user.

The same request on an NFS-based repository store, where operation latency is often in the range of 0.5-2 ms, could instead take between 2.5 and 10 s, which is an unacceptably long time for an interactive user interface.

Mesh solves the above problem by **moving the processing to the storage**, eliminating the additional I/O operation latency that exists in the NFS-based system (see Figure 3). If we take the above example and apply it to a Mesh-based system, the cluster node makes a single remote procedure call (RPC) to a Mesh node. Then, the forked Git process makes its 5000 I/O requests to the local storage, taking 50 ms to complete (that is 5000 x 10 ms). Then, factoring in the RPC round trip overhead of, for example, 1 ms, the entire request would take a total of 51 ms to complete – again appearing almost instantaneous to a user.

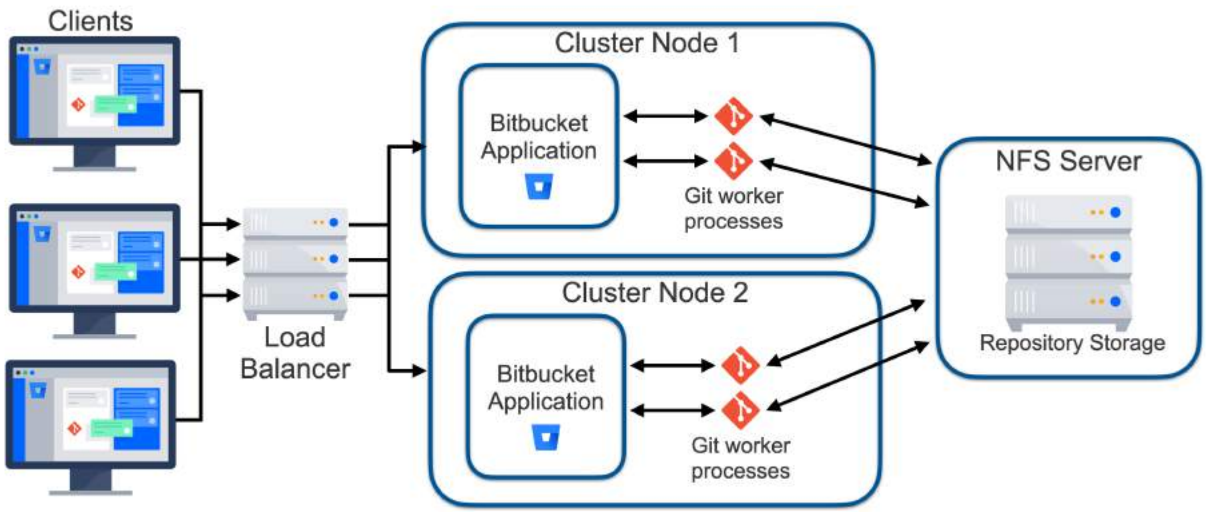
Figure 3 – Bitbucket with Mesh-based repository store



Resilience

When deployed as a cluster, Bitbucket Data Center is designed for high availability. Figure 4 shows a typical Bitbucket cluster in a high-availability deployment. This type of deployment can sustain the loss of a cluster node either due to scheduled maintenance or a failure.

Figure 4 – Bitbucket cluster with NFS-based repository store in a typical high-availability deployment



However, it can be challenging to build a truly highly available NFS server. The standard supported NFS deployment is a Linux-based NFS server. While this system may be built with redundant disks, power supplies, and network interfaces, it's still a single node and subject to failures. Besides, it can't be restarted for maintenance (such as operating system patching) without a Bitbucket system outage.

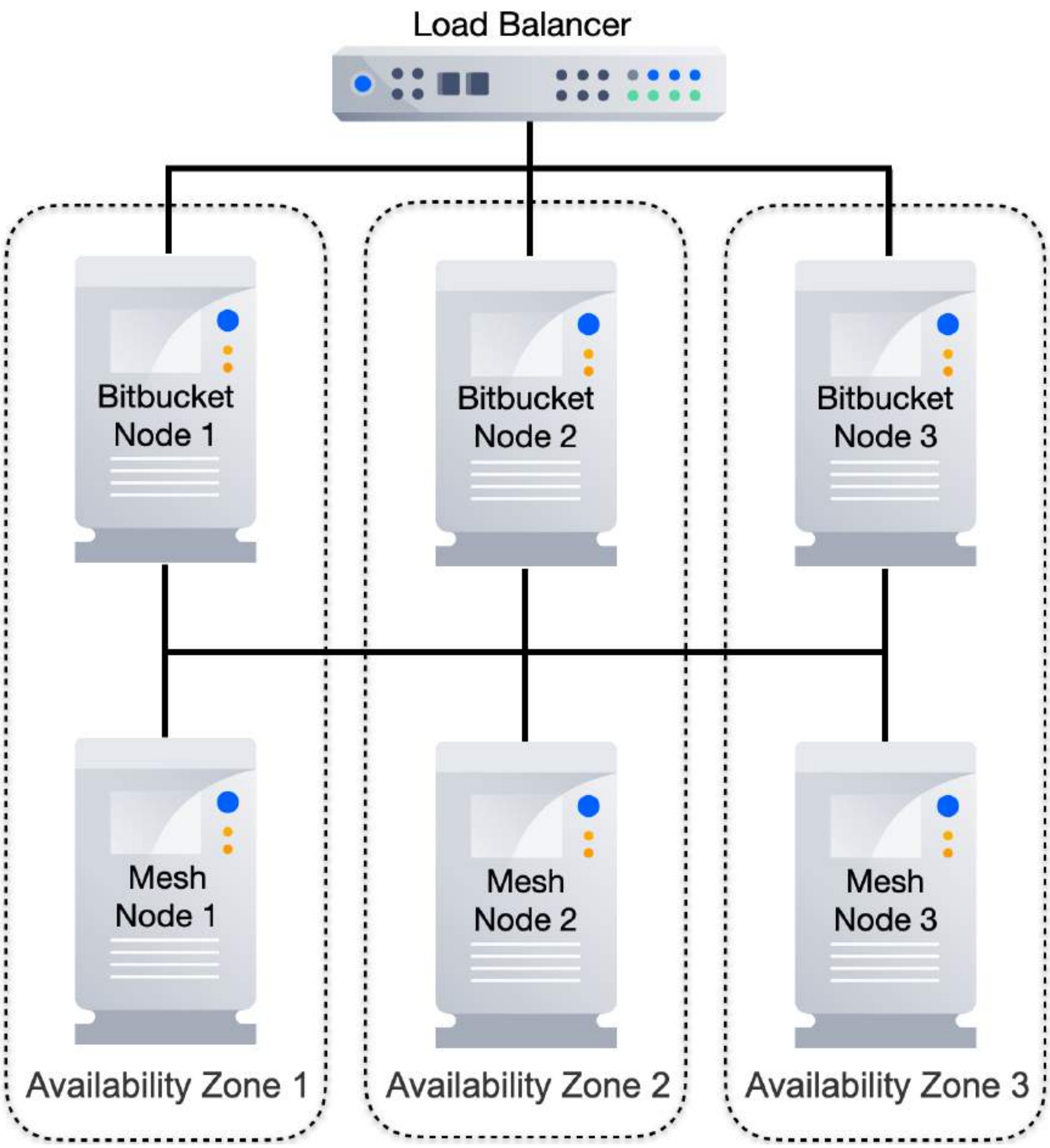
Various commercial NFS “appliances” take the concept of redundancy further, including redundant system boards. These boards mean that updates can be carried out without interrupting operations, and often most components can be replaced without an outage. However, these are expensive and still deployed in a single physical location, so they aren't truly redundant.

Unfortunately, fully redundant network filesystems are highly unsuited to Bitbucket’s needs, or more specifically Git’s needs, as the synchronization and coordination overheads result in very high I/O latency for filesystem operations. As a consequence, Bitbucket performance becomes wholly unacceptable. This problem also applies to cloud-based NFS services such as Amazon’s Elastic Filesystem and other cloud offerings, making highly available cloud deployments unobtainable.

Mesh solves this problem as it's a sharded, replication-based repository store consisting of multiple truly redundant nodes. When repositories are migrated to Mesh, they're replicated to multiple Mesh nodes. That ensures that the loss of any single node has no impact on the availability of the repositories it hosted because each still has replicas available on other nodes. When Mesh nodes are brought back online, they automatically repair their replicas and are returned to service.

Furthermore, it's possible to host Mesh nodes in different physical locations. This permits different Mesh nodes to reside in different data centers, with separate power supplies, network infrastructure, cooling systems, and other factors that can greatly increase resilience. Using cloud terminology enables a multiavailability zone repository store.

Figure 5 – Multiavailability zone deployment of Bitbucket with Mesh



Scalability

The NFS-based Bitbucket cluster permits horizontal scalability but with some limitations as to how the NFS-based repository store can be scaled. Specifically:

- **Adding new cluster nodes** increases CPU and memory available to Git worker processes as well as increases network bandwidth.
- **Adding additional NFS data stores** increases repository storage I/O bandwidth.

However, adding additional NFS data stores only provides the ability to scale the I/O bandwidth available to *e xisting repositories*. Only new repositories are created on the additional NFS data stores while existing repositories don't benefit from the additional data stores.

Additional data stores provide scaling where the load is mostly uniformly distributed over all repositories. However, this is also not a helpful scaling mechanism when development teams are using a monorepo – a single large repository that hosts multiple projects, potentially used by all developers or a large fraction of the development staff.

Bitbucket Mesh provides true horizontal scaling of both processing and storage capacity. Repositories are replicated to multiple Mesh nodes, and each replica is capable of actively serving both read and write traffic. Each replica adds capacity, and this capacity can be incrementally added or removed, permitting flexible scaling both up and down.

Disadvantages of Bitbucket Mesh

While discussing the many benefits of Bitbucket Mesh, it's also worth discussing the disadvantages, with the primary disadvantage being the increased complexity.

Complexity

A typical Bitbucket Data Center instance is relatively simple. It consists of the Bitbucket Java application plus a database, filesystem, and an OpenSearch instance. This is made slightly more complex when an instance is deployed in a cluster since there are multiple instances of the Bitbucket Java application running. However, at the core, it's still simple, with the core state existing on the shared filesystem and the database.

Mesh complicates this, with a second Java application type needing deployment (the Mesh application) and the additional core state existing on multiple Mesh nodes. This makes the following activities more complex:

- Deployment
- Bitbucket version upgrades
- Monitoring
- Backup and restore
- Troubleshooting

For a Bitbucket instance running well, one that wouldn’t benefit from any of the abovementioned performance, resilience, or scalability benefits, migrating to a Mesh-based deployment may not be desirable. Instead, the NFS-based Git repository storage subsystem may better suit such instances.

Additional storage capacity requirement

With the traditional NFS-based repository store, there's exactly one copy of each repository on disk. Although this is a slight oversimplification as filesystems may be configured as RAID1, RAID5, or similar, which incurs some additional storage space.

Bitbucket Mesh provides increased scalability, performance, and resilience, but at the cost of additional disk storage requirements. Bitbucket Mesh uses *replication* of repositories to achieve these goals, and with a minimum replication factor of three, the minimum disk storage requirement is also increased by a factor of three.

This doesn’t necessarily translate to a linear (for example, three-fold) increase in storage pricing. Most Bitbucket Data Center deployments that are built for high availability rely on expensive “NFS appliances” for highly scalable and reliable storage. Bitbucket Mesh permits building out horizontally using usually the most cost-effective internal storage, direct attached storage (DAS), or storage area network (SAN) based storage.

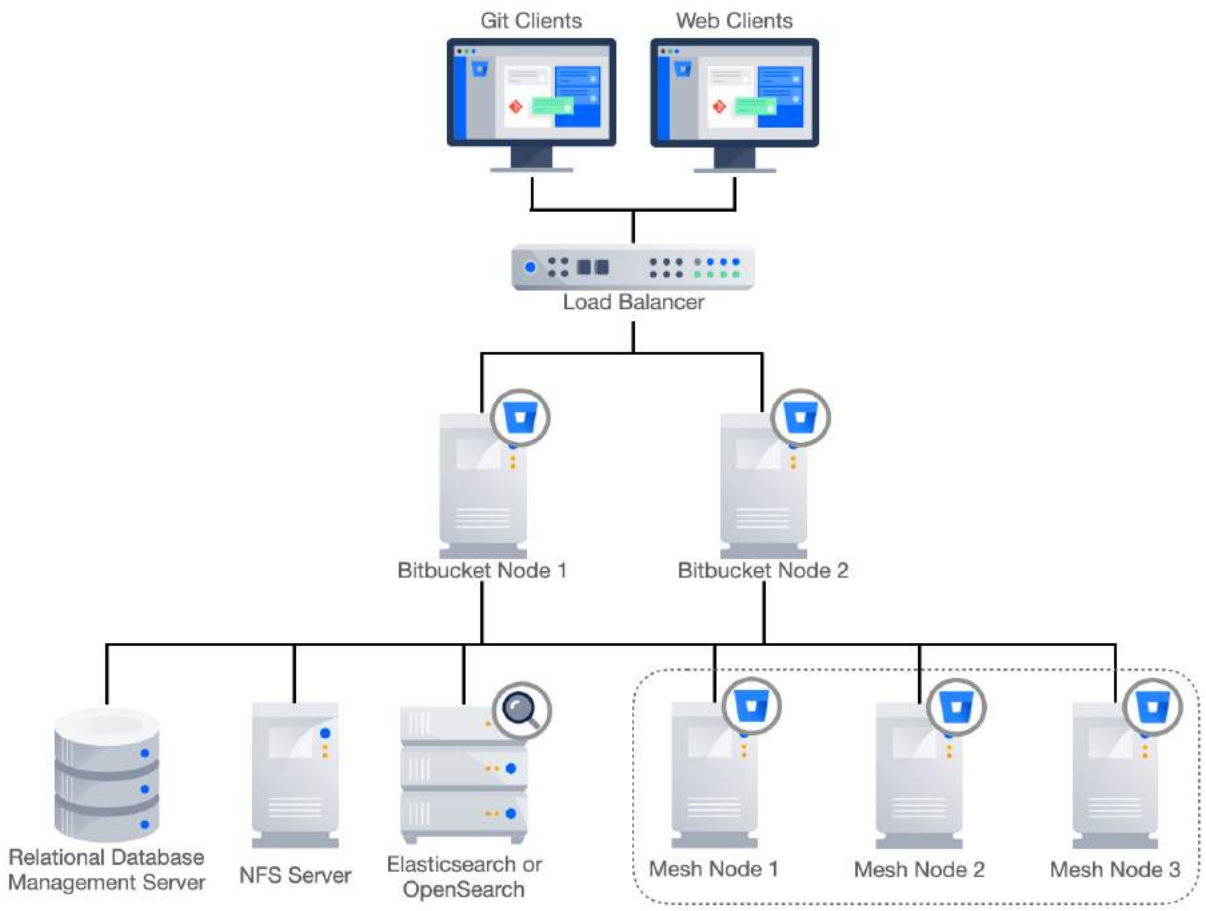
Deployment overview

A traditional (pre-Mesh) clustered Bitbucket Data Center deployment is comprised of the following components:

- One or more Bitbucket Application nodes
- Load balancer
- Relational database management system (RDBMS)
- OpenSearch instance
- Network filesystem (NFS)

Enhancing this deployment to include Mesh requires the addition of a minimum of three Mesh nodes. A minimal clustered Bitbucket Data Center deployment with Mesh can be seen in Figure 6.

Figure 6 – Minimal clustered Bitbucket Data Center deployment with Mesh



A minimum of three Mesh nodes must be deployed because this is the minimum supported replication factor required for the system to sustain a failure of one node and still form a write quorum. Any number of Mesh nodes three or greater can still be deployed, as this may be needed to scale processing, storage, or networking capacity.

It should be noted at this point that the application running on the Mesh nodes isn't the normal Bitbucket Java application, which we'll call the *core Bitbucket application* from here onwards. Rather, a new application is installed on the Mesh nodes – we'll call it the *Mesh application*. This new application is a gRPC server that provides remote procedure calls (RPCs) to read, write, and manage the Git repositories managed by the Mesh application.

It may seem surprising that the NFS server still exists in the above deployment. On the surface, it might appear that once the repository data is migrated to the Mesh nodes, the NFS server could potentially be removed. The NFS server, or more specifically a shared file system, is still necessary and continues to host non-Git data, including project and user avatars, attachments that may be associated with pull requests and inlined in comments, plugins, Git Large File Storage (LFS) objects, and many other things. However, once all repositories have been migrated to Mesh, many of the strict performance requirements Bitbucket sets for the shared filesystem are no longer present. This means:

- The requirement to use NFSv3 can be relaxed to permit NFSv4 usage. Historically, NFSv4 wasn’t supported as it requires more round trips for the same operation when compared to NFSv3, which resulted in inferior performance.
- Cloud-managed NFS filesystems such as AWS Elastic Filesystem (EFS) can be utilized.
- Potentially, in the future, non-NFS shared filesystem may be available for utilization. This is subject to further testing to ensure the basic requirements are still met, including POSIX compatibility, delete on last close, locking, etc.

Key concepts

The following describes a number of key Mesh concepts. Understanding them will improve the understanding of how the system works and why it works that way.

Replication

The key to Bitbucket Mesh’s ability to scale and provide fault tolerance is the concept of replication. In the NFS-based repository store, there's only one copy of the repository on disk. In Mesh, there exist multiple copies of any given repository, with the specific number controlled by the “replication factor” tunable. At the time this document is being written, this setting is global, affecting all repositories. In a future version of Bitbucket, it's expected that the setting will become tunable on a per-repository basis. The default replication factor is three, and the minimum is also three for the reasons described below.

Replication implies an increase in the storage required for repositories when compared to an NFS-based repository store. If we take a simple example with 500 GB of repository data on NFS, deploying three Mesh nodes, and given the default replication factor of three, each Mesh node will require 500 GB of storage for these repositories. This is a total of 1500 GB of storage.

For a more complex example, it's more challenging to determine the exact amount of disk space required. Take the same 500 GB of repository data on NFS, with a replication factor of three, and five Mesh nodes. In this case, the total storage requirement is also 1500 GB but distributed over five Mesh nodes. Assuming a large number of repositories of the same size, 1500 GB could be divided by five, indicating a storage requirement of 300 GB per Mesh node.

In reality, not all repositories are of equal size. In the above example, if the size of one repository was 400 GB, three of the five Mesh nodes would clearly require at least 400 GB of storage.

Scalability

Mesh provides the ability to scale vertically and horizontally. Horizontal scaling specifically exceeds the scaling capabilities of the NFS-based repository store. However, there are some important subtleties. For the purposes of scaling, we’ll focus on three core factors:

- Disk I/O bandwidth and IOPS capacity
- CPU available to Git worker processes
- Memory available to Git worker processes

In the NFS-based repository store, the ability to scale disk I/O faces an inevitable upper bound since for a given repository, only vertical scaling is possible. Additional NFS filesystems can be attached, providing some horizontal scaling, but a given repository can only ever exist on one NFS filesystem.

However, CPU and memory can be added to the system by adding *application nodes*. Since each application node has a shared view of mounted NFS filesystems, it can service a request for **any repository** hosted by the system. This is true regardless of whether the instance has two or 20 application nodes.

Mesh has a slightly different characteristic when scaling horizontally since a given Mesh node can only service requests for repositories for which it hosts a replica. This can become a bottleneck where some “hot” repositories exist. That is repositories that are large, busy, and have a disproportionally large fraction of usage relative to other repositories. For example, given a replication factor of three and a deployment of 20 mesh nodes, only three mesh nodes are able to service requests for a given “hot” repository, with the other 17 nodes remaining idle or only servicing requests for other repositories.

This problem could be resolved by increasing the replication factor to 20, resulting in all 20 mesh nodes hosting a replica of each repository, and thus being able to service requests for any repository. However, this comes at the cost of increased storage space required: in this case, a 20-time increase over the storage requirement of the NFS-based deployment.

In reality, for most systems, there will be a happy middle ground that balances the need for scaling with the desire to minimize the cost of storage. When migrating an existing system, this middle ground can be obtained, at least approximately, by analyzing the distribution of requests using the access logs.

Fault tolerance

Replication also provides increased fault tolerance over the NFS-based repository store. The standard supported NFS deployment is a Linux-based NFS server. While this system may be built with redundant disks, power supplies, and network interfaces, it's still a single node and is subject to failures. Besides, it can’t be restarted for maintenance (such as operating system patching) without a Bitbucket system outage.

Mesh replicas are located on three or more completely separate Mesh nodes which can leverage not just independent hardware but also needn’t share the same power source, cooling, network, or even physical location.

The minimum configurable replication factor is three. This permits the loss of one replica while still supporting writes. The writes succeed on a quorum of replicas, where “n” is the replication factor a quorum of (n/2 + 1) replicas must be available for a write to succeed.

The result of the division should be rounded down. For example, with a replication factor of three, a minimum of two replicas must be present for a write to succeed. For a replica to participate in a write operation, it must be consistent. A replica may be inconsistent because the node missed one or more writes while it was offline and hasn’t been repaired yet. So, a node hosting a replica may be online but may still be inconsistent and thus, ineligible for participating in a write transaction. As a result, it won’t count towards the quorum.

Read operations aren't subject to the same quorum logic and only require one available and consistent replica.

Control plane

To build a model of how Bitbucket Mesh functions, it's useful to understand what the Mesh application is responsible for managing and what the core Bitbucket application is responsible for.

The subsystem in the core Bitbucket application that is responsible for managing the Mesh nodes is known as the *control plane*. Among other things, it's responsible for:

- Distribution of configuration information to Mesh nodes.
- Allocation of repository replicas to Mesh nodes, specifically partition replicas described below.
- Routing of requests to Mesh nodes based on the knowledge of which Mesh nodes contain a consistent and up-to-date replica of a given repository.
- Management and distribution of replica state, either consistent or inconsistent.

Generally, it's useful to think of Mesh nodes as relatively simple repository storage agents and of the control plane in the core Bitbucket application as the brains.

Partitions

Managing replicas on a per-repository basis is potentially inefficient on systems with large numbers of repositories impacting scalability. A higher-level entity exists to solve this – a partition. The partition is an aggregate entity encompassing one or more repository replicas. The concept of the partition isn't particularly relevant to the operation of a Mesh-based system. It's introduced here to aid in describing some of the topics in this document.

Rebalancing

Bitbucket Mesh implements partition migration to allow repository replicas (actually, partition replicas) to be migrated between nodes. At this time, partition migration exists to support rebalancing repositories across Mesh nodes in support of the following two use cases.

Adding a new Mesh node

When a new Mesh node is added to the system, it should start servicing requests for existing repositories. When a new Mesh node is added, a rebalancing operation takes place, migrating one or more partition replicas from existing Mesh nodes to the new Mesh node.

Removing a Mesh node

When a Mesh node is removed, it becomes unavailable to host replicas. It's important to understand the difference between an *offline* node and a *removed* Mesh node. If a Mesh node is simply shut down or is drained and disabled, this node still hosts replicas. They are unavailable temporarily.

Removing a Mesh node is a configuration change that means the Mesh node is no longer known to the contr ol plane and no longer hosts replicas. For the system to maintain the same availability guarantees, the replicas must be hosted by that node to be migrated to another node prior to removal, and specifically, to another node that doesn't already host replicas for the given partition.

Currently, rebalancing doesn't take available disk space or load into account. It implements an algorithm that simply tries to uniformly distribute replicas amongst available Mesh nodes. A future version of Bitbucket is expected to account for these additional factors in making placement decisions.

Repository repair

A repository replica needs to be repaired when the replica has fallen behind either because the node missed one or more writes while it was offline, or because the node failed to replicate the write. The repair is also used to initialize a repository replica from scratch. This is done when:

- A new replica is created for a partition.
- A repository is migrated from NFS to Mesh. The migration does an upload to a 'primary' migration target and then, uses the repair to sync up the other replicas.
- Migrating partitions from one node to another. This happens during rebalancing, after a new Mesh node has been added or prior to the deletion of a Mesh node.

Request routing

Mesh provides horizontal scaling because multiple nodes can handle read and write requests. A request for a given repository can be routed to potentially any Mesh node that hosts a replica of that repository.

Before we describe request routing to Mesh nodes, let's start with a description of how client requests are routed to application nodes. When a client, either a web UI client or a Git client connecting via SSH or HTTP, makes a request, they're connected to one of the nodes of the primary cluster that runs the **core** Bitbucket application.

These connections are initially handled by the load balancer, which then proxies those connections through to one of the cluster nodes. Web UI connections generally require session stickiness so subsequent requests for the same session are routed through to the same node, although the initial connection is typically randomly assigned to a node. So, given a large number of users, the load from web users will be roughly uniformly distributed. However, connections from Git clients don't require stickiness, and a user performing multiple clones can see each request connected to a different cluster node.

While processing a request, the cluster node handling the request may need to query the database for information, and it may need to read or write to the Git repository. This need is obvious for Git operations such as clone, fetch, or push. However, even the web UI connections often require information from the Git repository. For example, the user may be asking for a list of all branches, viewing the contents of a file, or comparing the diff between two branches. These needs are fulfilled by the Mesh subsystem, with the application running on the cluster, making gRPC remote procedure calls on the Mesh nodes.

Before making an RPC, a Mesh node must be selected to fulfill the request. This node:

- Must host a replica of the repository that is the target of the request.
- Must be online and not draining. Draining means the system is trying to quiesce the node so it can be taken offline, perhaps for maintenance.
- The replica must be consistent. A replica may be inconsistent either because the node missed one or more writes while it was offline or because the node failed to replicate a write.

Given the set of Mesh nodes that match the above criteria, the request will be assigned to a Mesh node randomly, with the set of all requests expected to be uniformly distributed across eligible Mesh nodes.

Authentication

The core Bitbucket application communicates with the Mesh process via gRPC so that the Mesh application is the gRPC server and the core Bitbucket application is the gRPC client. Mesh application processes also communicate amongst each other via gRPC, primarily for tasks such as write replication and repairs.

These RPC are authenticated using JWT. Each request has a JWT auth token with claims signed by the caller and each response has a token signed by the responder. A 2048-bit RSA signing key pair exists for each Mesh node, and one exists for the control plane, that is for the core Bitbucket application. The key exchange happens when a Mesh node is first added to the system.

Repository migration

Repository migration is the process of moving repositories from the NFS-based repository store to Mesh. It's possible to upgrade to Bitbucket 8.0+ and not adopt Mesh. Repositories continue to reside on the NFS-based repository store. When ready to leverage Mesh, three or more Mesh nodes are deployed and Bitbucket is configured to use them. However, once the nodes are added to the system, they remain unused until existing repositories are migrated to Mesh or until new repositories are created there.

By default, new repositories aren’t created on Mesh. This can be changed by enabling **Create new repositories on Mesh** in Bitbucket Administration. Note that forking existing repositories doesn’t result in the fork being created on Mesh. If a repository resides on the NFS store, so do all forks, the existing and new ones.

Separate from the option to create new repositories on Mesh is the ability to migrate existing repositories to Mesh. The UI provides a tool that allows repositories to be migrated individually or for all repositories to be migrated at once. Repository migration doesn’t require downtime and can be carried out even while the repositories being migrated are still in use.

Not all repositories need to be migrated to Mesh simultaneously, permitting a gradual migration that may be phased and stretched out over many days, weeks, or more. This is often useful to derisk a Mesh migration in case you are unsure if your Mesh deployment is appropriately sized or ready for production load. It is possible to move repositories gradually while monitoring load and resource usage.

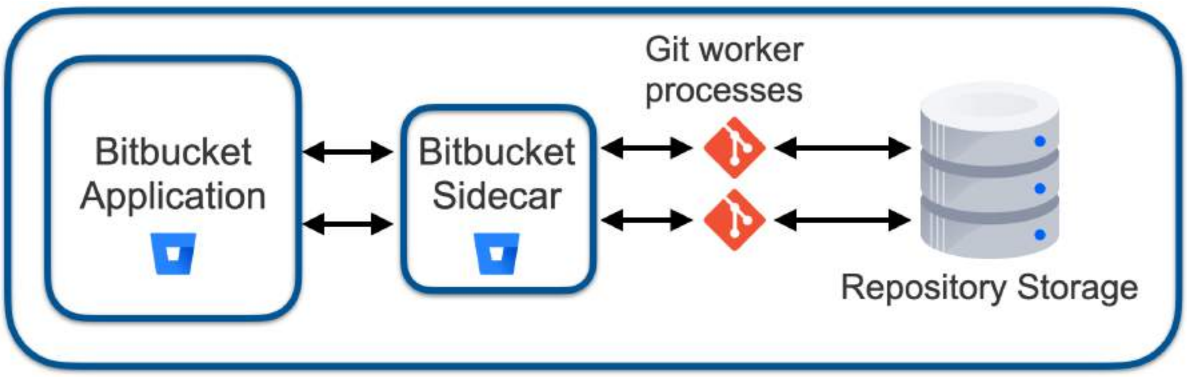
Sidecar

The Git source code management (SCM) logic, which was part of the core Bitbucket application prior to Bitbucket 8.0, has been extracted to the Mesh application.

Specifically, when upgrading Bitbucket to 8.0+, even repositories hosted on the NFS repository use a sliver of the Mesh code path. In Bitbucket prior to 8.0, the Git SCM logic existed in the core Bitbucket application. It was responsible for forking Git worker processes (see Figure 1). In Bitbucket 8.0, this Git SCM logic is factored out of the core Bitbucket process into its own process that we call the *Sidecar* (see Figure 7).

This sidecar is actually the same application as Bitbucket Mesh, but only a small subset of the functionality is used in this role. Think of it as a Mesh-lite process. It's used for repository access but doesn't leverage concepts such as replication, or partitions.

Figure 7 – Bitbucket with sidecar process



Generally, the sidecar is a concept that isn't important to the operations of your Bitbucket instance. Where previously the Bitbucket application made Java method calls to access process-local SCM code, now it makes a gRPC call to the sidecar process to do the same. The primary areas where the administrator needs to be aware of the existence of the sidecar are monitoring and troubleshooting.

The existence of the sidecar process doesn't constitute “using Mesh”. The sidecar process isn't listed in Mesh nodes in the administration UI. None of the benefits of using a Mesh-based deployment are granted by the use of this sidecar process.

Deployment considerations

The following describes a number of considerations relating to the deployment of Bitbucket Mesh.

Multiple availability zone deployments

The concept of an availability zone is a common cloud term used to describe a data center where all resources share a physical location and often cooling, power, and other core subsystems. A multiple availability zone deployment leverages two or more of these availability zones to provide additional redundancy. The system is then more resilient in the face of power, cooling, and other hardware failures, as well as to events such as fires and floods.

As described previously, Bitbucket Mesh supports the concept of multiavailability zone deployment. This wasn't possible with the NFS-based repository store since the NFS server could only exist in a single location and thus, be a single point of failure. Consequently, deploying the Bitbucket application nodes in multiple availability zones didn't increase resilience. Furthermore, the low filesystem I/O latency Bitbucket and Git require means that even if a multiavailability zone NFS service was available, the performance of this deployment would be unacceptable.

A successful multiavailability zone deployment of Bitbucket Mesh hinges on two factors:

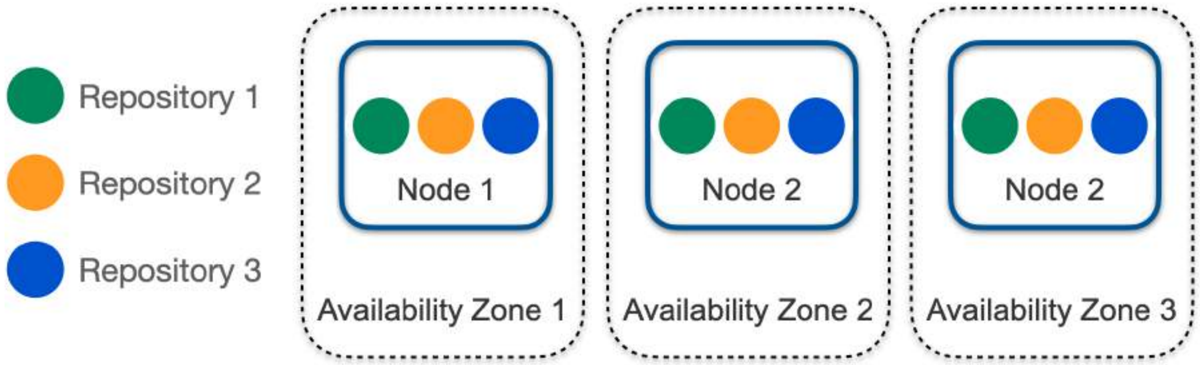
- The ability to ensure the additional latency incurred for the RPCs is acceptable.
- Replicas are distributed across Mesh nodes so that they exist in a sufficient number of availability zones to permit a single availability zone failure, while still having enough replicas to form a write quorum.

The first requirement can be met by ensuring the round trip latency between Mesh nodes is under five ms, and similarly, the round trip latency between the Bitbucket application nodes and the Mesh nodes is under five ms. This can be measured with an Internet Control Message Protocol (ICMP) ping between nodes. This figure of five ms implies that these availability zones must be relatively close geographically, generally within the same city. In cloud terminology, this also means that while multiavailability zone deployments are viable, multiregion deployments aren't. The typical latency between regions is often tens of milliseconds and often over one hundred milliseconds.

The second requirement can be met when some conditions are fulfilled. Specifically, nodes must be distributed between availability zones so that the loss of one availability zone leaves a sufficient number of replicas for a write to succeed. The writes succeed on a quorum of replicas, where “n” is the replication factor a quorum of (n/2 + 1) replicas must be available. Note that the result of the division should be rounded down. For example, with a replication factor of three, a minimum of two replicas must be present for a write to succeed.

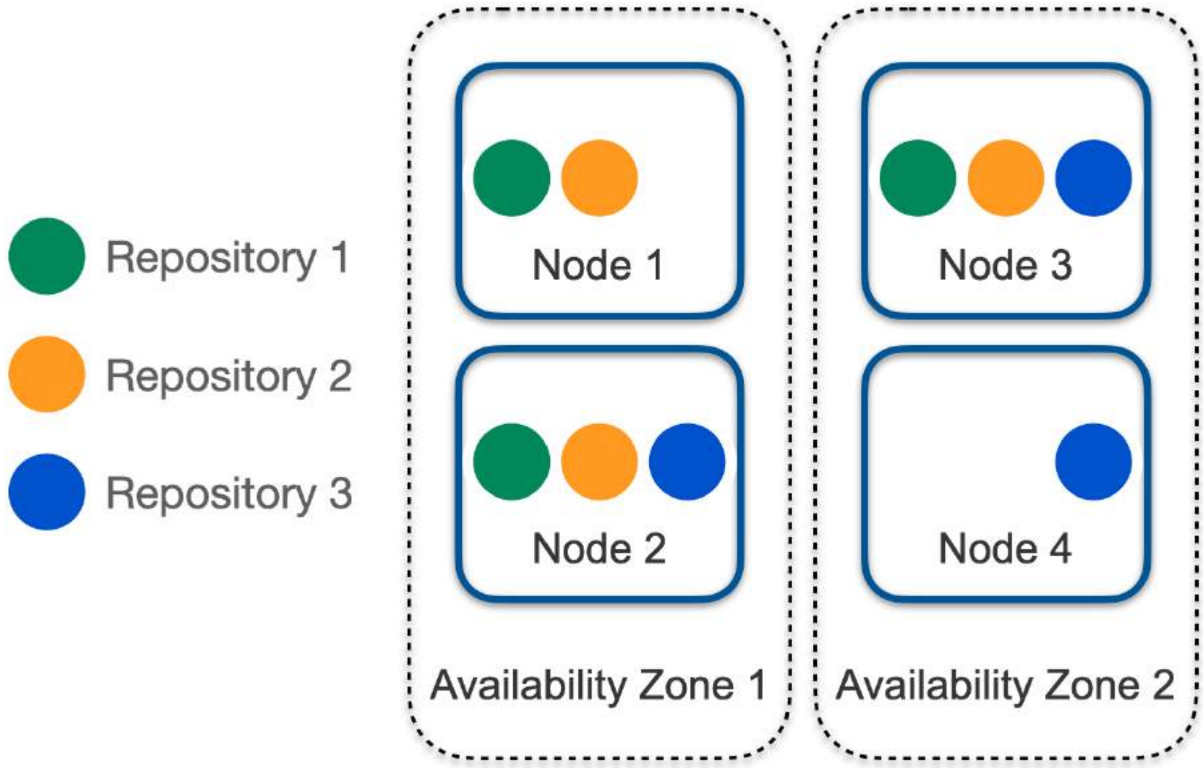
In a simple scenario with a replication factor of three and three Mesh nodes each in separate availability zones, it’s easy to check how an outage in one availability zone would still result in two replicas being available. See Figure 8.

Figure 8 – Redundant multiavailability zone deployment



However, a scenario with a replication factor of three and only two availability zones results in a nonredundant deployment. See Figure 9, where a failure of availability zone 1 would mean repository 1 only has one remaining replica, and thus a quorum can't be achieved and writes would be rejected. Reads would be successful via node 3.

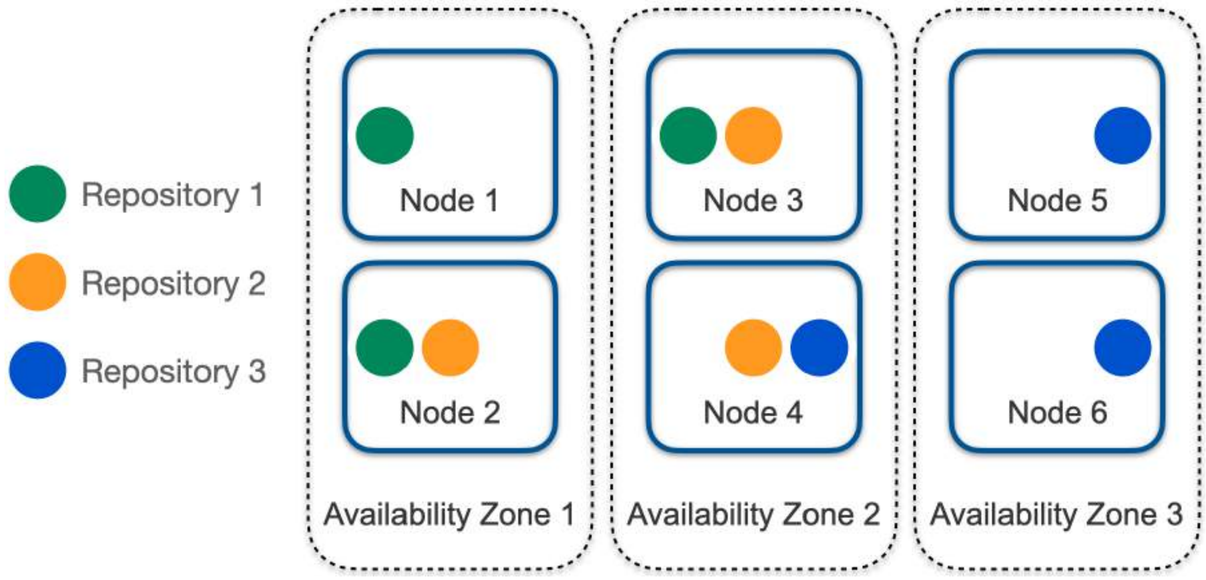
Figure 9 – Nonredundant multiavailability zone deployment



However, having a redundant deployment isn’t sufficient in many cases. Bitbucket must be aware of availability zones and the replica placement aware of availability zone must be implemented.

Take the scenario in Figure 10. For a replication factor of three, each replica can be placed in a separate availability zone. However, as illustrated, this hasn't happened. An outage in any availability zone will result in one of the three repositories not being able to form a quorum for writing.

Figure 10 – Multi availability zone deployment with nonredundant replica placement



In Bitbucket 8.9, the logic to perform the replica placement aware of availability zones doesn't exist. It's still in development. The work can be tracked here:

BSERV-13270 - Mesh: Support Mesh nodes being deployed to multiple Availability Zones **IN PROGRESS**

Until support for the replica placement aware of availability zones is added, achieving a redundant multiavailability zone deployment must be implemented manually. This can be achieved *manually* by ensuring that, even with the most pessimistic replica placement, the loss of a single availability zone would still permit a write quorum to be formed. This can often be achieved by increasing the replication factor. For example, the case in Figure 10 can be made resilient by increasing the replication factor from the default three to at least five.

The simplest approach may be to ensure that each Mesh node resides in its own availability zone, with no other Mesh nodes residing in the same availability zone.

Auto-scaling

Bitbucket Mesh can scale up by adding more nodes and scale down by removing nodes. This can be a desirable characteristic for a Bitbucket deployment since the load is often very spiky. These spikes occur due to the load from build systems that can execute hundreds of build jobs in response to a change being pushed to Bitbucket. These build jobs can result in hundreds of Git clone or fetch requests almost simultaneously.

In many cloud environments, it's desirable to implement automatic scaling or auto-scaling. This is a method of scaling up and down automatically, based on continuous monitoring of the load combined with some logic that decides when to add or remove nodes.

Auto-scaling works well for mostly stateless applications. However, Mesh is very stateful by definition. Adding a Mesh node so that it can service requests involves a process called *rebalancing*. This process migrates some replicas from existing Mesh nodes to new Mesh nodes. Likewise, deleting a Mesh node also involves rebalancing, where replicas are evacuated to the remaining Mesh nodes. So, the configured replication factor is maintained after the node is deleted. These processes can take tens of minutes or even hours for larger systems. Such timeframes are somewhat incompatible with the demand for auto-scaling because the bursts of traffic that auto-scaling aims to handle have a duration of about five to 20 minutes typically. So, by the time a Mesh node is available to service requests, the spike may have subsided.

Furthermore, when adding a new node, populating it with repositories replicas places a load on the existing nodes, as these are the source of the data being copied. So, right at the moment, the system is trying to better handle a load spike while replication actually taxes the system, reducing its capacity to handle user-driven requests. Consequently, it's unlikely that fine-grained auto-scaling would be beneficial, so it wasn’t a design goal for Bitbucket Mesh.

Export and import projects and repositories

Data Center Migration is a tool for admins that can be used to:

- consolidate multiple Bitbucket instances
- move from a Bitbucket Server to a Bitbucket Data Center instance
- selectively export/import projects and repositories from one Bitbucket Data Center instance to another

Git data can be imported or exported into Bitbucket Data Center from another Bitbucket Server or Data Center deployment, along with pull requests, comments and attachment history.

This feature is only available to customers with a Bitbucket Data Center instance.

Before starting a migration, review the below information carefully. There is also information around troubleshooting, canceling and cleanup, and error and warning messages.

Before you start

This is a high-level description of considerations and tasks to review and complete before performing a migration. Read through the following sections carefully before starting a migration.

User Interface

There's no graphical user interface in the initial (Bitbucket Server 5.14) release of this feature. Instead, REST calls can be made to control the migration process.

To perform the migration you will need to either:

- use your favorite tool to make REST calls, or
- refer to the provided sample cURL commands for import and sample cURL commands for export.

If you plan to use cURL commands, we recommended you setup a `.netrc` file (sample commands use the `-n` flag) and install `jq` on your machine.

Using the preview REST endpoint

You can use the preview function to review the scope of the export, prior to a migration.

The preview takes into account fork hierarchies, which are always migrated fully.

Disk space requirements

Always make sure you have enough disk space for the files you're migrating. The space required on disk during export is roughly the size of the Git data and attachments being exported.

Additional space is required for ElasticSearch, and for your database server.

If you are unsure what space you have available, the following knowledge base article tells you how to identify a repository ID in Bitbucket, which you can then use to check the available disk space.

Issues with project name conflicts

Before migration, check the names of projects on both the source and destination instances. If a project name is in use **on the destination instance**, the project being **imported** will be renamed.

To avoid this either:

- check all project names and rename **before** migration, or
- **after** the migration, review the warnings on the import job, and rename projects manually.

The same logic applies to repository names in personal projects.

Time needed for export

There is no real way to predict the time required for the export, it is impacted by your data set, individual load, and traffic.

Some tests have shown that an export of 200GB can take anywhere between 2 - 4 hours, but this can be higher.

Time needed for import

There is no real way to predict the time required for import, it is impacted by the size of the export archive being imported, the number of pull requests, and the number of repositories.

An import **will take longer than an export** (roughly four times as long). This is because indexing and validation (performed during import) doesn't occur during export, and remains dependent on your data set, individual load, and traffic.

User and license management recommendations

Non-active users are added to a generated list of "deleted users" on **export**, and do not take up licenses on migration.

We strongly recommend that both the source and destination instances are connected to the **same user directory** prior to migration.

Even though users will not be migrated, their permissions on projects and repositories will, and permissions are matched by *username*. If users are missing on the destination instance, permissions might not be migrated and a warning will be logged.

If user directories are different on both instances, it is possible that users with the same *username* exist on the destination instance, but are actually different users in the source instance. This would result in incorrect permissions being granted to those users on import.

Third party plugins

It's important to know that third party plugins **will not be migrated, neither will their data.**

Plugins can implement their own migrations using this API.

Pull request comments

If a pull request comment references an attachment that was uploaded to a different repository, there is a possibility that the attachment will not be successfully imported.

E.g if a user has uploaded an attachment to a comment on a pull request in one repository, then copies and pastes the link into a **different** comment on a pull request, in another repository.

This will not impact the import of the rest of the comment, only the attachment.

For more information see the troubleshooting, canceling and cleanup page.

Entities included in migration

The below table lists the entities that will be imported and exported during migration.

⚠

- Data/settings not included in the below table are not migrated (for example, repository hooks, Git LFS)
- **Git LFS objects** migration needs to be run separately. You can use this Git LFS migration process to export these objects (LFS objects on file system).

Category	**Item**	**Import**	**Export**
Git	Git repositories on file system	✓	✓
Pull requests	Pull request metadata	✓	✓
	PR user info	✓	✓
	PR comments	✓	✓
	PR attachments	✓	✓
	PR File comments	✓	✓
Project Settings	Description	✓	✓
	Project permissions (user access)	✓	✓
	Project permissions (group access)	✓	✓
	Project permissions (public)	✓	✓
	Project permissions (default permission)	✓	✓
Repository Settings	Default branch	✓	✓
	Forks	✓	✓
	Transcode diffs	✓	✓
	LFS enabled	✓	✓
	Repo permissions (user access)	✓	✓
	Repo permissions (group access)	✓	✓
	Repo permissions (public access)	✓	✓
	Git hooks on disk	✓	✓

Here's the list of items that are not migrated:

- Git LFS
- Access keys
- HTTP access tokens
- Webhooks
- Default reviewers
- Default tasks
- Merge strategies
- Merge checks
- Hooks
- Branching model
- Branch permissions
- Commit comments
- Commit file comments
- Tasks
- Likes/reactions
- Linked Jira issues
- Build status
- Watchers

Exporting

Before you start your export

Always carefully review the migration prerequisites before starting the export process.

Decide which project or repositories you want to migrate.

You will require project keys and repository slugs, which you can get from the URL of the repository.

Visiting an URL for a repository

The format is `https://bitbucket.example.com/projects/`**`PROJECT`**`/repos/`**`repository`**, where **`PROJECT`** is the project key and **`repository`** is the repository slug.

Previewing the export

Previewing allows you to experiment with the export request and returns a list of repositories that would be included with a given request.

You can perform a preview using the below command:

```
curl -u <adminusername> -s -n -X POST -H 'Content-type: application/json' -d '{"repositoriesRequest":
{"includes":[{"projectKey":"*","slug":"*"}]}}' http://localhost:7990/rest/api/1.0/migration/exports/preview
| jq .
```

The following request values are required for preview (REST Documentation):

Description	Value
URL	`/rest/api/1.0/migration/exports/preview`
HTTP verb	POST
HTTP header	`Content-type: application/json`
Authentication	Basic

To preview all repositories:

Request body

```
{
    "repositoriesRequest": {
        "includes": [
            {
                "projectKey":"*",
                "slug":"*"
            }
        ]
    }
}
```

To preview one full project and a specific repository:

Request body

```
{
    "repositoriesRequest": {
        "includes": [
            {
                "projectKey":"PROJECTKEY",
                "slug":"*"
            },
            {
                "projectKey":"PROJECTKEY2",
                "slug":"repository-slug"
            }
        ]
    }
}
```

If needed, you can specify the project key and slug pair as many times as necessary.

⚠ As soon as you select one repository of a fork hierarchy, then every repository of that fork hierarchy will be exported, including personal forks and origins of the repository.

Performing the export

Once the export is started, an archive file will be written to disk containing all necessary Git data and database entities.

⚠ The archive file can be found after the migration is finished, in `$BITBUCKET_SHARED_HOME/data/migration/export/Bitbucket_export_<Job ID>.tar`

You can perform the export using the below command:

```
curl -u <adminusername> -s -n -X POST -H 'Content-type: application/json' -d '{"repositoriesRequest":
{"includes":[{"projectKey":"*","slug":"*"}]}}' http://localhost:7990/rest/api/1.0/migration/exports | jq .
```

The following values are required for export (REST Documentation):

Description	Value
URL	`/rest/api/1.0/migration/exports`
HTTP verb	POST
HTTP header	`Content-type: application/json`
Authentication	Basic

Note: exactly the same request body as with previewing the export can be used.

To export all repositories:

Request body

```
{
    "repositoriesRequest": {
        "includes": [
            {
                "projectKey":"*",
                "slug":"*"
            }
        ]
    }
}
```

To export one full project and a specific repository:

Request body

```
{
    "repositoriesRequest": {
        "includes": [
            {
                "projectKey":"PROJECTKEY",
                "slug":"*"
            },
            {
                "projectKey":"PROJECTKEY2",
                "slug":"repository-slug"
            }
        ]
    }
}
```

You can specify the `projectKey` and `slug` pair as many times as necessary.

As soon as you select one repository of a fork hierarchy, then every repository of that fork hierarchy will be exported, including personal forks and origins of the repository.

The response will contain the job ID, which is important to query the status of the job later.

During the export

You can query the following specific REST endpoint to see progress:

```
watch -n30 'curl -u <adminusername> -s -n -X GET http://localhost:7990/rest/api/1.0/migration/exports/<Job
ID> | jq .'
```

Replace `<Job ID>` with the **"id"** value that was returned from the request that started the export job.

The following values are required to query the progress (REST Documentation):

Description	Value
URL	`/rest/api/1.0/migration/exports/<Job ID>`

HTTP verb	GET
Authentication	Basic

After the export

On completion, the job state will change to `COMPLETED` and the export file can be found in `$BITBUCKET_SHARED_HOME/data/migration/export/Bitbucket_export_<Job ID>.tar`. If any errors occurred, the job state will change to `ABORTED` for fatal errors or `FAILED`.

To check for warnings or errors:

```
curl -u <adminusername> -s -n -X GET http://localhost:7990/rest/api/1.0/migration/exports/<Job ID>/messages
| jq .
```

Replace `<Job ID>` with the **"id"** value that was returned from the request that started the export job.

The following values are required to check for warnings or errors (REST Documentation):

Description	Value
URL	`/rest/api/1.0/migration/exports/<Job ID>/messages`
HTTP verb	GET
Authentication	Basic

Warning messages should be dealt with on a case-by-case basis, it generally means that some data was not exported but the archive can be used to import into another instance.

Error messages generally mean that the archive that was generated is not usable. Please see the troubleshooting section for more information.

Canceling the export

You may see a small delay between accepting the request and the actual job cancelation. In most cases, the delay will be inconsequential.

In the unlikely case of communication issues across a cluster, it may take a few seconds to cancel a job.

You should always actively query the job status to confirm that a job has been successfully canceled.

The export archive will remain in place, but can not be used to perform an import and should only be used to diagnose problems.

To cancel the export:

```
curl -u <adminusername> -s -n -X POST -H 'Content-type: application/json' http://localhost:7990/rest/api/1.0
/migration/exports/<Job ID>/cancel
```

Replace `<Job ID>` with the **"id"** value that was returned from the request that started the export job.

The following values are required to cancel the export (REST Documentation):

Description	Value

URL	`/rest/api/1.0/migration/exports/<Job ID>/cancel`
HTTP verb	POST
Authentication	Basic

Importing

Before you start your import

Always carefully review the migration prerequisites before starting the import process.

Copy your import file to the target instance by copying into `$BITBUCKET_HOME/shared/data/migration/import` and specifying the path relative to the import directory in the REST call. Your import file must be copied to this directory or your import will not work.

After copying the file, it is recommended to verify its integrity and that it has been copied without errors. You can do this for example by calculating the export archive's MD5 sum (e.g. by using the `md5` tool or similar) on both the source and the target instance and checking that the result is the same.

Performing the import

Once you call the REST endpoint, the importer will begin to populate the database and file system.

⚠ **You will not be prompted to resolve project-key collisions, they will be resolved automatically and a warning message will be added to the job. See section After the import below for how to query job messages.**

You can perform the import using the below command:

```
curl -u <adminusername> -s -n -X POST -H 'Content-type: application/json' -d '{"archivePath":"
Bitbucket_export_422.tar"}' http://localhost:7990/rest/api/1.0/migration/imports | jq .
```

In the above example, the file '**Bitbucket_export_422.tar**' was imported from the `home/shared/data/migration/import` directory. The `archivePath` parameter can either be relative or absolute.

Example

Relative (to `$BITBUCKET_HOME/shared/data/migration/import`):

```
{"archivePath":"Bitbucket_export_422.tar"}
```

The following request values are required for import (REST Documentation):

Value	Description
URL	`/rest/api/1.0/migration/imports`
HTTP verb	POST
HTTP header	`Content-type: application/json`
Authentication	Basic

The response will contain the job ID, which is important to query the status of the job later.

During the import

You can query the following specific REST point to see progress:

```
watch -n1 'curl -u <adminusername> -s -n -X GET http://localhost:7990/rest/api/1.0/migration/imports/<Job
ID> | jq .'
```

Replace `<Job ID>` with the **"id"** value that was returned from request that started the import job.

The following request values are required to query the progress (REST Documentation):

Description	Value
URL	`/rest/api/1.0/migration/imports/<Job ID>`
HTTP verb	GET
Authentication	Basic

During the import process, no modifications are made to the source instance, so you can roll back to it if anything goes wrong.

After the import

On successful completion, the job state will change to "completed". If any errors occurred, the job state will change to `ABORTED` for fatal errors or `FAILED`.

To check for warnings or errors:

```
curl -u <adminusername> -s -n -X GET http://localhost:7990/rest/api/1.0/migration/imports/<Job ID>/messages
| jq .
```

Replace `<Job ID>` with the **"id"** value that was returned from the request that started the import job.

The following values are required to check for warnings or errors (REST Documentation):

Description	Value
URL	`/rest/api/1.0/migration/imports/<Job ID>/messages`
HTTP verb	GET
Authentication	Basic

Warning messages should be dealt with on a case-by-case basis, it generally means that some data was not completely imported, or that name collisions were resolved.

Error messages mean that the import was not successful and some data was only partially imported or not at all. Please see the troubleshooting section for more information.

Canceling the import

Import jobs are not canceled instantaneously like export jobs. During import, once the cancel request has been accepted, the following checkpoints will apply, then the job will stop:

- after the current fork hierarchy has been imported and verified.
- before the next repository is imported.
- before the next pull request is imported.

This means that some repositories might be missing from a fork hierarchy, or some pull requests might be missing from repositories. Git data in a repository will always be consistent if the job was canceled cleanly.

To cancel the import:

```
curl -u <adminusername> -s -n -X POST -H 'Content-type: application/json' http://localhost:7990/rest/api/1.0
/migration/imports/<job ID>/cancel
```

Replace `<Job ID>` with the **"id"** value that was returned from the request that started the import job.

The following request values are required to cancel the import (REST Documentation):

Description	Value
URL	`/rest/api/1.0/migration/imports/<job ID>/cancel`
HTTP verb	POST
Authentication	Basic

LFS Migration

Git LFS data and objects are not migrated using the Data Center Migration tool, and/or cloned or re-pushed manually.

LFS enabled is a per-repository setting. This means that after the import if you have it enabled on the source, **LFS enabled** will be enabled on the target.

Before you start

The LFS migration process requires read access to all affected repositories on the **source** instance, and write access to the same repositories, on the **target** instance.

Preparing the export

Export outputs generated when using Data Center Management do not contain LFS objects.

This process is required for LFS objects only.

Clones can be done before, during or after the export. If you discard the source after exporting, your export archive does not contain the LFS objects. These exist only in the source or in clones that you've made separately.

To prepare for migrating LFS objects you will need Git LFS installed on the client. Refer to Git Large File Storage for the process if you are unsure.

1. Clone the relevant repositories that include the LFS objects you want to migrate:

- For each Git LFS enabled repository, a clone has to be created on a machine that can access both the source and target instance of a migration.
- Otherwise, clone from the source instance first, and transfer the clone later.
- You may have existing clones as part of your development workflow that you can use. If you can't or don't want to rely on existing clones, it's best to create dedicated clones for the migration process.

To migrate the full history of LFS objects, you need full clones: use `git clone $source_repo_url` for each LFS-enabled repository.

If a recent history will be sufficient, you can use a shallow clone: `git clone $source_repo_url --depth 1` or similar, for **each** LFS-enabled repository.

2. Run `git lfs fetch --all` on each individual clone to retrieve the LFS objects.

Exporting LFS objects/data

You can find the full export process here if needed.

1. Export relevant repositories using the existing data center migration process.

2. Maintain respective clones with LFS objects separately, as described above.

Importing LFS objects/data

Separate clones are created prior to export, as only the **setting** that enables LFC will be restored, not the objects.

1. Import relevant repositories using the existing data center import process.

   These repositories will have LFS enabled as when they were exported.

2. Once the import is completed, add the new origin to each of your clones: `git remote add $target_instance_name $target_repo_url`

3. To complete the process, push LFS objects: `git lfs push --all $target_instance_name`

Troubleshooting, canceling and cleanup

Exporting forks

When selecting individual repositories for exporting, the following rules apply:

- Once you select a fork in any hierarchy, the entire hierarchy will be included.
- If you only select the root repository, all forks will still be included.

Conflict resolution

Conflict resolution is automatic. If a project with the same name or key already exists, the imported project is renamed. After the import has finished, imported projects and repositories can be renamed or moved around as required.

For personal repositories, if a repository with the same name already exists, the imported repository is renamed.

Cancellation

If you cancel during export: The migration will stop immediately, and the archive is not usable.

If you cancel during import: The migration will complete importing the current repository, then stop. It's important to understand that if you cancel midway through the import, the fork hierarchy may not be complete and subsequent imports will not reuse already existing fork parents.

> ⚠ If you cancel while importing pull requests, the import will finish importing the current pull request, then stop.
>
> If you cancel while importing Git data, no pull requests will be imported.

Import complete with errors

Every job (both import and export) has messages that you can query from the REST API.

Warnings:

If a job is completed but has warnings: you should read the warnings and decide if any action is required.

Errors:

Errors mean something is broken or will fail.

The job will not complete, and you will need to identify and mitigate any errors you receive.

Repositories that remain "Initializing":

Whenever there is an error, there is a chance repositories will stay in a state that says "initializing". This are a technical error, and will not resolve on their own. **Currently you will need to log a support case if you see this behaviour.**

Rollback and Delete

There is no automatic rollback, you will need to manually go through and delete the data you do not want, before trying again.

Will source or target be down during migration?

Source and target will both remain available during a migration, during both import and export. This may negatively impact performance, and it should be run during low usage periods if possible.

Export archives may become bigger or less efficient if the instance is being used during migration. Because of this it is not recommended to use an instance during a migration.

What to do if your migration is corrupted

The export can be corrupted: When the job is completed and has no errors in the job messages, you can use the archive.

Import: there is a chance when the import fails, repos will stay in an initializing state. This is a fatal error, and cannot be remediated. You have to go and delete any initializing repos.

There is a REST endpoint which can be used to find all repos that are in state initializing.

Attachments in comments on pull requests

Attachments are uploaded and stored in the repository of the comment they added in. If a pull request comment references an attachment that was uploaded to a **different** repository, there is a possibility that the attachment will not be successfully imported. The following will be logged (and added as a warning to the import job) if an attachment is not successfully imported:

```
WARN c.a.s.i.m.DefaultImportContext Warning registered for job 1 of type com.atlassian.bitbucket.migration.
import (RUNNING) against pr attachment: Could not find repository created with export ID '1,234'
```

Workaround: On the source instance, find the repository with the export ID that was logged when the attachment link failed to resolve on import (see example above).

If this repository was exported and imported onto the target instance, find the repository ID on the target instance, and update the repository ID in the attachment link in the comment text of any comments referencing it.

If this repository was not exported, replace the attachment link by downloading the attachment from the source instance and reattaching it to the comment on the target instance.

Error and warning messages

Import and export jobs may have associated messages after a migration is completed.

The messages range in severity from low (warnings) to high (errors), and if a job is associated with error messages, there is a chance it has not completed successfully.

Warnings

Warnings contain information that is important for the admin to consider before using an export archive or after importing archives.

Errors

A job is not considered successful if at least one error message is registered with it. More information about an error, such as the full stack trace for exceptions, is available in the server logs.

Export Warnings

```
Number of repositories / projects has changed since the export was
first initiated.
```

Meaning: Repositories may have been created, deleted, renamed or moved while the export job was executing. This has no effect on the export, except for repositories not being exported if they don't match the repository selector anymore, or projects being exported if they now match the repository selector.

Recommended action: None.

Export errors

```
Could not serialize object with id: '<ID>' to JSON
```

Meaning: An exception occurred while exporting pull request data. This means that the export archive will be missing some data related to pull requests.

Recommended action: Delete export archive and retry export.

```
Could not export attachments for '<ID>': an unexpected error
occurred: <MESSAGE>
```

Meaning: An exception occurred while exporting repository attachments. This means some attachments for the repository mentioned will be missing.

Recommended action: Delete export archive and retry export.

```
Exception executing callback '<METHOD>' on '<EXPORTER>':
'<MESSAGE>'
```

Meaning:

An exception occurred while executing a request to an exporter interface. Data Center Migrations uses a collection of exporters to migrate data. If this message is logged, some data of their related entities might be missing:

- **GitRepositoryExporter**: Git data might be corrupt or missing. The resulting export archive will most likely contain corrupt Git data.
- **GitLfsSettingsExporter**: The setting whether Git LFS is enabled was not exported.
- **MetadataExporter**: Project or repository metadata, such as name, description, owner, fork hierarchy or public accessibility setting, may not have been exported correctly.
- **PullRequestExporter**: Data related to pull requests, such as title, description, reviewers, and other activity, may not have been exported correctly.
- **RefSyncStatusExporter**: For forked repositories that have fork synchronization enabled, the synchronization status may not have been exported correctly.
- **PermissionExporter**: Permissions for projects or repositories may not have been exported completely.

Recommended action: Delete export archive and retry export.

Import warnings

```
Failed to delete file: <FILE>.

Failed to delete temp directory: <DIRECTORY>.

Following errors happened while deleting temp directory:
<ERRORS>
```

Meaning: During import, some temporary files and directories are created and then cleaned up. This message means that a file or directory could not be cleaned up and may have to be cleaned up manually.

Recommended action: Delete these files after import manually.

```
Custom hooks have been imported and stored in directory:
<DIRECTORY>.
```

Meaning: Git repositories on disk may contain custom hooks that an administrator has placed there manually. These hooks are not migrated as-is, but are placed in a different directory so Git does not use them.

Recommended action: To enable these custom hooks again, they have to be moved out of this directory and into the corresponding 'hooks' directory of the repository.

```
Unknown entry '<ENTRY>' found in archive
```

Meaning: This message is registered when the export archive contains an entry that the import job did not handle. This message can have a multitude of causes, and means that the data related to this entry is not imported. The most common cause is when an export archive has been tampered with.

Recommended action: Verify that repositories have been imported correctly.

```
Detected inconsistency with repository '<REPOSITORY>'
```

Meaning: Integrity checks are run on repositories after they have been imported. It is possible for these checks to find and fix inconsistencies, which are logged as warnings.

Recommended action: None.

Import errors

```
Could not import comment activity '<ACTIVITY>' for pull request
'<PULL REQUEST>': the referenced comment could not be found.
This may be due to an earlier import error.
```

Meaning: A pull request activity (such as replies to comments) is referencing a comment that could not be found. This means that some activity stream data will be missing from the mentioned pull request.

Recommended action: Check the server logs and verify that the pull request has been imported correctly.

```
Could not import activity '<ACTIVITY>' for pull request
'<PULL REQUEST>': an unexpected error occurred and the
activities in the current batch will be rolled back: <MESSAGE>
```

Meaning: A pull request activity could not be imported due to the mentioned error message. Some data related to this pull request will be missing.

Recommended action: Check the server logs and verify that the pull request has been imported correctly.

```
Error performing an integrity check. Further checks will continue.
```

Meaning: Integrity checks are run on repositories after they have been imported. It is possible for these checks to find errors that can not be fixed.

Recommended action: Check the server logs. Log messages preceding this one may give more information about why this check failed.

```
Checking the integrity of imported repository hierarchy
<HIERARCHY ID> failed with an unexpected error: <MESSAGE>
```

Meaning: Integrity checks have failed with an unexpected error.

Recommended action: Check the server logs. Log messages preceding this one may give more information about why this check failed.

```
Checking the integrity of imported repositories failed with
an unexpected error: <MESSAGE>
```

Meaning: Integrity checks have failed with an unexpected error.

Recommended action: Check the server logs. Log messages preceding this one may give more information about why this check failed.

```
The importing of repository '<REPOSITORY>' failed to complete:
an unexpected error occurred while attempting to make it available
to the system: <MESSAGE>
```

Meaning: The repository state could not be set to AVAILABLE.

Recommended action: These repositories failed to import and may have to be cleaned up manually. Delete these repositories using the REST API.

```
Exception executing callback '<METHOD>' on '<IMPORTER>':
'<MESSAGE>'
```

Meaning:

An exception occurred while executing a request to an importer interface. Data Center Migrations uses a collection of importers to migrate data. If this message is logged, some data to their related entities might be missing:

- **GitRepositoryImporter**: Git data was not imported completely. The repository is most likely not usable and should be deleted.
- **GitLfsSettingsImporter**: The setting whether Git LFS is enabled was not imported.
- **MetadataImporter**: Project or repository metadata, such as name, description, owner, fork hierarchy or public accessibility setting, may not have been imported correctly.
- **PullRequestImporter**: Data related to pull requests, such as title, description, reviewers, and other activity, may not have been imported correctly.
- **RefSyncStatusImporter**: For forked repositories that have fork synchronization enabled, the synchronization status may not have been imported correctly.
- **PermissionImporter**: Permissions for projects or repositories may not have been imported completely.

Recommended action: The affected repositories were most likely not imported correctly. They should be deleted using the REST API and another attempt at importing them should be made. If repeated attempts fail, it might help to export again.

Git Large File Storage

Git Large File Storage (LFS) is a Git extension that improves how large files are handled. It replaces them with tiny text pointers that are stored on a remote server instead of in their repository, speeding up operations like cloning and fetching.

Bitbucket Data Center ships with Git LFS enabled at an instance level, but disabled for each repository. It also includes an embedded LFS object store, removing the need for an external one. Learn more about Git LFS

On this page

Important Notices

HTTP(S) must be enabled

Git LFS supports SSH remotes, but downloading and uploading objects is done via HTTP(S). If SCM connections to Bitbucket over HTTP(S) are not enabled, Git LFS will not work.

The Bitbucket base URL should also be configured to a HTTP(S) URL.

We recommend configuring SSL

If your instance is available over the internet, usernames, passwords, and other data may be at risk. See Proxy and secure Bitbucket for more info.

The Data Center Migration Tool does not export Git LFS

For more information see LFS Migration.

Enable Git LFS for a repository

Git LFS is disabled by default.

To enable Git LFS:

1. Go to **Repository settings** > **Large file storage (LFS).**
2. Select **Allow LFS**.
3. Select **Save.**

If you cannot select **Allow LFS**, this is because the instance administrator has disabled LFS support on the instance.

Install and use the Git LFS command line client

Git LFS aims to integrate with the standard Git workflow as seamlessly as possible.

To push your first Git LFS files to an existing repository:

1. Enable Git LFS support for the repository (see above).
2. Download and install the git-lfs command line client.
3. Install the Git LFS filters:

```
git lfs install
```

This adds the following lines to the `.gitconfig` file located in your home directory:

```
[filter "lfs"]
    clean = git-lfs clean %f
    smudge = git-lfs smudge %f
    required = true
```

The above change applies globally, so it is not necessary to run this for each repository you work with.

4. Choose the file types you would like LFS to handle by executing the `git lfs track` command. The `git lfs track` command creates or updates the `.gitattributes` file in your repository. Change to your cloned repository, then execute `git add` to ensure updates to the `.gitattributes` are later committed:

```
git lfs track "*.jpg"
git add .gitattributes
```

5. Add, commit, and push your changes as you normally would:

```
git add image.jpg
git commit -m "Added an image"
git push
```

When pushed, the Git tree updates to include a pointer to the actual file content. This pointer will include the SHA256 hash of the object and its size in bytes. For example:

```
oid sha256:4fa32d6f9b1461c4a53618a47324e243e36ce7ceae72ad440cc811a7e6881be1
size 1580060
```

The object itself will be uploaded to a separate location via the Git LFS Batch API. Specifically, the object will be uploaded to an embedded LFS object store within your Bitbucket instance.

Disable Git LFS

Git LFS support is enabled by default. It can, however, be disabled. This will prevent upload or download of LFS objects for all repositories, but it won't delete existing LFS objects stored within Bitbucket.

To disable Git LFS:

1. Log in with sysadmin permissions.
2. Go to ⚙ > **Server settings**.
3. Untick **Git LFS enabled**.
4. Select **Save**.

Embedded Object Store

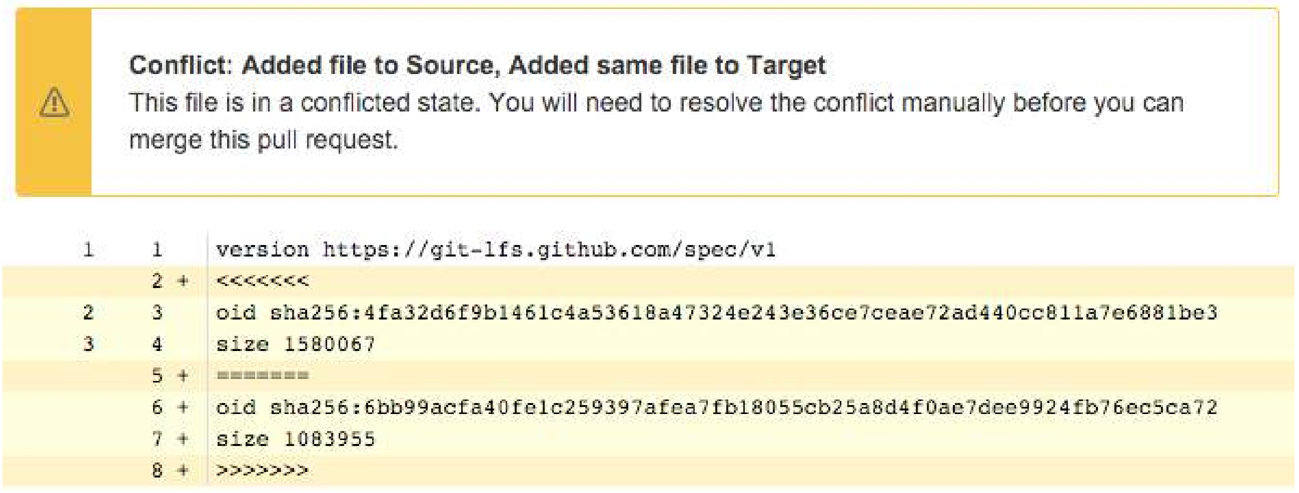
Bitbucket includes an embedded LFS object store. Uploaded Git LFS objects are stored in the directory `$BITBUCKET_HOME/shared/data/git-lfs/storage`. This storage location cannot be changed, as for clustered deployments it is critical that LFS object storage reside on the `shared` filesystem so it is globally visible to all cluster nodes.

Repository Forking

LFS enabled repositories support forking and a full fork-based workflow including pull requests between forks and fork synchronization. Forking is implemented through sharing of objects between fork and origin repositories and as such forks are lightweight. This means creating a fork is faster because objects are not duplicated when a fork is created.

Resolution of merge conflicts is slightly different from the non-LFS case, specifically where a merge conflict exists between two LFS objects. Since the Git repository simply contains an LFS pointer, conflict resolution must be performed with the conflicted pointer file.

Such a conflict might look like this:



Conflict: Added file to Source, Added same file to Target
This file is in a conflicted state. You will need to resolve the conflict manually before you can merge this pull request.

```
  version https://git-lfs.github.com/spec/v1
+ <<<<<<<
  oid sha256:4fa32d6f9b1461c4a53618a47324e243e36ce7ceae72ad440cc811a7e6881be3
  size 1580067
+ =======
+ oid sha256:6bb99acfa40fe1c259397afea7fb18055cb25a8d4f0ae7dee9924fb76ec5ca72
+ size 1083955
+ >>>>>>>
```

Users are still required to resolve the merge conflict manually using the command line Git client, as they normally would. The merge strategy, since this is only a pointer, can only be an *ours* or *theirs* based strategy, keeping one or the two pairs (oid/size). When resolving the conflict, if the pointer file becomes corrupted it will not be recognized as an LFS file.

Smart Mirroring

Mirrors supports mirroring of Git LFS objects as of Bitbucket 4.5. Mirroring of Git LFS objects is performed on-demand; that is, when a client requests download of a Git LFS object from the mirror node, the object will be streamed from the upstream node if it is not already available on the mirror. Subsequent downloads of the same object will be downloaded directly from the copy stored on the mirror.

Limit Disk Space Usage

By default Bitbucket won't permit Git LFS uploads if the amount of free disk space in the filesystem that hosts the storage directory has less than 100 megabytes of free disk space. When a client attempts to upload (via a Git push) an LFS file that would result in the free disk-space threshold being exceeded, an error message indicating as such is sent to the client:

```
$ git push
Git LFS: (0 of 1 files, 1 skipped) 0 B / 348.59 MB, 348.59 MB skipped
[a39717817507d0ae3434a36347159e4970aec061c8c506f197c0eeadd2e8efe2] Insufficient free space in store
error: failed to push some refs to 'https://bitbucket.example.com/bitbucket/scm/myproject/myrepo.git'
```

A warning will also be logged in the `atlassian-bitbucket.log` file. For example:

```
2016-01-01 18:00:00 WARN  [http-nio-7990-exec-2] user @G6I7R6x969x556x0 0:0:0:0:0:0:0:1 "POST /scm
/myproject/myrepo.git/info/lfs/objects/batch HTTP/1.1" c.a.b.i.s.g.l.s.e.EmbeddedStoreAccessor Upload
rejected due to insufficient free space in store - Required: 1073741824 Free: 10485760
```

The free disk-space threshold can be tuned by adding the following property to the config properties file (this example tunes the threshold to one gigabyte, and note that this value is in bytes):

```
plugin.bitbucket-git-lfs.minimum.free.space=1073741824
```

Setting the value to zero will disable the free disk space check and will allow files to be uploaded even if doing so would exhaust all available disk space. This however is not encouraged, it can lead to situations where the system exhausts all disk space but is unable to log error messages stating the same (because the disk is full), leading to difficulties debugging problems that are caused by disk space exhaustion.

```
plugin.bitbucket-git-lfs.minimum.free.space=0
```

Bitbucket must be restarted for the change to take effect.

Limit Network Connections

Large Git LFS download or upload operations over very slow network links could take many minutes, or even hours. Bitbucket supports a finite number of HTTP connections (by default 200). If Git LFS were permitted to exhaust this connection pool then the user interface, Git hosting, and REST API access could be impacted. For this reason a default limit of 80 concurrent Git LFS connections are permitted. This limit can be increased or decreased if necessary by overriding the `throttle.resource.git-lfs=` setting in the config properties file. Bitbucket must be restarted for the change to take effect.

When a client makes a request to upload or download an object, and the request would exceed the maximum number of concurrent connections, a HTTP status 503 is returned, and this error is sent to the client:

```
The requested resource is busy and cannot service your request. Please try again later
```

The `atlassian-bitbucket.log` file will also contain an associated warning:

```
2016-01-01 18:00:00 WARN  [http-nio-7990-exec-3] username @1HJ1OF1x1115x417x1 0:0:0:0:0:0:0:1 "GET /rest
/git-lfs/storage/myproject/myrepo/3a9219fde5bc436a2fc37cdd38bdb8478a210c7a49405dd9603ccdc95ed39613 HTTP
/1.1" c.a.s.i.t.SemaphoreThrottleService A [git-lfs] ticket could not be acquired (0/80)
```

Git Virtual File System (GVFS)

Microsoft has developed an open source project called GVFS (Git Virtual File System) that helps with developer productivity when it comes to very large monolithic codebases in Git.

On this page:

GVFS virtualizes the file system underlying Git repositories on developers' machines, making more efficient use of bandwidth, space and computation by only transferring and working with files that have been accessed.

The Atlassian Marketplace provides an *experimental* app for Bitbucket Data Center that adds the server-side support needed to serve GVFS-enabled Git clients. It can be installed on any supported server platform and once installed, Bitbucket will handle GVFS protocol requests for any repository without any additional setup, from properly configured Git clients.

For more information about setting up GVFS on the client side, please see the blog post and linked resources from Microsoft. As at October 2017, only Windows client support was available. Sourcetree 2.0 and above for Windows is also GVFS aware when used with a GVFS enabled client.

Like GVFS itself, the experimental app is relatively new, and unsupported. It is an experimental technology preview not intended for production use, though being a distinct code path it is unlikely to introduce side effects for non-GVFS users on a production instance. If you work on large repositories, we'd love for you to ta ke it for a spin and send us your feedback.

Enable SSH access to Git repositories

Administrators can enable SSH access to Git repositories in Bitbucket Data Center. This allows users to:

- add their own SSH keys to Bitbucket
- use those SSH keys to secure Git operations between their computer and the Bitbucket instance.

Each user must add their own SSH key pairs to their account to be able to use SSH to access repositories.

Bitbucket supports the following SSH key types:

- ED25519
- RSA2
- ECDSA
- DSA (we recommend you use other key types)
- ED25519-SK
- ECDSA-SK

On this page:

Related pages:

- Setting up SSH port forwarding
- Creating SSH keys

Performance

Using SSH has performance implications. When users connect to Bitbucket using SSH the encryption of data adds to overall CPU usage. See Scaling Bitbucket Server for more information.

Security

To implement SSH authentication support, Bitbucket bundles a version of the Apache Mina SSHD server. The Bitbucket SSH server is not integrated with the SSH server on the host Bitbucket is running on, and it doesn't consider the users on the host when authenticating Bitbucket users.

To prevent security issues, the embedded SSH server has been locked down to allow execution of a small set of commands for Git hosting. The only commands that are supported are `git upload-pack`, `git receive-pack`, `git archive-pack` and `whoami` (a custom `whoami` implemented in Bitbucket, not the `whoami` command that exists on Linux). It is not possible to open an SSH shell using the embedded server to execute arbitrary commands on the server.

Enabling SSH access

To enable SSH access:

1. Go to ⚙ > **Server settings**.
2. Select **SSH enabled**.
3. Enter values for **SSH port** and **SSH base URL**, according to the information in the sections below.
4. Select **Save**.

These options will only be available if the "Bitbucket Server - SSH" app is enabled. For instructions on how to enable this app on your instance, please refer to Disabling and enabling apps.

For Data Center installations, a load balancer setup is required for SSH. For instructions on how to install and configure your load balancer, refer to Install Bitbucket Data Center.

SSH base URL

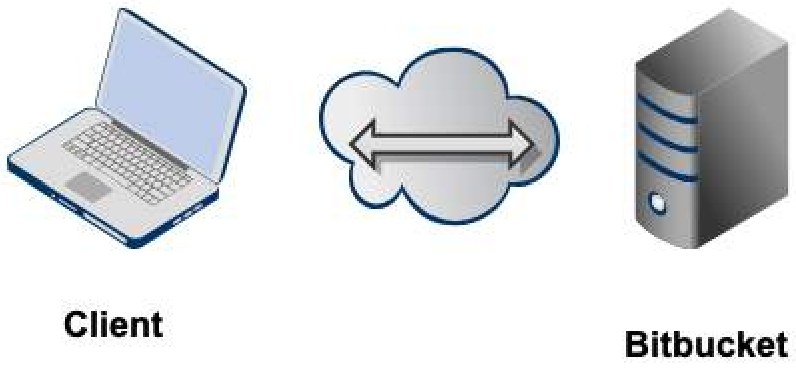
The **SSH base URL** is the base URL with which users can access the SSH push/pull/clone functionality of Bitbucket.

This is the base URL that Bitbucket will use when displaying SSH URLs to users. If you do not set this, it will default to the host that is set in **Bitbucket base URL**, with the port that SSH is listening on. See Specify the Bitbucket base URL.

For example, if the **SSH base URL** is not set and the **Bitbucket base URL** is `https://bitbucket.atlassian.com` and the SSH port is `7999`, the SSH URL for the repository `Jira` in the project `Atlassian` will be `ssh://git@bitbucket.atlassian.com:7999/ATLASSIAN/jira.git`

If you set up port forwarding, you will need to set the **SSH base URL** to the machine and port that is being forwarded to Bitbucket. However, you do not need to specify the port portion of the URL if the default SSH port (port 22) is being forwarded to Bitbucket.

If the **SSH base URL** and **SSH port** configurations are modified in the global Server settings page, the configurations specified in the properties file will no longer be used.



Port forwarding	SSH base URL	Bitbucket base URL	SSH port	Resulting SSH URL for a repo
✗	Not set	`https://bitbucket.atlassian.com`	`7999`	`ssh://git@bitbucket.atlassian.com:7999/<projectname>/<reponame>.git`
✓ Port 22 –> 7999	`https://bitbucket.atlassian.com`	`https://bitbucket.atlassian.com`	`7999`	`ssh://git@bitbucket.atlassian.com/<projectname>/<reponame>.git`

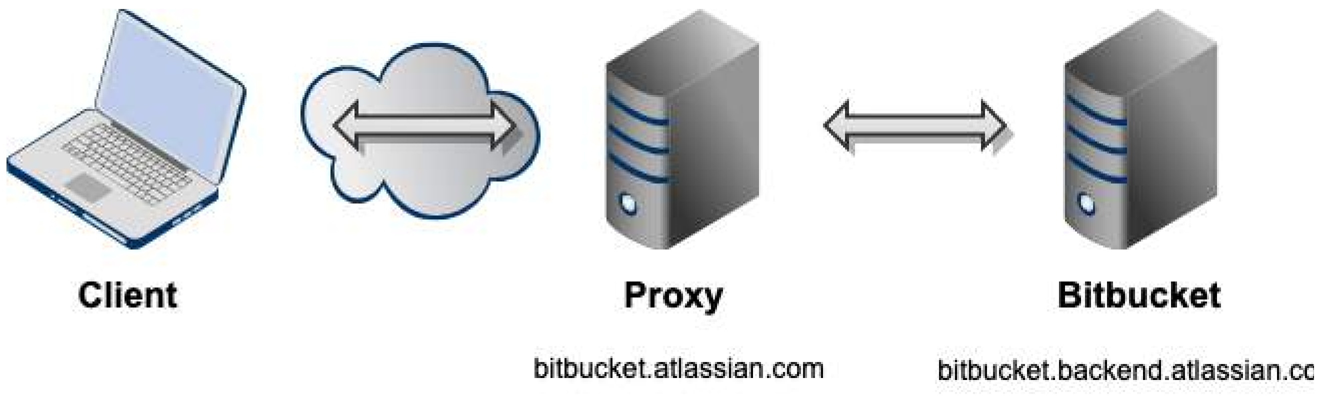
When running Bitbucket behind a proxy

If you run Bitbucket behind a http proxy such as Apache (e.g. as per our instructions), and if Apache runs on a different host, SSH will not be available on that host. Instead, you will need to set the SSH base URL to the machine Bitbucket is actually running on (and the URL should include the SSH port Bitbucket is serving from).

> For example, if the **SSH base URL** is set to `ssh://bitbucket.backend.atlassian.com:7999`, the SSH URL for the repository `Jira` in the project `Atlassian` will be `ssh://git@bitbucket.backend.atlassian.com:7999/ATLASSIAN/jira.git`

If you set up port forwarding, you will need to set the **SSH base URL** to the proxy machine and port that is being forwarded to Bitbucket However, you do not need to specify the port portion of the URL if the default SSH port (port 22) is being forwarded to Bitbucket.

> For example, if you set up port forwarding from your http proxy host, `bitbucket.atlassian.com`, port 22, to `bitbucket.backend.atlassian.com` port 7999, set the **SSH base URL** to `ssh://bitbucket.atlassian.com`. Then, the SSH URL for the repository `Jira` in the project `Atlassian` will be `ssh://git@bitbucket.atlassian.com/ATLASSIAN/jira.git`



Port forwarding	SSH base URL	SSH port	Bitbucket base URL	Resulting SSH URL for a repo
✗	`ssh://bitbucket.backend.atlassian.com:7999`	7999	`https://bitbucket.backend.atlassian.com`	`ssh://git@bitbucket.backend.atlassian.com:7999/<projectname>/<reponame>.git`
✓ Port 22–>7999	`ssh://bitbucket.atlassian.com`	7999	`https://bitbucket.backend.atlassian.com`	`ssh://git@bitbucket.atlassian.com/<projectname>/<reponame>.git`
✓ Port 44–>7999	`ssh://bitbucket.atlassian.com:44`	7999	`https://bitbucket.backend.atlassian.com`	`ssh://git@bitbucket.atlassian.com:44/<projectname>/<reponame>.git`

Setting up SSH port forwarding

There are two scenarios where you might want to set up port forwarding in Bitbucket Data Center: to remove port numbers from your SSH URLs or if Bitbucket is running behind a reverse proxy on a separate machine

On this page:

Remove port numbers from your SSH URLs

Bitbucket listens for SSH connections on port 7999 by default.

Your users will need to include the port in the URL they use to clone from Bitbucket, for example:

```
git clone ssh://git@bitbucket.mycompany.com:7999/PROJECT/repo.git
```

Rather than have the port number in the URL, you may wish to set up port forwarding so that connections to the default SSH port are forwarded to the port Bitbucket is listening on (e.g. you could forward port 22 to port 7999).

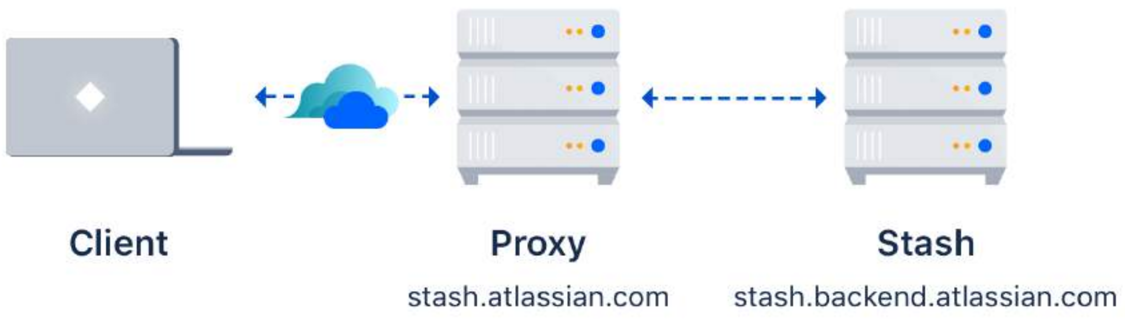
This would allow your users to use a URL without a port number in it, like this:

```
 git clone ssh://git@bitbucket.mycompany.com/PROJECT/repo.git
```

Bitbucket is running behind a reverse proxy on a separate machine

You may be following our instructions for setting up Bitbucket behind an Apache front-end.

In this case, your users may not be able to access Bitbucket directly for SSH connections, or if they can, you may wish to make the SSH and HTTPS URLs consistent.



For example, if you have the above topology, without port forwarding (and assuming the default port of 7999), your users will need to clone Bitbucket directly from the backend, like this:

```
git clone ssh://git@bitbucket.backend.atlassian.com:7999/PROJECT/repo.git
```

In your network, the `bitbucket.backend.atlassian.com` machine may not be accessible directly, or you may want the URL to be consistent with the HTTPS URL of `https://bitbucket.atlassian.com/scm/PROJECT/repo.git`.

In this case, you need to set up port forwarding on the `bitbucket.atlassian.com` machine to accept connections and forward them to port 7999 on the `bitbucket.backend.atlassian.com` machine.

How to set up port forwarding

HAProxy

Atlassian recommends the use of HAProxy for forwarding SSH connections through to Bitbucket.

HAProxy is supported on Linux, Solaris and FreeBSD.

HAProxy is not an Atlassian product, so Atlassian does not guarantee to provide support for its configuration. This section is provided for your information only – use it at your own risk. We recommend that you refer to the HAProxy documentation.

Installing HAProxy

Your operating system may support installing HAProxy using its system package manager, such as `apt-get`, `yum` or `rpm`. This will be the easiest way.

Alternatively, you may build HAProxy yourself and install it.

1. Download the latest version of HAProxy.
2. Extract the archive and cd into the directory:

   ```
   tar xzvf haproxy-1.4.21.tar.gz
   cd haproxy-1.4.21
   ```

3. Read the instructions in the README for how to build on your system. This is generally quite simple - on a Linux 64 bit 2.6 Kernel, the command is:

   ```
   make TARGET=linux26 ARCH=x86_64
   ```

4. If it completes successfully, install it following the instructions in the README:

   ```
   sudo make install
   ```

Configuring HAProxy

HAProxy is extremely powerful - it is designed as a HTTPS load balancer, but also can serve as a port forwarder for `ssh`. Learn more about how to enable client IP forwarding for SSH sessions by setting up Proxy protocol for Bitbucket Data Center.

The full documentation for version 1.4 is here. More documentation is available on the HAProxy website.

An example simple configuration is as follows:

```
global
        daemon
        maxconn 10000

defaults
        timeout connect 500s
        timeout client 5000s
        timeout server 1h

frontend sshd
        bind *:7999
        default_backend ssh
        timeout client 1h

backend ssh
        mode tcp
        server localhost-bitbucket-ssh 127.0.0.1:7999
```

The above configuration will listen on port 7999 (indicated by the `bind` directive) on all network interfaces. As indicated by the `server` directive, traffic is forwarded to 127.0.0.1, port 7999. You will need to replace `127.0.0.1` with the IP address of the machine running Bitbucket.

You can check your configuration by running:

```
haproxy -f haproxyconf.txt -c
```

To run haproxy, simply start it using

```
haproxy -f haproxyconf.txt
```

⚠ If you use HAProxy to additionally proxy HTTP traffic, ensure that the running `mode` configuration is set to `http`:

```
backend http
        mode http
            bind *:80
        server localhost-bitbucket-http 127.0.0.1:7990
```

Using the default SSH port

You can configure HAProxy to listen on the default SSH port instead, so that the port does not need to be specified in the clone URL.

By default, the normal ssh daemon is running on port 22. You have several options:

- Configure HAProxy to listen on an alternate port as in the previous example.
- Configure multiple network interfaces on the physical machine and force the default ssh daemon to listen on all but the interface for accessing Bitbucket. Configure HAProxy to only listen on that interface.
- Move the default ssh daemon to listen on another port and let HAProxy bind on port 22.

We do not provide instructions on the last two options, except for how to configure HAProxy.

Use the same configuration as the last example, but change the bind port to 22, e.g.

```
...
frontend sshd
        bind *:22
...
```

You will have to run this configuration as the `root` user, using `sudo`, because it specifies a port to listen on that is less than 1024.

```
sudo haproxy -f haproxyconf.txt
```

Configuring the SSH base URL

Once port forwarding is set up, you will need to configure the SSH base URL in Bitbucket so that the clone urls presented in Bitbucket indicate the correct host and port to clone from. See the SSH base URL section in Enable SSH access to Git repositories.

Signed system commits

When you enable signed system commits, Bitbucket will use a system public GPG key to automatically sign the commits that it creates. This includes pull request merge commits, commits made by editing files in the browser, and accepted code suggestions in comments.

Bitbucket-signed commits will have a verified status. Using Bitbucket-signed commits will prevent failures and errors when you're checking commits for signatures, having all signed commits merged into subsequent pull requests, or verifying commit signatures through your local Git installation. So you can be sure that you comply even with the strictest security and compliance standards.

On this page:

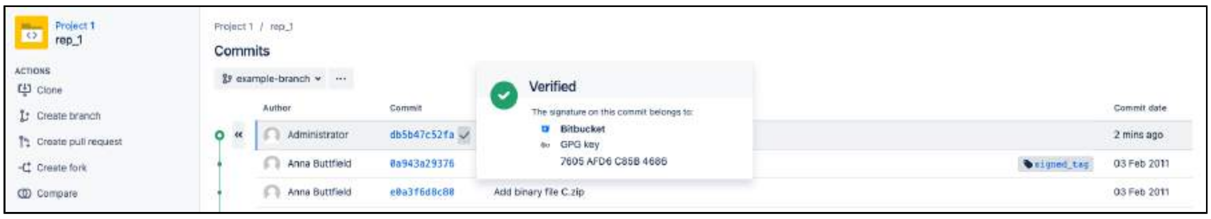
Enable signed system commits

System commit signing is disabled by default. You need to be a system administrator to configure signed system commits.

To turn on signed system commits:

1. Go to **Global administration** > **Signed system commits**.
2. Select **On**.
3. Select **Save**.

Here's how the information on a signed system commit is displayed in the user interface.



Author	Commit		Commit date
Administrator	db5b47c52fa		2 mins ago
Anna Buttfield	0a943a29376		03 Feb 2011
Anna Buttfield	e0a3f6d8c88	Add binary file C.zip	03 Feb 2011

Download the system GPG key

You can use the system public GPG key to do local verification of commits signed by Bitbucket.

The GPG key is available to download at:

```
{bitbucket}/signing/system-public-key.gpg
```

Rotate the system GPG key

As a result of rotating the system GPG key, a new key will be generated. You might need it to troubleshoot issues with signing system commits.

To rotate the system GPG key:

1. Stop Bitbucket. If you're using a clustered instance, stop all nodes in the cluster.
2. Delete the following files from the Bitbucket shared home directory:
    a. `{Bitbucket shared home}/config/secret-system-signing-key.asc`
    b. `{Bitbucket shared home}/config/upgrades/core-system-signing-secret-key`
3. Restart Bitbucket.

When Bitbucket is restarted, a new GPG key will be generated and used for commit signing and verification.

After you rotate the system GPG key, previously signed system commits will remain signed and verified but they will display the fingerprint of the previous system key.

Disable signed system commits

You need to be a system administrator to configure signed system commits.

To turn off signed system commits:

1. Go to **Global administration** > **Signed system commits**.
2. Select **Off**.
3. Select **Save**.

After the feature is disabled, previously created system commits will remain signed and verified. If the feature is re-enabled, the same GPG key will be used for commit signing unless it's rotated.

As a system administrator, you can disable signed system commits instance-wide through the Bitbucket properties file. To find out how to do this, look for `feature.system.signed.git.objects` in Configuration properties.

What if Bitbucket fails to sign system commits?

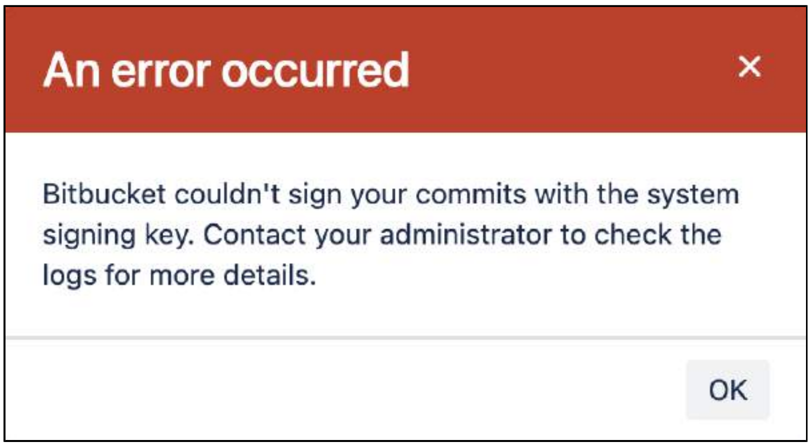
System commits won't be signed in the following known cases:

- An error occurs when a commit is created on your behalf.
- The system GPG key can't be loaded.
- mesh.enabled=false
- You're using a rebase merge strategy.

Case #1: An error occurs when a commit is created on your behalf

The following error can display when Bitbucket creates a system commit on your behalf:

"Bitbucket couldn't sign your commits with the system signing key. Contact your administrator to check the logs for more details."


An error occurred

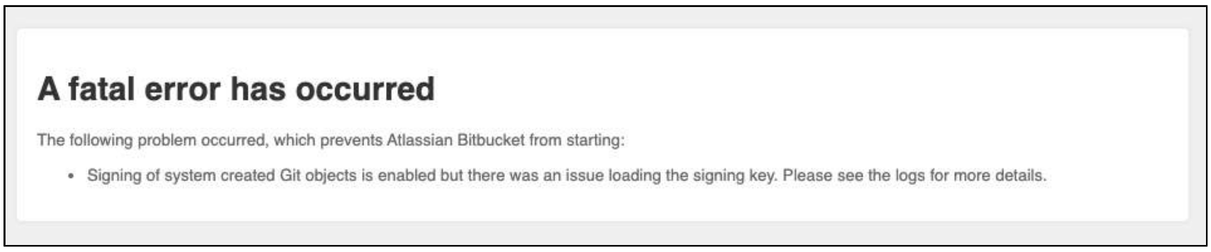
Bitbucket couldn't sign your commits with the system signing key. Contact your administrator to check the logs for more details.

If system commits can't be signed when you're trying to merge a pull request or make an in-browser edit, check Mesh logs (depending on where your repository is located, you should check either the sidecar logs or external Mesh logs).

Case #2: The system GPG key can't be loaded

When there's an issue with loading the GPG key for signing system commits, Bitbucket will fail to start. In this case, the following error will display:

“Signing of system created Git objects is enabled but there was an issue loading the signing key. Please see the logs for more details.“



A fatal error has occurred

The following problem occurred, which prevents Atlassian Bitbucket from starting:

- Signing of system created Git objects is enabled but there was an issue loading the signing key. Please see the logs for more details.

In this case, the issue might be with the key file. To find out more, check the application logs.

Here’s an example of how Bitbucket will log issues with the key file:

```
The signing key file could not be found - {Bitbucket shared home}/shared/config/secret-system-signing-
key.asc
```

Rotating the system GPG key might be required to resolve the issue.

Case #3: `mesh.enabled=false`

Bitbucket won’t sign system commits when repositories are located in the shared home and the sidecar is disabled. That is when `mesh.enabled=false`. Signed system commits are only supported when using either the sidecar or external Mesh nodes.

To have system commits auto-signed, check your Bitbucket configuration and make sure that `mesh.enabled` is set to `true`. After that, restart Bitbucket.

Case #4: You’re using a rebase merge strategy

When you’re using a rebase merge strategy (**Rebase and merge** or **Rebase and fast-forward**), system commits won’t be signed even if the feature has been enabled.

When you use one of these options, Bitbucket commits from the source branch to the target branch, generating a new non-merge commit for each incoming commit. Non-merge commits use the content and data of the original commits. That is, Bitbucket doesn’t actually create non-merge commits and therefore, can’t sign them.

To fix this issue, you can rebase and merge locally, and then push the changes to the target branch. For more details, check Pull request merge strategies.

If you need more information or help with these or other issues, contact Atlassian Support.

Secret scanning

About secret scanning

While your team collaborates on code to build software, sensitive information such as passwords, tokens, private keys, environment variables, `.pem` files or other secrets may accidentally get added to your repositories. As soon as code containing secrets gets pushed into your repositories, secrets are added to the commit history and persist until they are revoked. Unidentified breaches may result in the potential use of secrets by any users with access to your repositories.

On this page

To improve the security of your repositories and help you make sure that secrets are not accidentally exposed in your code, Bitbucket scans your repositories for secrets and triggers notifications when leaked secrets are detected within new commits. Email notifications are sent out to everyone involved in the commit of the secret: the authors, committers, and the developer who pushed or merged the code containing secrets into the repositories.

Even if a mail server isn't configured in your instance, Bitbucket records an alert about the detected secret in the audit log, which you can access from **Administration** > **Audit log**, and in the `audit.log` file on the file system (`$BITBUCKET_HOME/log/audit`). Learn more about these records in the section Track alerts about leaked secrets.

Secret scanning is enabled by default in your Bitbucket instance, and both global and system admins can disable or enable secret scanning by modifying the configuration properties in the `bitbucket.properties` file.

Customize the scanner

The scanner makes use of default patterns to scan your repositories and can detect a majority of the generic secrets. You can customize the scanner to optimize the performance and reduce the number of false positives—modify or delete the default patterns or add your own regex patterns and file paths.

Project or repository admins, can further configure the scanner at each level. You can't remove the rules inherited from the higher levels unless you have admin permission to the original location (repository, project, global). Forked repositories will use their own rules and will not sync rules from the parent.

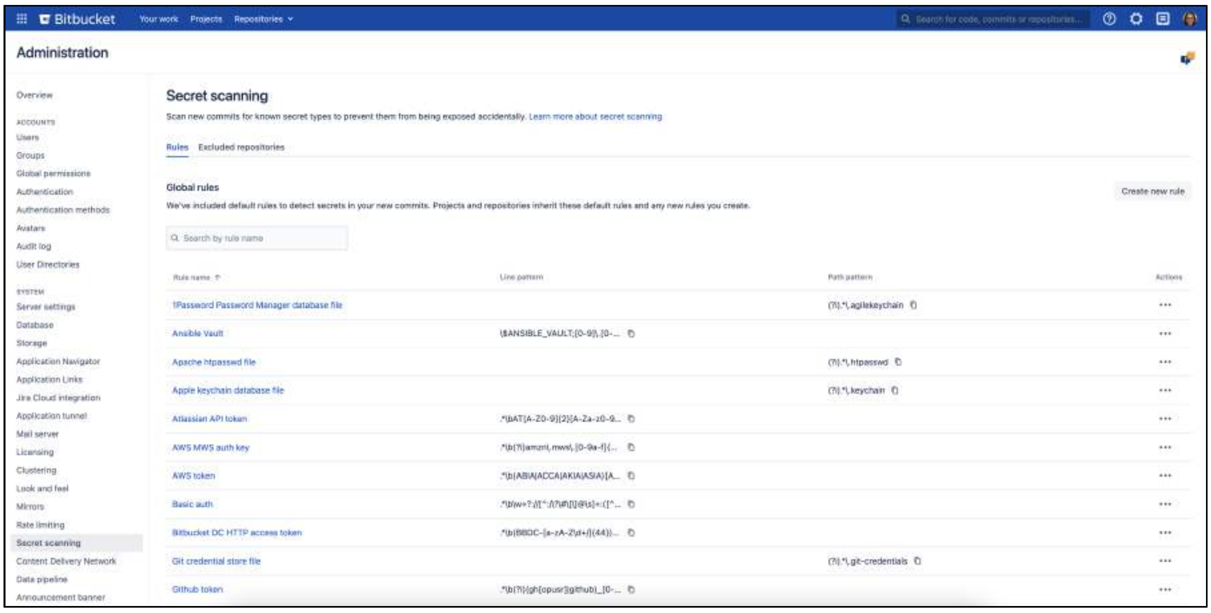
To customize:

1. From either the **System**, **Project**, or **Repository** settings, select **Secret scanning**.
2. Select **Create new rule** to add your own rule or select **More actions …** > **Edit** to modify a default rule.
3. Enter the rule details such as name, including regex for **Line pattern** or **Path pattern**.

   When you specify both path and line pattern regex, scanning looks for the pattern only in the specified file paths.

4. Select **Save**.

To remove a rule, select **More actions …** > **Remove**.



Secret scanning

Scan new commits for known secret types to prevent them from being exposed accidentally. Learn more about secret scanning

Global rules

We've included default rules to detect secrets in your new commits. Projects and repositories inherit these default rules and any new rules you create.

Rule name ↑	Line pattern	Path pattern	Actions
1Password Password Manager database file		(?i).*\.agilekeychain	•••
Ansible Vault	\$ANSIBLE_VAULT;[0-9]\.[0-...		•••
Apache htpasswd file		(?i).*\.htpasswd	•••
Apple keychain database file		(?i).*\.keychain	•••
Atlassian API token	.*\bAT[A-Z0-9]{2}[A-Za-z0-9...		•••
AWS MWS auth key	.*\b(?i)amzn\.mws\.[0-9a-f]{...		•••
AWS token	.*\b(ABIA|ACCA|AKIA|ASIA)[A...		•••
Basic auth	.*\b\w+?:\/\/[^:/?#\[\]@\s]+:([^...		•••
Bitbucket DC HTTP access token	.*\b(BBDC-[a-zA-Z\d+/]{44})...		•••
Git credential store file		(?i).*\.git-credentials	•••
Github token	.*\b(?i)(gh[opusr]|github)_[0-...		•••

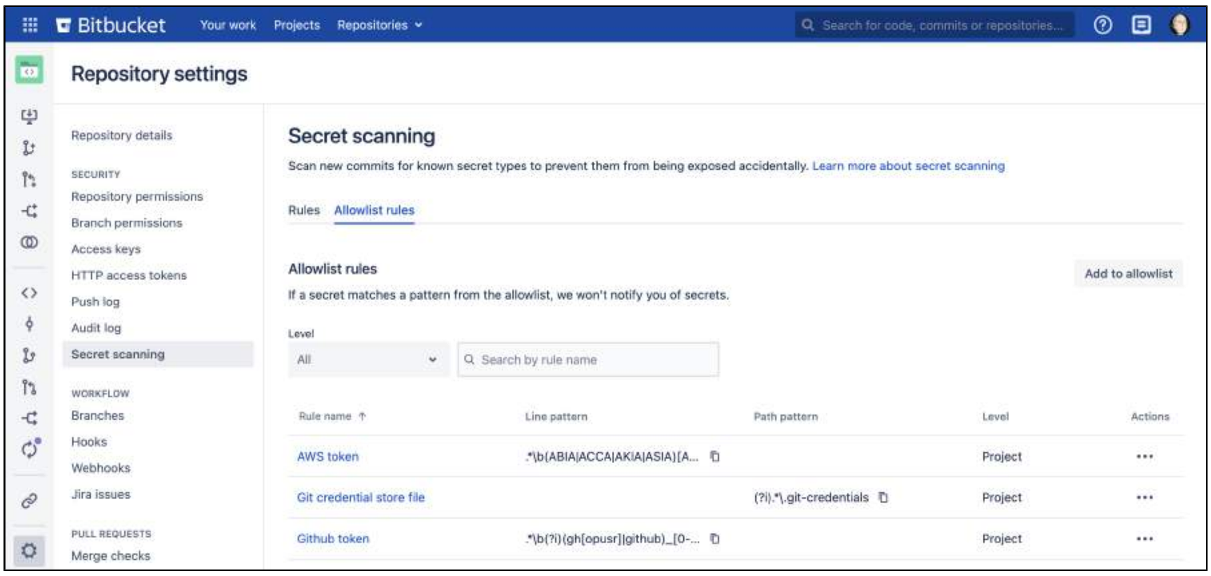
Customize allowlist rules

You can add an allowlist at the project or repository level to negate matches from scanning rules. Allowlist rule patterns can be defined the same as scanner rules. Any matches to your allowlist will not trigger a notification. Repositories inherit allowlists created at the project level.

> If scanning and allowlist rules match, the allowlist rule takes precedence.

To customize allowlist rules:

1. From either the **Project** or **Repository settings**, select **Secret scanning**.
2. Select **Allowlist rules** tab.
3. Select **Add to allowlist** to add a rule pattern.



Secret scanning

Scan new commits for known secret types to prevent them from being exposed accidentally. Learn more about secret scanning

Allowlist rules

If a secret matches a pattern from the allowlist, we won't notify you of secrets.

Rule name ↑	Line pattern	Path pattern	Level	Actions
AWS token	.*\b(ABIA|ACCA|AKIA|ASIA)[A...		Project	•••
Git credential store file		(?i).*\.git-credentials	Project	•••
Github token	.*\b(?i)(gh[opusr]|github)_[0-...		Project	•••

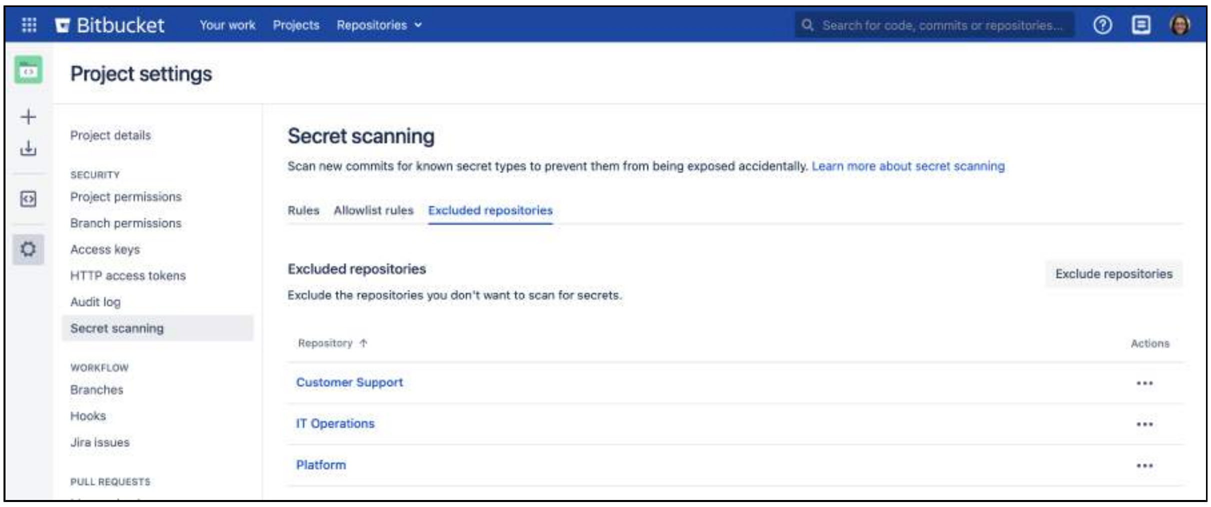
Exclude repositories from scanning

You can exclude specific repositories from scanning at the global or project level. Admins can also exclude all personal repositories at the global level. When excluded, Bitbucket won't scan any new commits added to the repository.

To exclude repositories from scanning:

1. From either the **System** or **Project** settings, select **Secret scanning**.
2. Select **Excluded repositories** tab.
3. Select **Exclude repositories** to exclude specific repositories from scanning.
4. Select **Exclude**.

To remove a repository, select **More actions …** > **Remove**.



Scan new commits for known secret types to prevent them from being exposed accidentally. Learn more about secret scanning

Excluded repositories

Exclude the repositories you don't want to scan for secrets.

Repository	Actions
Customer Support	•••
IT Operations	•••
Platform	•••

Resolve issues detected by secret scanning

Once a secret has been detected in a repository by the scanner, it is good practice to treat the secret as being compromised. Any secrets that are detected by the scanner should be invalidated in the tool they were created in (either through revoking, deleting, or rotating said secret) and new secrets should be generated in their place. Invalidating secrets may involve working with other teams in your organization such as DevOps or Security to make sure that existing systems and workflows are not impacted.

Removing the secret from Git history by force pushing does not guarantee that the commit is completely cleaned up. There are lots of edge cases (such as other branches, pull requests, forks or local copies) where the commit may still be referenced and so will never be completely removed from Git, even if it is not part of the main branch. Additionally, anyone with access to the repository may have already seen the secret and made a copy of it elsewhere. Therefore, **we don't recommend** that you revoke the secret from your com mit history as the only preventative measure. The secret must always be revoked in the tool they were created in too.

If the detected secret is a false positive, contact your admin and ask them to make modifications to the secret scanner to reduce the chance of a false positive. Here are some ways to narrow down false positives:

- Modify the regex in a secret scanning rule (sometimes the regex used may be too permissive).
- Provide a path pattern to limit the files and directories scanned.
- Use the allowlists at the project and repository levels to specify patterns that aren't secrets.
- Exclude the repositories you don't want to scan for secrets.

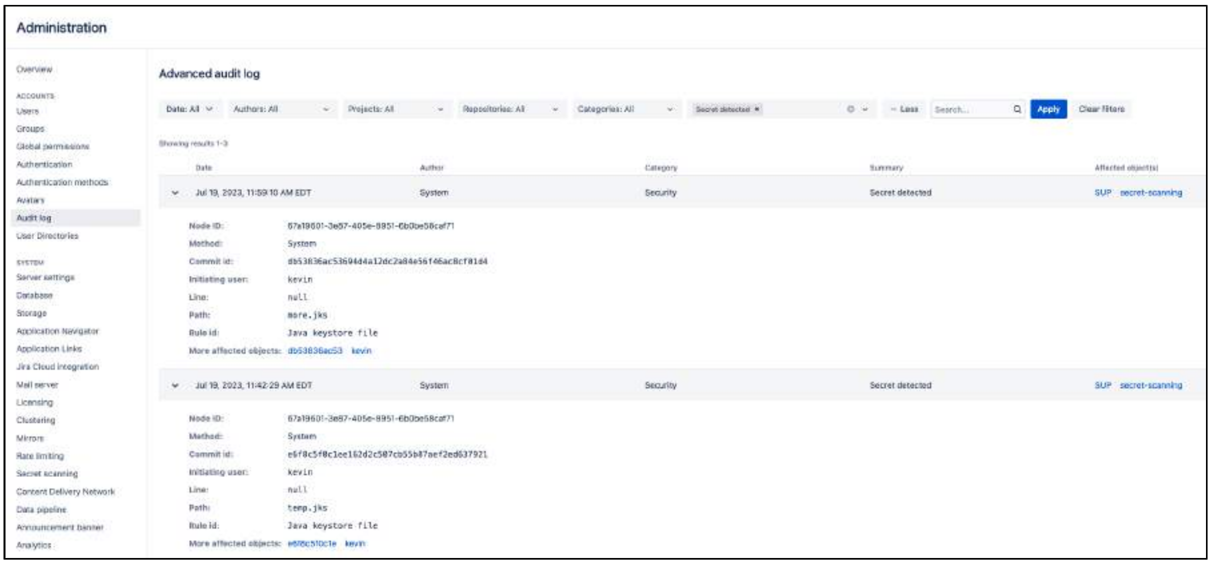
Track alerts about leaked secrets

Along with sending email notifications about detected secrets when a mail server is configured, Bitbucket also records these alerts in two locations:

- the audit log that you can access from **Administration** > **Audit log**
- the `audit.log` file on the file system (`$BITBUCKET_HOME/log/audit`).

Audit log in the user interface

To find alerts about detected secrets in the audit log, select **Administration** > **Audit log**. You can filter the list of alerts by selecting the **+ More** button and **Secret detected** for **Summary**.



Date	Author	Category	Summary	Affected object(s)
Jul 19, 2023, 11:59:10 AM EDT	System	Security	Secret detected	SUP secret-scanning

```
Node ID:                 67a19601-3e87-405e-8951-6b0be58caf71
Method:                  System
Commit id:               db53836ac53694d4a12dc2a84e56f46ac8cf01d4
Initiating user:         kevin
Line:                    null
Path:                    more.jks
Rule id:                 Java keystore file
More affected objects:   db53836ac53   kevin
```

Date	Author	Category	Summary	Affected object(s)
Jul 19, 2023, 11:42:29 AM EDT	System	Security	Secret detected	SUP secret-scanning

```
Node ID:                 67a19601-3e87-405e-8951-6b0be58caf71
Method:                  System
Commit id:               e6f8c5f0c1ee162d2c507cb55b87aef2ed637921
Initiating user:         kevin
Line:                    null
Path:                    temp.jks
Rule id:                 Java keystore file
More affected objects:   e6f8c510c1e   kevin
```

Each record will look similar to the following:

```
## When a file containing secrets is found:
Node ID: 67a19601-3e87-405e-8951-6b0be58caf71
Method: System
Commit id: db53836ac53694d4a12dc2a84e56f46ac8cf01d4
Initiating user: kevin
Line: null
Path: more.jks
Rule id: Java keystore file
More affected objects: db53836ac53 kevin
----
## When a secret is found within a file:
...
Line: 1
Path: env
Rule id: Basic auth
More affected objects: 0a1fea57765 kevin
```

The audit.log file

In `$BITBUCKET_HOME/log/audit`, Bitbucket includes a JSON record for each audit event. If secret scanning is triggered, a new record with the relevant information will be appended. If pragmatically parsing these JSONs, we may want to look inside the `auditType` key for entries similar to the following:

```
...
  "auditType": {
    "action": "Secret detected",
    "actionI18nKey": "bitbucket.secretscanning.audit.action.secretdetected",
```

Secret scanning performance

While only new commits are scanned as soon as they’re pushed, the performance of secret scanning can be affected by a few other factors along with the number of pushed commits:

- the size of the commit diff
- the number of scanning rules
- the complexity of scanning rules
- the complexity of allowlist rules
- the high load caused by third-party plugins or REST API activity in your instance.

A system administrator can track the performance of secret scanning with the properties from the `application-default.properties` file that are described in the following table.

Property	Default value	Description
`secretscanning.max.threads`	`${scaling.concurrency}` – the number of detected CPU cores	Controls the maximum number of threads allowed per node to perform secret scanning
`secretscanning.scan.timeout`	1000	Controls the timeout in milliseconds for streaming the diff for a commit and detecting any secrets
`secretscanning.scan.batch.size`	200	Controls the number of commits sent to the executor to be scanned for secrets. If the number of commits pushed exceeds the batch size, multiple batches will be sent.
`secretscanning.scan.commit.limit`	10000	Controls the maximum number of commits to be scanned in a single push
`secretscanning.email.maxsecrets`	100	Controls the maximum number of detected secrets that a single email can contain to limit the size of the emails Bitbucket sends out

Learn more about configuration properties

Use diff transcoding

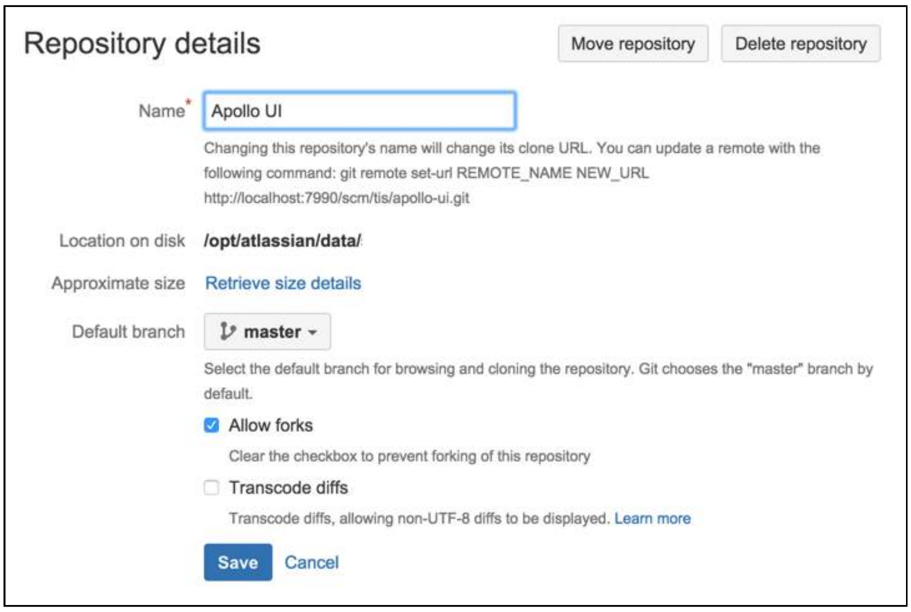
Bitbucket Data Center supports transcoding for diffs. This allows it to convert files in encodings like EUC-JP, GB18030 and UTF-16 to UTF-8, so they are processed correctly by `git diff`, which only supports UTF-8. Similar transcoding has been applied to the Bitbucket source view since it was released, so this change brings the diff view in line with the source view. Diff transcoding is applied to commit and pull request diffs, as well as the diff-to-previous view.

Git for Windows, formerly known as msysgit, has known issues with Unicode paths. Diff transcoding works on all supported versions of Git for Windows, but 1.8.0 or higher is required to support Unicode paths.

Enabling diff transcoding

Diff transcoding must be explicitly enabled for each repository (unlike source view transcoding, which is always performed).

Repository administrators can enable diff transcoding on the repository settings page:



Repository details

Name* Apollo UI

Changing this repository's name will change its clone URL. You can update a remote with the following command: git remote set-url REMOTE_NAME NEW_URL http://localhost:7990/scm/tis/apollo-ui.git

Location on disk /opt/atlassian/data/

Approximate size Retrieve size details

Default branch master

Select the default branch for browsing and cloning the repository. Git chooses the "master" branch by default.

[✓] Allow forks

Clear the checkbox to prevent forking of this repository

[ ] Transcode diffs

Transcode diffs, allowing non-UTF-8 diffs to be displayed. Learn more

Performance and scaling

There's a performance consideration with transcoding. It is implemented using Git's `textconv` support, so using it adds overhead to displaying diffs. Where possible, the best approach, given `git` only supports UTF-8 content, is to use UTF-8 encoding so that transcoding is not necessary. In repositories without non-UTF-8 content, diff transcoding should be left disabled. Other encodings are often a necessity, however, and for repositories containing such content enabling diff transcoding allows using the full range of Bitbucket features.

When transcoding is enabled, `git diff` writes the before and after blobs to temporary files and invokes the `textconv` script once for each file. The script Bitbucket installs uses Perl to send a request back to Bitbucket with the path to each temporary file. Bitbucket then opens each file, detects the encoding using the same algorithm the source view uses, converts the file to UTF-8 and streams it out for `git diff` to use. After `git diff` has invoked the `textconv` script the temporary files it created are deleted.

Writing the blobs to disk, starting Perl and calling back into Bitbucket are all overhead processing compared to performing a diff without transcoding. How much overhead that is varies by the size of the diff. When nominally-sized files containing two or three thousand lines or less are being compared the overhead is miniscule, under 50 milliseconds on an average server. However, when comparing larger files the overhead can result in a noticeable delay displaying the diff.

Change the port Bitbucket listens on

You can change the port that Bitbucket Data Center listens on from the default '`7990`' to a different value if another application is already running on that port.

You can use netstat to identify free ports on your machine.

Related pages:

- Specify the Bitbucket base URL
- Proxy and secure Bitbucket
- Configuration properties

To change the port Bitbucket listens on

1. Navigate to your home directory.
2. Open the `shared/bitbucket.properties` file, add the `sever.port` property (or edit it if a line for the `server.port` property already exists), and set the value to the port number Bitbucket will run on. For example, to set to the port to `8080` you would add:

   ```
   server.port=8080
   ```

   Then save the file.

3. Restart Bitbucket so the change takes effect. See Start and stop Bitbucket.

Important considerations

If you are using a firewall, ensure that it is configured to allow HTTP or HTTPS traffic over the connector port you have chosen.

If you are running Bitbucket on a Linux server and want to bind to privileged ports (those below 1024, for example port 80), you will *need to start Bitbucket as root* to successfully bind to the port. However; we don't recommend that you start *Bitbucket* as *root* and instead do one of the following:

- Bind Bitbucket to a port over 1024 and configure a load balancer in front of the server to redirect traffic from port 80 to the higher port. Learn more about load balance configuration options
- Bind Bitbucket to a port over 1024 and configure `iptables` to redirect traffic from port 80 to the higher port
- Use `setcap` to allow privileged port access for `java` processes. For more information, see Running Bitbucket Server on a privileged port without root

Lockout recovery process

This page describes how to recover administrator access for Bitbucket Data Center 5.X+, and later. For releases prior to that, please refer to the documentation specific to that version.

As an administrator, you may find yourself locked out of Bitbucket and unable to log in. This situation can arise when all users are managed externally from Bitbucket, and it becomes unable to access those user directories for some reason, including:

- The external user directory server is not accessible (because the network is down, or the directory is down, or the directory has been moved to another IP address).
- Users are managed within a Jira application and the Application Link from Bitbucket to a Jira application has been accidentally deleted.
- The admin password has been forgotten or lost.
- The admin account is shaded by a remote account in an LDAP or Jira application that is connected to Bitbucket but which is unavailable.

Steps for Linux:

1. Edit the `<Bitbucket installation directory>\bin\_start-webapp.sh` file and add the "`-Datlassian.recovery.password=temporarypassword`" value to the `JVM_SUPPORT_RECOMMENDED_ARGS` property. The property value must be non-blank, and should look like this when you've done that:

   ```
   # Occasionally Atlassian Support may recommend that you set some specific JVM arguments.
   # You can use this variable to do that. Simply uncomment the below line and add any required
   # arguments. Note however, if this environment variable has been set in the environment of the
   # user running this script, uncommenting the below will override that.
   #
   JVM_SUPPORT_RECOMMENDED_ARGS=-Datlassian.recovery.password=temporarypassword
   ```

   Here we are using "`temporarypassword`", but you should use your own value.

   If your password includes special characters like ! (exclamation mark), @ (at sign), # (pound sign), $ (dollar sign), % (percent sign), ^ (caret), & (ampersand), or * (asterisk), enclose the JVM argument within quotation marks. For example:

   ```
   JVM_SUPPORT_RECOMMENDED_ARGS="-Datlassian.recovery.password=password-with-special-chars"
   ```

2. Start Bitbucket **manually** by running `<Bitbucket installation directory>\bin\start-bitbucket.sh`.
3. Log in using the 'recovery_admin' username and the temporary password specified in Step 1.
4. Repair your configuration. We strongly recommend that you do not perform other actions while Bitbucket is in recovery mode.
5. Confirm your ability to log in with your usual admin profile.
6. Shut down Bitbucket, remove the `atlassian.recovery.password` argument from `_start-webapp.sh`, and restart Bitbucket as usual.

Steps for Windows: We've ended support for Bitbucket Server and Data Center hosting on Windows from 8.0. For lockout recovery process in Windows, see our 7.21 documentation.

Steps for Kubernetes

A Kubernetes environment doesn't have a `_start-webapp.sh` file that can be edited to pass the recovery password. Therefore, you need to pass it as a JVM argument in a ConfigMap referenced by a StatefulSet. In most cases, the default ConfigMap is `bitbucket-jvm-config`.

You can check it in the following example:

```
kubectl edit configmaps -n <namespace> bitbucket-jvm-config -o yaml
apiVersion: v1
data:
  additional_jvm_args: -Datlassian.recovery.password=<temp password> -XX:ActiveProcessorCount=8
```

Then, you need to restart the StatefulSet:

```
kubectl rollout restart statefulset bitbucket -n <namespace>
```

If the login page is disabled due to SSO restrictions, learn how to bypass SSO from How to enable auth_fallback functionality when using SSO in Bitbucket Data Center.

Proxy and secure Bitbucket

This page provides an overview of some common network topology options for running Bitbucket Data Center, including running Bitbucket behind a reverse proxy and securing access to Bitbucket by using HTTPS (HTTP over SSL).

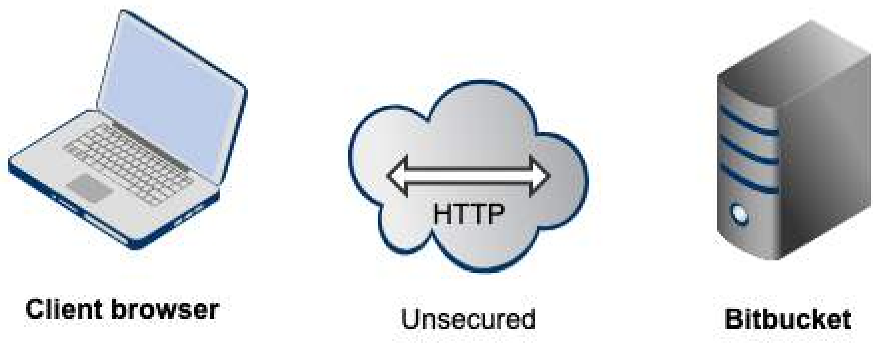
Note that Bitbucket does not need to run behind a web server – it is capable of serving web requests directly using the bundled Tomcat application server. On this page, 'connecting to Bitbucket' really means connecting to Tomcat, which is used to serve Bitbucket content.

On this page

Connecting to Bitbucket directly over HTTP

Connecting directly to Bitbucket (that is, Tomcat) is the default install configuration, as described on Getting started.

When set up this way, the user accesses Bitbucket directly over HTTP, without using SSL – all communication between the user's browser and Bitbucket will be unsecured.



You may also wish to consider the following:

- Bitbucket, by default, will listen for requests on port 7990 – this port can be changed if required.

- The address with which to access Bitbucket, by default, will be http://<computer name>:7990. Change the base URL if required.
- You can set the context path for Bitbucket if you are running another Atlassian application, or Java web application, at the same hostname and context path as Bitbucket.
- Securing Git operations between the user's computer and Bitbucket is a separate consideration - see Enabling SSH access to Git.

Securing access to Bitbucket using HTTPS

Access to Bitbucket can be secured by enabling HTTPS (HTTP over SSL) for the Tomcat application server that is bundled with Bitbucket. You should consider doing this, and making secure access mandatory, if Bitbucket will be internet-facing and usernames, passwords and other proprietary data may be at risk.

When set up in this way, access to Bitbucket is direct, and all communication between the user's browser and Bitbucket will be secured using SSL.

See Secure Bitbucket with Tomcat using SSL for configuration details.

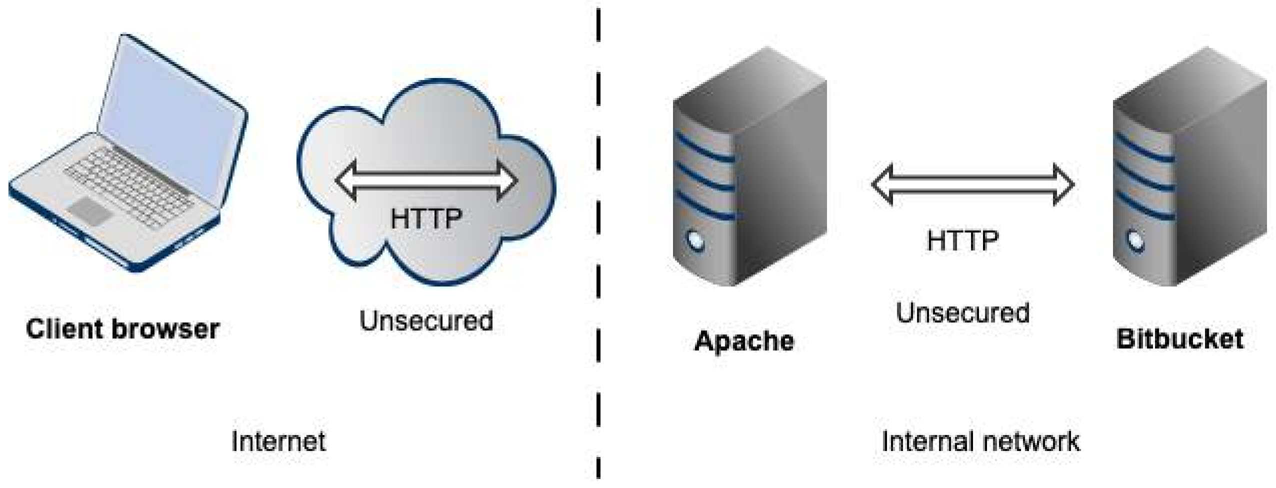
Using a reverse proxy for Bitbucket

You can run Bitbucket behind a reverse proxy, such as Apache HTTP Server. You may wish to do this if you want to:

- use a different port number to access Bitbucket, particularly if you are Integrating Jira Cloud with Bitbucket.
- use a different context path to access Bitbucket

When set up this way, external access to Bitbucket is via a reverse proxy, without using SSL. All communication between the user's browser and Apache, and so Bitbucket, will be unsecured, but users do not have direct access to Bitbucket. An example scenario is where Apache provides a gateway through which users outside the firewall can access Bitbucket.

See Integrate Bitbucket with Apache HTTP Server for configuration details.



Note that:

- Bitbucket, by default, will listen for requests on port 7990 – this port can be changed if required.
- Bitbucket (Tomcat) needs to know the URL (proxy name) that Apache serves.
- The address with which to access Bitbucket will be http://<proxy name>:7990. Change the base URL if required.
- Any existing links with other applications will need to be reconfigured using this new URL for Bitbucket.
- You can set the context path for Bitbucket if you are running another Atlassian application, or Java web application, at the same hostname and context path as Bitbucket.
- Securing Git operations between the user's computer and Bitbucket is a separate consideration - see Enabling SSH access to Git.

Securing a reverse proxy using HTTPS

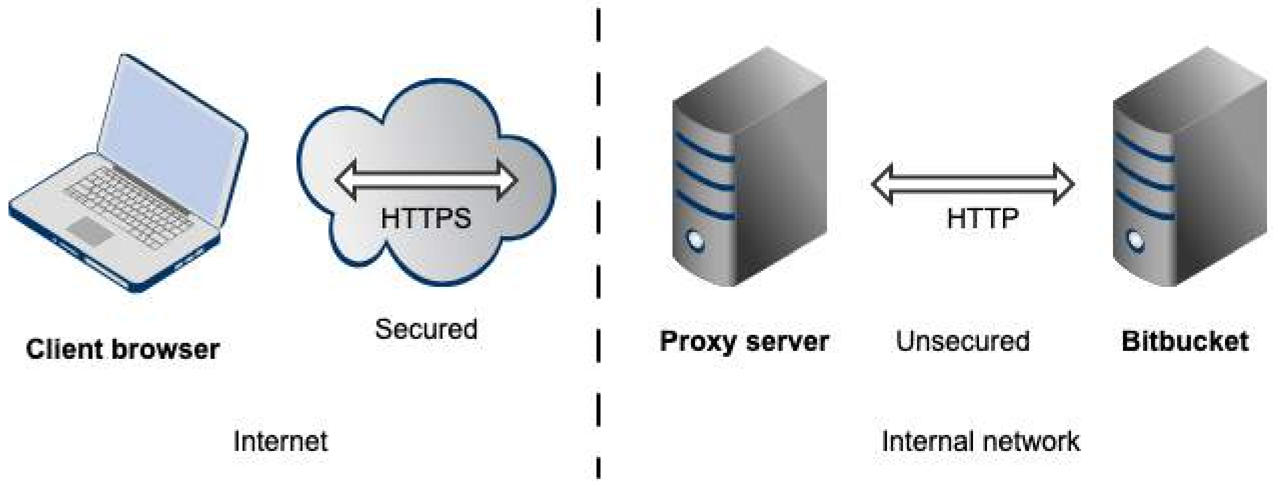
You can run Bitbucket behind a reverse proxy, such as Apache HTTP Server or nginx, that is secured using HTTPS (HTTP over SSL). You should consider doing this, and making secure access mandatory, if usernames, passwords and other proprietary data may be at risk. An example scenario is where Apache HTTP Server provides a gateway through which users outside the firewall can access Bitbucket.

When set up in this way, external access to Bitbucket is via a reverse proxy, where external communication with the proxy uses HTTPS. All communication between the user's browser and the reverse proxy will be secured, whereas communication between the proxy and Bitbucket will not be secured (it doesn't use SSL).

See the following pages for configuration details:

- Secure Bitbucket with Apache using SSL

- Secure Bitbucket behind nginx using SSL
- Secure Bitbucket behind HAProxy using SSL



Note that:

- The reverse proxy (for example, Apache) will listen for requests on port 443.
- Bitbucket, by default, will listen for requests on port 7990. Bitbucket (Tomcat) needs to know the URL (proxy name) that the proxy serves.

- The address with which to access Bitbucket will be https://<proxyName>:<proxyPort>/<context path>, for example https://mycompany.com:443/bitbucket
- Any existing links with other applications will need to be reconfigured using this new URL for Bitbucket.

- Bitbucket (Tomcat) should be configured to refuse requests on port 7990 and to redirect those to the proxy on port 443.
- Securing Git operations between the user's computer and Bitbucket is a separate consideration - see Enabling SSH access to Git.
- It would be possible to set up an SSL connection between the proxy server and Tomcat (Bitbucket), but that configuration is very unusual, and not recommended in most circumstances.
- Incidentally, note that Bitbucket 4.0 and later versions do not support `mod_auth_basic` .

Secure Bitbucket with Tomcat using SSL

This page describes how to enable HTTPS (HTTP over SSL) access for Apache Tomcat, the application server shipped with Bitbucket Data Center.

Why should I secure Bitbucket using SSL?

You should consider doing this, and making secure access mandatory, if Bitbucket will be internet-facing, which could potentially put usernames, passwords and other proprietary data at risk.

There are other network topology options for running Bitbucket, including running Bitbucket behind a reverse proxy. For an overview of some common options, see Proxy and secure Bitbucket.

When Bitbucket is set up using these instructions, access to Bitbucket is direct, and all communication between a user's browser and Bitbucket will be secured using SSL.

On this page:

Related pages:

- Integrate Bitbucket with Apache HTTP Server
- Secure Bitbucket with Apache using SSL

Before you begin

The configuration described here results in a scenario where:

- Bitbucket would listen for requests on port `8443`; the port can be changed, if required.
- Bitbucket would be available at `https://<computer name>:8443`; the base URL can be changed, if required.
- As a result, any existing links with other applications would need to be reconfigured using this new URL for Bitbucket.
- You can set the context path for Bitbucket if you are running another Atlassian application, or Java web application, at the same hostname and context path as Bitbucket.
- Securing Git operations between the user's computer and Bitbucket is a separate consideration - see Enabling SSH access to Git.

These instructions are for reference use only

Atlassian applications allow the use of SSL within our products, however Atlassian Support does not provide assistance for configuring it. Consequently, Atlassian **cannot guarantee providing any support for it**.

If you require assistance with conversions of certificates is required, consult the vendor who provided the certificate. Atlassian Support will refer SSL-related support to the issuing authority for the certificate.

Also, these instructions are intended for administrators setting up Bitbucket for a small team.

Generate a self-signed certificate

Self-signed certificates are useful if you require encryption but do not need to verify the identity of the requesting website. In general, you might use a self-signed certificate on a test environment and on internal corporate networks (intranets).

Because the certificate is not signed by a certificate authority (CA), users may receive a message that the site is not trusted and may have to perform several steps to accept the certificate before they can access the site. This usually occurs the first time they access the site.

This approach to creating a certificate uses Java's keytool, there are other tools for generating certificates are available.

⚠ If you are setting up a production instance of Bitbucket, we strongly recommend using a CA certificate (described below), rather than using a self-signed certificate.

To generate a self-signed certificate using Java's `keytool` utility

1. Create a new `.keystore` file in the Bitbucket home directory.
   a. Log in with the user account that has access to Bitbucket home directory (or use sudo alternatively).
   b. Run the following command:

Windows	`"%JAVA_HOME%\bin\keytool" -genkey -alias tomcat -keyalg RSA -sigalg SHA256withRSA -keystore <Bitbucket home>\shared\config\ssl-keystore`
Linux, macOS	`$JAVA_HOME/bin/keytool -genkey -alias tomcat -keyalg RSA -sigalg SHA256withRSA -keystore <Bitbucket home>/shared/config/ssl-keystore`

   ⚠ The default keystore Bitbucket uses is `<Bitbucket home directory>/shared/config/ssl-keystore`. You can specify different keystore location using the `keystore` parameter. But, in this case, you will have to include it in the `bitbucket.properties` file as described in the configuration section.

2. When asked for a **password** (the first of two passwords you will set, which must be identical):
   - Specify the password you want to use for the certificate (private key).
   - The default password Tomcat expects is '`changeit`'. If you use any other value you must specify it in the `<Bitbucket home directory>/shared/bitbucket.properties` file.
   - Make a note of the password as you will need it again in the next step.

3. Follow the prompts to specify your **name**, **organization** and **location**. This information is used to construct the X.500 Distinguished Name (DN) of the entity.

   The CN ("What is your first and last name?") *must match the fully-qualified hostname of the server running Bitbucket*, otherwise Tomcat will not be able to use the certificate for SSL. This is the name you would type in your web browser after 'http://' (no port number) to access your Bitbucket installation.

4. When asked for the **password** for '`tomcat`' (the alias you entered in the keytool command above), press the 'Enter' key. This specifies that your keystore entry will have the **same password** as your private key. If needed, you can specify different key password.

Configure HTTPS in `bitbucket.properties`

The default connection for Bitbucket uses an unsecured HTTP connection. Depending on the type of access you require, you can change Bitbucket's default connector (or add additional connectors) to require HTTPS-only access to your instance.

- *To configure HTTPS-only access*, you would replace the default connector to require HTTPS-only access.
- *To redirect HTTP requests to a secure HTTPS connection*, you would configure the default connector to redirect to an additional, secured connector.

There are a number of ways to configure secure connections depending on your requirements. These instructions describe how to replace Bitbucket's default connector with a secure, HTTPS-only connection by adding configuration properties to the `bitbucket.properties` file.

To configure HTTPS-only access to Bitbucket

1. Navigate to your home directory.

   a. Open the `shared/bitbucket.properties` file and add these properties:

```
server.port=8443
server.ssl.enabled=true
server.ssl.key-store=/path/to/keystore/bitbucket.jks
server.ssl.key-store-password=<password value>
server.ssl.key-password=<password value>
```

By adding these properties to your `bitbucket.properties` file you override the default connector values.

Property	What it does
`server.port=8443`	Enables SSL access on port 8443 (the default for HTTPS is 443, but 8443 is used here instead of 443 to avoid conflicts)
`server.scheme=https`	Specifies a required URL scheme.
`server.ssl.enabled=true`	Specifies whether SSL enabled (true) or not (false). Setting this to `true` *automatically* defaults `server.scheme=https` and `server.secure=true`; they do not need to be set explicitly.
`server.ssl.client-auth=need`	Specifies whether client authentication is wanted ("`want`") or needed ("`need`"). Requires a trust store.
`server.ssl.protocol=TLSv1.2`	We recommend requiring TLS 1.2. If you have clients that don't support TLS 1.2, don't include this property. The default is"`TLS`".
`server.ssl.key-alias=<alias>`	Specifies SSH key values. Only required if non-default alias is used (default value is "tomcat").

`server.ssl.key-store=/path/to/keystore/bitbucket.jks`	Specifies where the keystore is on your filesystem. Only required if you created the keystore in non-default location (other than <Bitbucket home directory>/shared/config/ssl-keystore). On Windows you should use forward-slashes in the path, for example: `server.ssl.key-store=c:/Atlassian/ApplicationData/Bitbucket/bitbucket.jks` To use backslashes, they must be doubled (e.g. "C:\\Atlassian\\...")
`server.ssl.key-store-password=<password value>`	Specifies your keystore password. Only required if your keystore password is anything other than the default ("`changeit`").
`server.ssl.key-password=<password value>`	Specifies your key password. Only required if your key password is anything other than the default ("`changeit`").
`server.ssl.key-store-type=jks`	Specifies keystore type. Only required if your keystore is anything other than the default ("jks"). Could be "pkcs12" for certificates provided by CA.

If you created the keystore somewhere else on the filesystem, add the `keystoreFile` attribute to the connector tag as well. If your keystore password is anything other than "`changeit`", add `keystorePass="<password value>"` to the `bitbucket.properties` file.

2. Then save the file.
3. Start (or re-start) Bitbucket.
4. Access Bitbucket at `https://localhost:8443/` in your browser.

Export the self-signed certificate

If you need to export a certificate from the keystore (for example, to be able to import it into another keystore), you should use the following commands.

To export the self-signed certificate, run this command

Windows	`"%JAVA_HOME%\bin\keytool" -export -alias tomcat -file file.cer -keystore <Bitbucket home directory>\shared\config\ssl-keystore`
Linux, macOS	`$JAVA_HOME/bin/keytool -export -alias tomcat -file file.cer -keystore <Bitbucket home directory>/shared/config/ssl-keystore`

Request a CA certificate

Digital certificates are issued by a Certification Authority (CA) to verify your website represents your company. When running Bitbucket in a production environment, you need a certificate issued by a CA, such as VeriSign, DigiCert or Thawte. The instructions below are adapted from the Tomcat documentation.

First, you will generate a local certificate and create a certificate signing request (CSR) based on that certificate. You then submit the CSR to your chosen certificate authority. The CA will use that CSR to generate a certificate for you.

1. Use Java's `keytool` utility to generate a local self-signed certificate, as described in the section above.
2. Use the `keytool` utility to generate a CSR. If needed, replace the keystore file name with the path to and filename of the `.keystore` file you generated for your local certificate:

Windows	`"%JAVA_HOME%\bin\keytool" -certreq -keyalg RSA -alias tomcat -file certreq.csr -keystore <Bitbucket home>\shared\config\ssl-keystore`
Linux, macOS	`$JAVA_HOME/bin/keytool -certreq -keyalg RSA -alias tomcat -file certreq.csr -keystore <Bitbucket home>/shared/config/ssl-keystore`

3. Submit the generated file called `certreq.csr` to your chosen certificate authority. Refer to the documentation on the CA's website to find out how to do this.
4. The CA will send you a certificate.
5. Import the new certificate into your local keystore. Assuming your certificate is called `file.cer,` run this command to add the certificate to the keystore:

Windows	`"%JAVA_HOME%\bin\keytool" -import -alias tomcat -file file.cer -keystore <Bitbucket home>\shared\config\ssl-keystore`
Linux, macOS	`$JAVA_HOME/bin/keytool -import -alias tomcat -file file.cer -keystore <Bitbucket home>/shared/config/ssl-keystore`

Troubleshooting

Here are some troubleshooting tips if you are using a self-signed key created by keytool, or a CA certificate, as described above.

When you enter "https://localhost:8443/" in your browser, if you get a message such as "Cannot establish a connection to the server at localhost:8443," look for error messages in your `<Bitbucket home>/shared/logs/atlassian-bitbucket.log` file. Here are some possible errors with explanations.

SSL + Apache + IE problems

Some people have reported errors when uploading attachments over SSL using Internet Explorer. This is due to an IE bug, and can be fixed in Apache by setting:

```
BrowserMatch ".MSIE." \
        nokeepalive ssl-unclean-shutdown \
        downgrade-1.0 force-response-1.0
```

Google has plenty more on this.

Can't find the keystore

```
 java.io.FileNotFoundException: /var/atlassian/application-data/bitbucket/shared/config/ssl-keystore (No
such file or directory)
```

This indicates that Tomcat cannot find the keystore. By default Bitbucket expects keystore to be available in the file <Bitbucket home directory>/shared/config/ssl-keystore. If you use non-default location, you will need to specify where the keystore file is in <Bitbucket home directory>`/shared/bitbucket.properties`. Add the following attribute to the connector tag you uncommented:

```
server.ssl.key-store=${bitbucket.shared.home}/config/ssl-keystore
```

Additionally, please, make sure you are running Bitbucket as the user who has permission to read the keystore file.

Incorrect password, or passwords don't match

```
 java.io.IOException: Keystore was tampered with, or password was incorrect
```

You likely used a different password for your keystore file than the default, which is "`changeit`", or specified incorrect key password in the bitbucket.properties file.

```
 java.io.IOException: Cannot recover key
```

You likely used a different password for your key than the default, which is "`changeit`", or specified incorrect key password in the bitbucket.properties file.

To check if either of these problems is the case, locate the `<Bitbucket home directory>/shared/bitbucket.properties` file, and verify these two properties have matching values.

```
server.ssl.key-store-password=<password value>
server.ssl.key-password=<password value>
```

Invalid keystore format

```
java.io.IOException: Invalid keystore format
```

This is potentially being caused by generating a keystore on a later version of Java than supported by your current running version of Bitbucket. Compare the supported version with your installed version in the Supported platforms document:

```
java --version
```

Wrong certificate

```
javax.net.ssl.SSLException: No available certificate corresponds to the SSL cipher suites which are
enabled.
```

By default, keytool creates certificates that use DSA public key. Make sure you are using -keyalg RSA option when generating certificates.

If the Keystore has more than one certificate, Tomcat will use the "tomcat" certificate unless otherwise specified in the `<Bitbucket home directory>/shared/bitbucket.properties` file.

Verify this attribute is set in the `bitbucket.properties` file.

```
server.ssl.key-alias=tomcat
```

Using Apache Portable Runtime (APR)

Bitbucket does not support APR at the moment.

Enabling client authentication

To enable client authentication in Tomcat, ensure that the value of the `server.ssl.client-auth` attribute in your `bitbucket.properties` file is set to "`need`".

```
server.ssl.client-auth=need
```

Wrong certificate type

If the certificate from the CA is in PKSC12 format, add the `server.ssl.key-store-type` attribute in your `bitbucket.properties` file with the "`PKCS12`" value.

```
server.ssl.key-store=${bitbucket.shared.home}/config/ssl-keystore
server.ssl.key-store-password=changeit
server.ssl.key-store-type=pkcs12
```

Alternatively, you can import pkcs12 certificate into default JCS keystore using the following command:

```
keytool -importkeystore -srckeystore <Bitbucket home>/shared/config/certificate.pfx -srcstoretype pkcs12
-srcstorepass exportpass -srcalias <Source keystore alias> -destkeystore <Bitbucket home>/shared/config
/ssl-keystore  -deststoretype jks -deststorepass changeit -destalias tomcat
```

Certificate chain is incomplete

If the root certificate and intermediary certificate(s) aren't imported into the keystore before the entity/domain certificate, you will see the following error:

```
[root@dev atlas]# $JAVA_HOME/bin/keytool -import -alias tomcat -file my_entity_cert.crt
Enter keystore password:
keytool error: java.lang.Exception: Failed to establish chain from reply
```

Most likely, the CA sent a compressed file containing several certificates. The import order matters so you must import the root certificate first, followed by one or many intermediate certificates, followed lastly by the entity/domain certificate. There are many resources online that provide guidance for certificate installation for Tomcat (Java-based) web servers using keytool.

Integrate Bitbucket with Apache HTTP Server

When opened in a viewport, the user will be redirected to: Proxying Atlassian server applications with Apache HTTP Server (mod_proxy_http).

Redirect

See this page Secure Bitbucket with Apache using SSL for more info about why the page redirects

This page explains how to establish a network topology in which Apache HTTP Server acts as a reverse proxy fo r Bitbucket Data Center. Typically, such a configuration would be used when Bitbucket is installed in a protected zone 'behind the firewall', and Apache HTTP Server provides a gateway through which users outside the firewall can access Bitbucket. You may wish to do this if you want to:

- use a different port number to access Bitbucket
- use a different context path to access Bitbucket

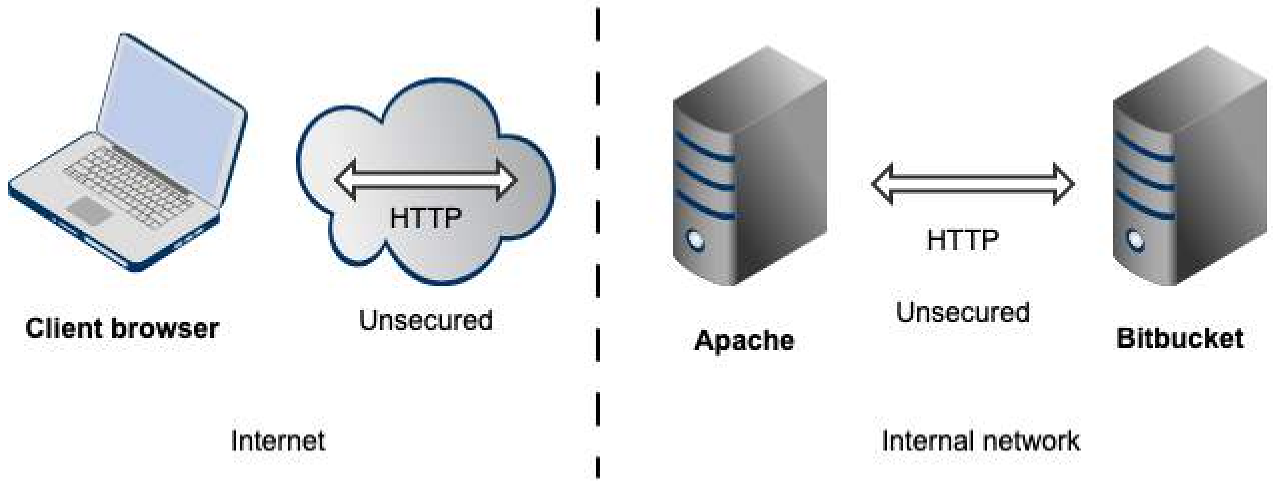
Be aware that Bitbucket does not need to run behind a web server, since it is capable of serving web requests directly; to secure Bitbucket when run in this way see Secure Bitbucket with Tomcat using SSL. For an overview of other network topology options, see Proxy and secure Bitbucket. Otherwise, if you want to install Bitbucket in an environment that incorporates Apache HTTP Server, this document is for you.

When Bitbucket is set up following the instructions on this page, external access to Bitbucket uses a reverse proxy, without using SSL. All communication between the user's browser and Apache, and so Bitbucket, will be unsecured, but users do not have direct access to Bitbucket.

On this page:

Related pages:

- Secure Bitbucket with Apache using SSL
- Secure Bitbucket with Tomcat using SSL



Note that:

- Bitbucket, by default, will listen for requests on port 7990 – this port can be changed if required.
- Bitbucket (Tomcat) needs to know the URL (proxy name) that Apache serves.
- The address with which to access Bitbucket will be http://<proxy name>:7990. Change the base URL if required.
- Any existing links with other applications will need to be reconfigured using this new URL for Bitbucket.
- You can set the context path for Bitbucket if you are running another Atlassian application, or Java web application, at the same hostname and context path as Bitbucket.
- Securing Git operations between the user's computer and Bitbucket is a separate consideration - see Ena bling SSH access to Git.

About using Apache software

This section has general information pertaining to the use of Apache HTTP Server and Apache Tomcat. It is important that you read this section before proceeding to the steps that follow.

Configuring Tomcat 7

The Bitbucket distribution includes an instance of Tomcat 7, the configuration of which is determined by the contents of the `<Bitbucket home directory>/shared/server.xml` file. Note that any changes that you make to the `server.xml` file will only be effective upon starting or re-starting Bitbucket.

You may find it helpful to refer to the Apache Tomcat 7.0 Proxy Support HowTo page.

Configuring Apache HTTP Server

Since Apache HTTP Server is not an Atlassian product, Atlassian does not guarantee to provide support for its configuration. You should consider the material on this page to be for your information only; use it at your own risk. If you encounter problems with configuring Apache HTTP Server, we recommend that you refer to the Apache HTTP Server Support page.

Note that Bitbucket 2.10 and later versions do not support `mod_auth_basic`.

You may find it helpful to refer to the Apache HTTP Server Documentation, which describes how you can control Apache HTTP Server by changing the contents of the `httpd.conf` file. The section on Apache Module mod_proxy is particularly relevant. Note that any changes you make to the `httpd.conf` file will only be effective upon starting or re-starting Apache HTTP Server.

This document relates to Apache HTTP Server version 2.4.2; the configuration of other versions may differ.

Step 1: Configure the Tomcat Connector

Find the normal (non-SSL) `Connector` directive in Tomcat's `<Bitbucket home directory>/shared/server.xml` file, and add the `scheme`, `proxyName`, and `proxyPort` attributes as shown below. Instead of `mycompany.com`, set the `proxyName` attribute to your domain name that Apache HTTP Server will be configured to serve. This informs Bitbucket of the domain name and port of the requests that reach it via Apache HTTP Server, and is important to the correct operation of the Bitbucket functions that construct URLs.

```
<Connector port="7990"
    protocol="HTTP/1.1"
    connectionTimeout="20000"
    useBodyEncodingForURI="true"
    redirectPort="8443"
    compression="on"
    compressableMimeType="text/html,text/xml,text/plain,text/css,application/json,application/javascript,
application/x-javascript"
    scheme="http"
    proxyName="mycompany.com"
    proxyPort="80" />
```

Note: Apache HTTP Server's `ProxyPreserveHost` directive is another way to have the hostname of the incoming request recognized by Bitbucket instead of the hostname at which Bitbucket is actually running. However, the `ProxyPreserveHost` directive does not cause the scheme to be properly set. Since we have to mess with Tomcat's `Connector` directive anyway, we recommend that you stick with the above-described approach, and don't bother to set the `ProxyPreserveHost` in Apache HTTP Server.

For more information about configuring the Tomcat Connector, refer to the Apache Tomcat 7.0 HTTP Connector Reference.

Step 2: Change Bitbucket's base URL

After re-starting Bitbucket, open a browser window and log into Bitbucket using an administrator account. Go to the Bitbucket administration area and click **Server settings** (under 'Settings'), and change **Base URL** to match the proxy URL (the URL that Apache HTTP Server will be serving).

Step 3 (optional): Set a context path for Bitbucket

By default, Bitbucket is configured to run with an empty context path; in other words, from the 'root' of the server's name space. In that default configuration, Bitbucket is accessed at:

```
http://localhost:7990/
```

It's perfectly fine to run Bitbucket with the empty context path as above. Alternatively, you can set a context path by changing the `Context` directive in Tomcat's `<Bitbucket home directory>/shared/server.xml` file:

```
<Context path="/bitbucket" docBase="${catalina.home}/atlassian-bitbucket" reloadable="false" useHttpOnly="
true">
    ....
</Context>
```

If you do set a context path, it is important that the same path be used in Step 5, when setting up the `ProxyPass` and `ProxyPassReverse` directives. You should also append the context path to Bitbucket's base URL (see Step 2).

Step 4: Enable `mod_proxy` and `mod_proxy_http` in Apache HTTP Server

In the `mod_proxy` documentation, you will read that `mod_proxy` can be used as a forward proxy, or as a reverse proxy (gateway); you want the latter. Where the `mod_proxy` documentation mentions '*origin server*', it refers to your Bitbucket instance. Unless you have a good reason for doing otherwise, load `mod_proxy` and `mod_proxy_http` dynamically, using the LoadModule directive; that means un-commenting the following lines in the `httpd.conf` file:

```
LoadModule proxy_module modules/mod_proxy.so
LoadModule proxy_http_module modules/mod_proxy_http.so
```

Experienced administrators may be aware of the Apache Connector module, `mod_jk`. Atlassian does not recommend use of the `mod_jk` module with Bitbucket, since it has proven itself to be less reliable than `mod_proxy`.

Step 5: Configure `mod_proxy` to map requests to Bitbucket

To configure `mod_proxy` for use with Bitbucket, you need to use the `ProxyPass` and `ProxyPassReverse` directives in Apache HTTP Server's `httpd.conf` file as follows:

```
ProxyPass        / http://localhost:7990/ connectiontimeout=5 timeout=300
ProxyPassReverse / http://localhost:7990/
```

Suppose Apache HTTP Server is configured to serve the `mycompany.com` domain; then the above directives tell Apache HTTP Server to forward web requests of the form `http://mycompany.com/*` to the Tomcat connector (Bitbucket) running on port `7990` on the same machine.

> The `connectiontimeout` attribute specifies the number of seconds Apache HTTP Server waits for the creation of a connection to Bitbucket.
>
> The `timeout` attribute specifies the number of seconds Apache HTTP Server waits for data to be sent to Bitbucket.

If you set up a context path for Bitbucket in Step 3, you'll need to use that context path in your `ProxyPass` and `ProxyPassReverse` directives. Suppose your context path is set to "`/bitbucket`", the directives would be as follows:

```
ProxyPass        /bitbucket http://localhost:7990/bitbucket connectiontimeout=5 timeout=300
ProxyPassReverse /bitbucket http://localhost:7990/bitbucket
```

If Bitbucket is to run on a different domain and/or different port, you should use that domain and/or port number in the `ProxyPass` and `ProxyPassReverse` directives; for example, suppose that Bitbucket will run on port `990` on `private.mycompany.com` under the context path `/bitbucket`, then you would use the following directives:

```
ProxyPass        /bitbucket http://private.mycompany.com:9900/bitbucket connectiontimeout=5 timeout=300
ProxyPassReverse /bitbucket http://private.mycompany.com:9900/bitbucket
```

Step 6: Configure `mod_proxy` to disable forward proxying

If you are using Apache HTTP Server as a reverse proxy only, and not as a forward proxy server, you should turn forward proxying off by including a `ProxyRequests` directive in the `httpd.conf` file, as follows:

```
ProxyRequests Off
```

Step 7: Allow proxying to Bitbucket from everywhere

Strictly speaking, this step is unnecessary because access to proxied resources is unrestricted by default. Nevertheless, we explicitly allow access to Bitbucket from any host so that this policy will be applied regardless of any subsequent changes to access controls at the global level. Use the `Proxy` directive in the `httpd.conf` file as follows:

```
<Proxy *>
    Order Deny,Allow
    Allow from all
</Proxy>
```

The `Proxy` directive provides a context for the directives that are contained within its delimiting tags. In this case, we specify a wild-card url (the asterisk), which applies the two contained directives to all proxied requests.

The `Order` directive controls the order in which any `Allow` and `Deny` directives are applied. In the above configuration, we specify "`Deny,Allow`", which tells Apache HTTP Server to apply any `Deny` directives first, and if any match, the request is denied unless it also matches an `Allow` directive. In fact, "`Deny,Allow`" is the default; we include it merely for the sake of clarity. Note that we specify one `Allow` directive, which is described below, and don't specify any `Deny` directives.

The `Allow` directive, in this context, controls which hosts can access Bitbucket via Apache HTTP Server. Here, we specify that all hosts are allowed access to Bitbucket.

Step 8 (optional): Configure Apache HTTP Server for SSL

If you want to set up SSL access to Bitbucket, follow the instructions on Secure Bitbucket with Apache using SSL. When you are finished, users will be able to make secure connections to Apache HTTP Server; connections between Apache HTTP Server and Bitbucket will remain unsecured (not using SSL). If you don't want to set up SSL access, you can skip this section entirely.

Note: It would be possible to set up an SSL connection between Apache HTTP Server and Tomcat (Bitbucket), but that configuration is very unusual, and not recommended in most circumstances.

A note about application links

When an application link is established between Bitbucket and another Atlassian product (for example Jira), and Bitbucket is operating behind Apache HTTP Server, the link from the other product to Bitbucket must be via the proxy URL; that is, the 'reciprocal URL' from, say Jira, to Bitbucket must match the proxy name and port that you set at Step 1.

Troubleshooting

In general, if you are having problems:

1. Ensure that Bitbucket works as expected when running directly from Tomcat on http://localhost:7990/bitbucket.
2. Watch the log files (usually in /var/log/httpd/ or /var/log/apache2/). Check that you have a `LogLevel` directive in your `httpd.conf`, and turn up logging (`LogLevel debug`) to get more info.
3. Check out the Knowledge Base.

In particular:

- On **Fedora Core 4** people have reported 'permission denied' errors when trying to get mod_proxy (and mod_jk) working. Disabling SELinux (`/etc/selinux/config`) apparently fixes this.
- Some users have reported problems with user sessions being hijacked when the mod_cache module is enabled. If you have such problems, disable the mod_cache module. Note that this module is enabled by default in some Apache HTTP Server version 2 distributions.

Secure Bitbucket with Apache using SSL

When opened in a viewport, the user will be redirected to: Securing your Atlassian applications with Apache using SSL.

This guide for integrating Apache and SSL is now obsolete

We've created a much better guide for Securing your Atlassian applications with Apache using SSL.

You may also be interested in our other Reverse Proxy Setup Guides:

- Proxying Atlassian server applications with Apache HTTP Server (mod_proxy_http)
- Proxying Atlassian server applications with Apache HTTP Server (mod_proxy_ajp)
- Reverse Proxy and Application Link Troubleshooting Guide

You can run Bitbucket Data Center behind a reverse proxy, such as Apache HTTP Server or nginx, that is secured using HTTPS (HTTP over SSL). You should consider doing this, and making secure access mandatory, if usernames, passwords, and other proprietary data may be at risk.

There are other network topology options for running Bitbucket; for an overview of some common options, see Proxy and secure Bitbucket.

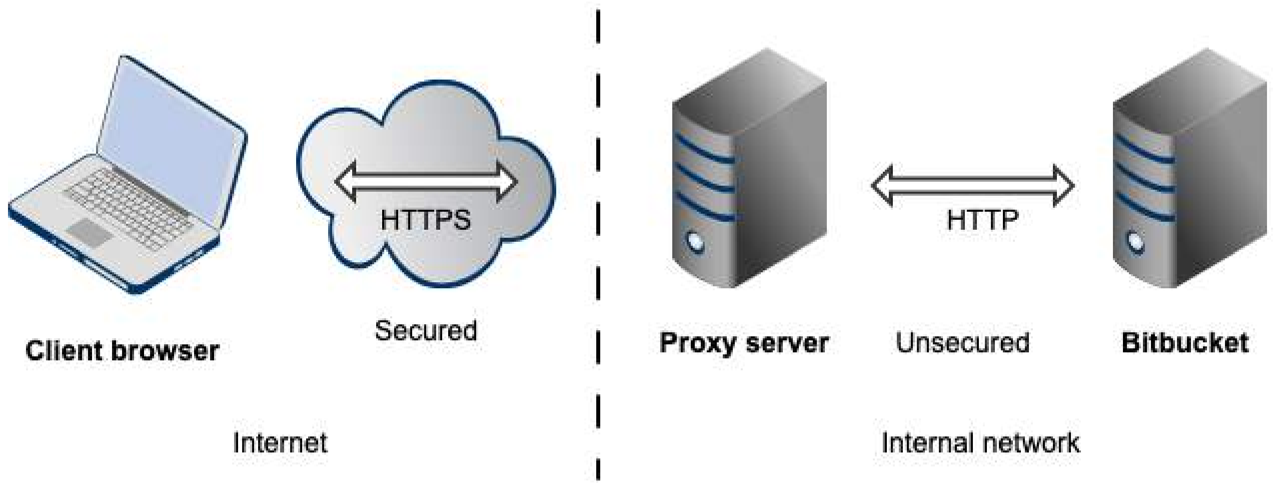
When Bitbucket is set up following the instructions on this page, external access to Bitbucket is via Apache HTTP Server as a reverse proxy, where external communication with the proxy uses HTTPS. All communication between the user's browser and Apache will be secured, whereas communication between Apache and Bitbucket will not be secured (it doesn't use SSL).

- The steps on this page would normally be performed after Integrate Bitbucket with Apache HTTP Server.

On this page:

Related pages:

- Integrate Bitbucket with Apache HTTP Server
- Secure Bitbucket with Tomcat using SSL
- Secure Bitbucket behind nginx using SSL



Note that:

- The reverse proxy (for example, Apache) will listen for requests on port 443.
- Bitbucket, by default, will listen for requests on port 7990. Bitbucket (Tomcat) needs to know the URL (proxy name) that the proxy serves.

- The address with which to access Bitbucket will be https://<proxyName>:<proxyPort>/<context path>, for example https://mycompany.com:443/bitbucket
- Any existing links with other applications will need to be reconfigured using this new URL for Bitbucket.

- Bitbucket (Tomcat) should be configured to refuse requests on port 7990 and to redirect those to the proxy on port 443.
- Securing Git operations between the user's computer and Bitbucket is a separate consideration - see Enabling SSH access to Git.
- It would be possible to set up an SSL connection between the proxy server and Tomcat (Bitbucket), but that configuration is very unusual, and not recommended in most circumstances.
- Incidentally, note that Bitbucket 4.0 and later versions do not support `mod_auth_basic` .

Step 1: Configure the Tomcat Connector for SSL

Find the normal (non-SSL) `Connector` directive in Tomcat's `<Bitbucket home directory>/shared/server.xml` file, and change the `redirectPort`, `scheme`, `proxyName` and `proxyPort` attributes as follows:

```
<Connector port="7990"
     protocol="HTTP/1.1"
     connectionTimeout="20000"
     useBodyEncodingForURI="true"
     redirectPort="443"
     compression="on"
     compressableMimeType="text/html,text/xml,text/plain,text/css,application/json,application/javascript,
application/x-javascript"
     secure="true"
     scheme="https"
     proxyName="mycompany.com"
     proxyPort="443" />
```

The `redirectPort` directive causes Tomcat-initiated redirections to secured resources to use the specified port. Right now, the Bitbucket configuration of Tomcat does not involve Tomcat-initiated redirections, so the change to `redirectPort` is redundant. Nevertheless, we suggest that you change it as directed above for the sake of completeness.

Start, or restart, Bitbucket.

Step 2: Set up a virtual host in Apache HTTP Server

Un-comment the following LoadModule directive in Apache HTTP Server's `httpd.conf` file:

```
LoadModule ssl_module modules/mod_ssl.so
```

Add the following directives to the `httpd.conf` file:

```
Listen 443
<VirtualHost *:443>
    SSLEngine On
    SSLCertificateFile    "/usr/local/apache2/conf/server.crt"
    SSLCertificateKeyFile "/usr/local/apache2/conf/server.key"
        SSLCertificateChainFile "/usr/local/apache2/conf/server.crt"
    ProxyPass        / http://localhost:7990/ connectiontimeout=5 timeout=300
    ProxyPassReverse / http://localhost:7990/
</VirtualHost>
```

The `Listen` directive instructs Apache HTTP Server to listen for incoming requests on port 443. Actually, we could omit that directive in this case, since Apache HTTP Server listens for `https` requests on port 443 by default. Nevertheless, it's good to make one's intentions explicit.

The `VirtualHost` directive encloses a number of child directives that apply only and always to requests that arrive at port 443. Since our `VirtualHost` block does not include a `ServerName` directive, it inherits the server name from the main server configuration.

The `SSLEngine` directive toggles the use of the SSL/TLS Protocol Engine. In this case, we're using it to turn SSL on for all requests that arrive at port 443.

The `SSLCertificateFile` directive tells Apache HTTP Server where to find the PEM-encoded certificate file for the server.

The `SSLCertificateKeyFile` directive tells Apache HTTP Server where to find the PEM-encoded private key file corresponding to the certificate file identified by the `SSLCertificateFile` directive. Depending on how the certificate file was generated, it may contain a RSA or DSA private key file, making the `SSLCertificateKeyFile` directive redundant; however, Apache strongly discourages that practice. The recommended approach is to separate the certificate and the private key. If the private key is encrypted, Apache HTTP Server will require a pass phrase to be entered when it starts up.

The `SSLCertificateChainFile` is optional. Please consult with the CA vendor to verify if this is required. This directive sets the optional all-in-one file where you can assemble the certificates of Certification Authorities (CA) which form the certificate chain of the server certificate.

The `ProxyPass` and `ProxyPassReverse` directives should be set up in the manner described in Step 5 of the Integrate Bitbucket with Apache HTTP Server page. In particular, if Bitbucket is to run on a separate machine from Apache, you should use that domain (and perhaps the port number and context path) in the `ProxyPass` and ProxyPassReverse directives.

For more information about the support for SSL in Apache HTTP Server, refer to the Apache SSL/TLS Encryption manual. In addition, you will find lots of relevant information in the `<apache directory>/conf/extra/httpd-ssl.conf` file, which is included in the standard Apache distribution.

Start, or restart, Apache.

Step 3: Create SSL certificate and key files

In Step 2, you specified `server.crt` and `server.key` as the certificate file and private key file respectively. Those two files must be created before we can proceed. This step assumes that OpenSSL is installed on your server.

Generate a server key file:

```
openssl genrsa -des3 -out server.key 2048
```

You will be asked to provide a password. Make sure that the password is strong because it will form the one real entry point into the SSL encryption set-up. *Make a note of the password because you'll need it when starting Apache HTTP Server later.*

If you don't wish to specify a password, don't use the `-des3` option in the command above.

Generate a certificate request file (`server.csr`):

```
openssl req -new -key server.key -out server.csr
```

Generate a self-signed certificate (`server.crt`):

```
openssl x509 -req -days 365 -in server.csr -signkey server.key -out server.crt
```

The above command generates a self-signed certificate that is valid for one year. You can use the certificate signing request to purchase a certificate from a certificate authority. For testing purposes though, the self-signed certificate will suffice. Copy the certificate file and private key file to the locations you specified in Step 2.

```
cp server.key /usr/local/apache2/conf/
cp server.crt /usr/local/apache2/conf/
```

Step 4: Update the base URL to use HTTPS

Open a browser window and log into Bitbucket using an administrator account. Go to the Bitbucket administration area and click **Server settings** (under 'Settings'). Change **Base URL** to use HTTPS, for example, "https://bitbucket.mycompany.com").

Using a self-signed certificate

There are two implications of using the self-signed certificate:

- When you access Bitbucket in a web browser, you can expect a warning to appear, alerting you that an un-trusted certificate is in use. Before proceeding you will have to indicate to the browser that you trust the certificate.
- When you perform a Git clone operation, SSL verification will fail.

The SSL verification error message will look something like this:

```
error:14090086:SSL routines:SSL3_GET_SERVER_CERTIFICATE:certificate verify
failed while accessing   https://justme@mycompany/git/TP/test.git
```

It's easy to fix. Turn SSL verification off for individual Git operations by setting the `GIT_SSL_NO_VERIFY` environment variable. In Unix, you can set the variable in-line with Git commands as follows:

```
GIT_SSL_NO_VERIFY=true git clone   https://justme@mycompany/git/TP/test.git
```

In Windows you have to set the variable in a separate shell statement:

```
set GIT_SSL_NO_VERIFY=true
git clone   https://justme@mycompany/git/TP/test.git
```

Once you have purchased and installed a signed certificate from a certificate authority, you will no longer have to include the `GIT_SSL_NO_VERIFY` modifier.

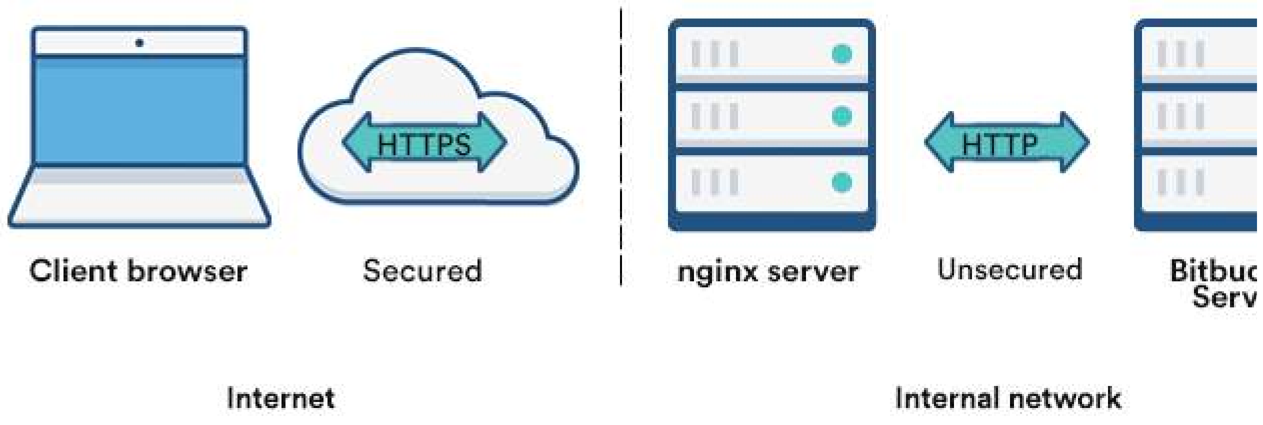
Secure Bitbucket behind nginx using SSL

This page describes how to establish a network topology in which the nginx server acts as a reverse proxy for Bitbucket Data Center. Typically, such a configuration would be used when Bitbucket is installed in a protected zone 'behind the firewall', and nginx provides a gateway through which users outside the firewall can access Bitbucket.

On this page

The configuration described on this page results in a scenario where:

- External client connections with nginx are secured using SSL. Connections between nginx and Bitbucket are unsecured.
- Bitbucket and nginx run on the same machine.
- Bitbucket is available at https://mycompany.com:7990/bitbucket.



Also note that:

- We assume that you already have a running instance of nginx. If not, refer to the nginx documentation for instructions on downloading and installing nginx.
- SSL certificates must be installed on the server machine.
- Any existing links with other applications will need to be reconfigured using the new URL for Bitbucket.
- Securing Git operations between the user's computer and Bitbucket is a separate consideration - see Enabling SSH access to Git.

Be aware that Bitbucket does not need to run behind a web server, since it is capable of serving web requests directly; to secure Bitbucket when run in this way see Secure Bitbucket with Tomcat using SSL. Otherwise, if you want to install Bitbucket in an environment that incorporates nginx, this document is for you. (You can of course run Bitbucket behind nginx without securing client connections to nginx using SSL – we don't describe this option on this page.)

Note that the Atlassian Support Offering does not cover nginx integration. Assistance with nginx may be obtained through the Atlassian community or from an Atlassian Partner.

Step 1: Configure the Embedded Tomcat Connector

Find the Bitbucket configuration properties file `<Bitbucket home directory>/shared/bitbucket.properties`, creating it if necessary and add the properties as shown below. Instead of `mycompany.com`, set the server.proxy-name property to your domain name that the nginx server will be configured to serve. This informs Bitbucket of the domain name and port of the requests that reach it via nginx, and is important for the correct operation of the Bitbucket functions that construct URLs.

```
server.port=7990
server.secure=true
server.scheme=https
server.proxy-port=443
server.proxy-name=mycompany.com
```

Step 2: Set a context path for Bitbucket

By default, Bitbucket is configured to run with an empty context path; in other words, from the 'root' of the server's name space. In that default configuration, Bitbucket would be accessed at:

`http://mycompany.com:7990/`

For the example configuration on this page, we want Bitbucket to be accessed at:

`https://mycompany.com/bitbucket`

In Bitbucket's configuration properties file `<Bitbucket home directory>/shared/bitbucket.properties` file, set the context path to `/Bitbucket by adding the following property`:

```
server.context-path=/bitbucket
```

If you use a context path, it is important that the same path is:

- appended to the context path of Bitbucket's base URL (Step 3).
- used when setting up the location for the `proxy_pass` directive (Step 4).

Step 3: Change Bitbucket's base URL

Before re-starting Bitbucket, open a browser window and log into Bitbucket using an administrator account. Go to the Bitbucket administration area and click **Server settings** (under 'Settings'), and change **Base URL** t o match the proxy URL (the URL that the nginx server will be serving).

For this example, use `http://mycompany.com/bitbucket` (Note the context path included with this).

Step 4: Configure nginx

Edit `/etc/nginx/nginx.conf` , using the example server configuration below, to configure nginx as a proxy server.

Put the `proxy_pass` directive in the location block, and specify the protocol, name and port of the proxied server in the parameter (in our case, it is `http://localhost:7990`):

https://confluence.atlassian.com/bitbucketserverkb/git-push-fails-client-intended-to-send-too-large-chunked-body-779171802.html

```
http {
...
...
        client_max_body_size 0;
...
...
        server {
                listen 443          ssl;
            server_name     mycompany.com;

                ssl                         on;
            ssl_certificate             <path/to/your/certificate>;
            ssl_certificate_key         <path/to/your/certificate/key>;
            ssl_session_timeout         5m;
            ssl_protocols                         TLSv1 TLSv1.1 TLSv1.2;
            ssl_ciphers                         HIGH:!aNULL:!MD5;
            ssl_prefer_server_ciphers   on;

                # Optional optimisation - please refer to
                # http://nginx.org/en/docs/http/configuring_https_servers.html
                # ssl_session_cache   shared:SSL:10m;
            location /bitbucket {
                proxy_pass                        http://localhost:7990;
                        proxy_set_header         X-Forwarded-Host $host;
                proxy_set_header         X-Forwarded-Server $host;
                        proxy_set_header    X-Forwarded-For $proxy_add_x_forwarded_for;
                        proxy_set_header    X-Real-IP $remote_addr;
                        proxy_redirect                 off;
            }
        }

...
...
}
```

Refer to http://nginx.org/en/docs/http/ngx_http_proxy_module.html.

Changes made in the configuration file will not be applied until the command to reload configuration is sent to nginx or it is restarted. To reload the configuration, execute:

```
nginx -s reload
```

This command should be executed under the same user that started nginx.

Notice that we added `client_max_body_size 0;` to the `http` block of the nginx configuration because of Git push fails - client intended to send too large chunked body.

Resources

You may find the following resources helpful in setting up Bitbucket behind nginx:

- http://nginx.org/en/docs/http/configuring_https_servers.html
- http://www.cyberciti.biz/tips/using-nginx-as-reverse-proxy.html
- https://mywushublog.com/2012/08/atlassian-tools-and-nginx/

Secure Bitbucket behind HAProxy using SSL

This page describes how to establish a network topology in which the HAProxy server acts as a reverse proxy for Bitbucket Data Center. Typically, such a configuration would be used when either when:

1. Bitbucket is installed in a protected zone 'behind the firewall', and HAProxy provides a gateway through which users outside the firewall can access Bitbucket.
2. Bitbucket needs to be served on protected ports (e.g. ports < 1024 on Linux). Bitbucket cannot access these ports directly as *it must not* be run as a privileged user (e.g root). In this case HAProxy can bind to these ports and forward the requests to Bitbucket.

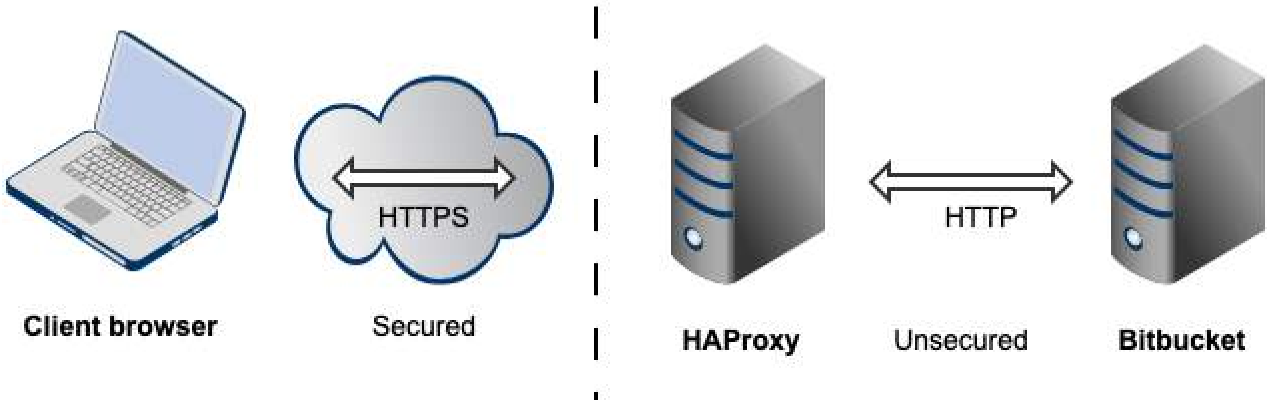
On this page:

Related pages:

- http://www.haproxy.org/#docs
- Setting up SSH port forwarding

The configuration described on this page results in a scenario where:

- External client connections with HAProxy are secured using SSL. Connections between HAProxy and Bitbucket are unsecured.
- Bitbucket and HAProxy run on the same machine.
- Bitbucket is currently available at `http://mycompany.com:7990/`.
- Bitbucket is to be made available at `https://mycompany.com/bitbucket`.



Important considerations

- We assume that you already have a running instance of HAProxy.
- SSL certificates must be installed on the server machine.
- Any existing links with other applications will need to be reconfigured using the new URL for Bitbucket.
- Securing Git operations between the user's computer and Bitbucket is a separate consideration - see Enabling SSH access to Git.
- It is also possible to get Bitbucket to directly use SSL without the help of a proxy as documented in Secure Bitbucket with Tomcat using SSL.

Note that the Atlassian Support Offering does not cover HAProxy integration, but you can get assistance with HAProxy from the Atlassian community on answers.atlassian.com, or from an Atlassian Expert.

Step 1: Set a context path for Bitbucket

Bitbucket and HAProxy need to be serving from the same context. Bitbucket is currently accessed at `http://mycompany.com:7990`. It needs to be changed to serve from `http://mycompany.com:7990/bitbucket` to match context `https://mycompany.com/bitbucket`.

1. Locate the `bitbucket.properties` file in the shared directory of your `<Bitbucket home directory>.`
2. Change the context path for Bitbucket by adding

   ```
   server.context-path=/bitbucket
   ```

3. Save the file.

Good to know

- If you use a context path, it is important that the same path is appended to the context path of Bitbucket's base URL (Step 2).
- The context path for serving from the *root* context is `path=""` (i.e **not** `path="/").`

Step 2: Change Bitbucket's base URL

1. Open a browser window and log into Bitbucket using an administrator account.
2. Go to the Bitbucket administration area and click **Server settings** (under 'Settings'), and change **Base URL** to match the URL HAProxy will be serving. For this example, use `https://mycompany.com/bitbucket.`

Step 3: Configure the Tomcat Connector

Following our example, you need to configure these attributes that tell Tomcat how **HAProxy** is serving Bitbucket so it can generate correct URLs.

Locate the `<Bitbucket home directory>/shared/bitbucket.properties` file, and add the following:

```
server.secure=true
server.scheme=https
server.proxy-port=443
server.redirect-port=443
server.proxy-name=mycompany.com
```

What these attributes do

- `proxyPort` is set to 443 to indicate that HAProxy is accepting connections over on the standard HTTPS port 443.
- `proxyName` and `scheme` are are set to the values that HAProxy is serving Bitbucket over.
- `secure` attribute is also set to `true` to tell Bitbucket that the connection between the client and HAProxy is considered secure.
- `redirectPort` is set to 443 so that Tomcat knows how to send a user to a secure location when necessary (this is not really necessary in this example because this connector is already `secure`).

For more information about configuring the Tomcat Connector, refer to the Apache Tomcat 7.0 HTTP Connector Reference.

Step 4: Configure HAProxy

Merge the example below into your HAProxy configuration (e.g `/etc/haproxy/haproxy.cfg`). This is a complete HAProxy 1.5.x configuration. Note that HAProxy 1.5.x or greater is required for SSL support. You can just take the bits that fit your needs. The important configuration is in the `bitbucket_http_frontend` and `bitbucket_http_backend`.

```
global
        log /dev/log local0
        log /dev/log local1 notice
        user haproxy
        group haproxy
        daemon
    ssl-default-bind-options no-sslv3
    maxconn 1000

defaults
        log        global
        mode http
        option httplog
        option dontlognull
    timeout connect 5000
    timeout client  50000
    timeout server  50000

# Tells HAProxy to start listening for HTTPS requests. It uses the SSL key
# and certificate found within certAndKey.pem. All requests will be routed
# to the bitbucket_http_backend.
frontend bitbucket_http_frontend
    bind *:443 ssl crt /etc/haproxy/certAndKey.pem ciphers HIGH:!aNULL:!MD5
    default_backend bitbucket_http_backend
    # This is an optional rule that will redirect all requests to https://mycompany.com
    # to https://mycompany.com/bitbucket.
    redirect location /bitbucket if { path -i / }

# The bitbucket_http_backend simply forwards all requests onto http://mycompany.com:7990/.
# It will only allow 50 concurrent connections to the server at once.
backend bitbucket_http_backend
    mode http
    option httplog
    option forwardfor
    option http-server-close
    option httpchk
    server bitbucket01 mycompany.com:7990 maxconn 50
```

(Optional) Step 4: Redirect SSH connections

HAProxy also has the ability to proxy all Bitbucket SSH traffic. See Setting up SSH port forwarding for details.

High availability for Bitbucket

This page describes how to set up a single Bitbucket Data Center instance in a highly available configuration.

For production installs, we highly recommend that you first read Use Bitbucket in the enterprise.

For Active/Active high availability with Bitbucket Data Center, see Bitbucket Data Center resources instead.

For guidance on using Bitbucket Data Center as part of your disaster recovery strategy, see the Disaster recovery guide for Bitbucket Data Center.

If Bitbucket Data Center is a critical part of your development workflow, maximizing application availability becomes an important consideration. There are many possible configurations for setting up a HA environment for Bitbucket Data Center, depending on the infrastructure components and software (SAN, etc.) you have at your disposal. This guide provides a high-level overview and the background information you need to be able to set up a single Bitbucket Data Center instance in a highly available configuration.

Note that Atlassian's Bitbucket Data Center resources product uses a cluster of Bitbucket Data Center nodes to provide Active/Active failover. It is the deployment option of choice for larger enterprises that require high availability and performance at scale, and is fully supported by Atlassian. Read about Failover for Bitbucket Data Center.

High availability

High availability describes a set of practices aimed at delivering a specific level of "availability" by eliminating and/or mitigating failure through redundancy. Failure can result from unscheduled down-time due to network errors, hardware failures or application failures, but can also result from failed application upgrades. Setting up a highly available system involves:

Proactive Concerns

- Change management (including staging and production instances for change implementation)
- Redundancy of network, application, storage and databases
- Monitoring system(s) for both the network and applications

Reactive Concerns

- Technical failover mechanisms, either automatic or scripted semi-automatic with manual switchover
- Standard Operating Procedure for guided actions during crisis situations

This guide assumes that processes such as change management are already covered and will focus on **redundancy / replication** and **failover procedures**. When it comes to setting up your infrastructure to quickly recover from system or application failure, you have different options. These options vary in the level of uptime they can provide. In general, as the required uptime increases, the complexity of the infrastructure and the knowledge required to administer the environment increases as well (and by extension the cost goes up as well).

Understanding the availability requirements for Bitbucket Data Center

Central version control systems such as Subversion, CVS, ClearCase and many others require the central server to be available for any operation that involves the version control system. Committing code, fetching the latest changes from the repository, switching branches or retrieving a diff all require access to the central version control system. If that server goes down, developers are severely limited in what they can do. They can continue coding until they're ready to commit, but then they're blocked.

Git is a distributed version control system and developers have a full clone of the repository on their machines. As a result, most operations that involve the version control system don't require access to the central repository. When Bitbucket Data Center is unavailable developers are not blocked to the same extent as with a central version control system.

As a result, the availability requirements for Bitbucket Data Center *may* be less strict than the requirements for say Subversion.

Consequences of Bitbucket Data Center unavailability	
✓ **Unaffected**	✗ **Affected**
Developer: <ul><li>Commit code</li><li>Create branch</li><li>Switch branches</li><li>Diff commits and files</li><li>...</li><li>Fetch changes from fellow developers</li></ul>	Developer: <ul><li>Clone repository</li><li>Fetch changes from central repository</li><li>Push changes to central repository</li><li>Access Bitbucket Data Center UI - create/do pull requests, browse code</li></ul>Build server: <ul><li>Clone repository</li><li>Poll for changes</li></ul>Continuous Deployment: <ul><li>Clone repository</li></ul>

Failover options

High availability and recovery solutions can be categorized as follows:

Failover option	**Recovery time**	**Description**	**Possible with Bitbucket Data Center**
Automatic correction / restart	2-10 min (application failure) hours-days (system failure)	<ul><li>Single node, no secondary server available</li><li>Application and server are monitored</li><li>Upon failure of production system, automatic restarting is conducted via scripting</li><li>Disk or hardware failure may require reprovisioning of the server and restoring application data from a backup</li></ul>	✓
Cold standby	2-10 min	<ul><li>Secondary server is available</li><li>Bitbucket Data Center is NOT running on secondary server</li><li>Filesystem and (optionally) database data is replicated between the 'active' server and the 'standby' server</li><li>All requests are routed to the 'active' server</li><li>On failure, Bitbucket Data Center is started on the 'standby' server and shut down on the 'active' server. All requests are now routed to the 'standby' server, which becomes 'active'.</li></ul>	✓

Warm standby	0-30 sec	• Secondary service is available • Bitbucket Data Center is running on both the 'active' server and the 'standby' server, but all requests are routed to the 'active' server • Filesystem and database data is replicated between the 'active' server and the 'standby' server • All requests are routed to the 'active' server • On failure, all requests are routed to the 'standby' server, which becomes 'active' • ✗ This configuration is currently not supported by Bitbucket Data Center, because Bitbucket Data Center uses in-memory caches and locking mechanisms. At this time, Bitbucket Data Center only supports a single application instance writing to the Set the home directory at a time.	✗
Active /Active	< 5 sec	• Provided by Bitbucket Data Center resources, using a cluster of Bitbucket Data Center nodes and a load balancer. • Bitbucket Data Center is running, and serving requests, on all cluster nodes. • Filesystem and database data is shared by all cluster nodes. Clustered databases are not yet supported. • All requests are routed to the load balancer, which distributes requests to the available cluster nodes. If a cluster node goes down, the load balancer immediately detects the failure and automatically directs requests to the other nodes within seconds. • Bitbucket Data Center is the deployment option of choice for larger enterprises that require high availability and performance at scale.	✓

Automatic correction

Before implementing failover solutions for your Bitbucket Data Center instance consider evaluating and leveraging automatic correction measures. These can be implemented through a monitoring service that watches your application and performs scripts to start, stop, kill or restart services.

1. A Monitoring Service detects that the system has failed.
2. A correction script attempts to gracefully shut down the failed system.
    a. If the system does not properly shut down after a defined period of time, the correction script kills the process.
3. After it is confirmed that the process is not running anymore, it is started again.
4. If this restart solved the failure, the mechanism ends.
    a. If the correction attempts are not or only partially successful a failover mechanism should be triggered, if one was implemented.

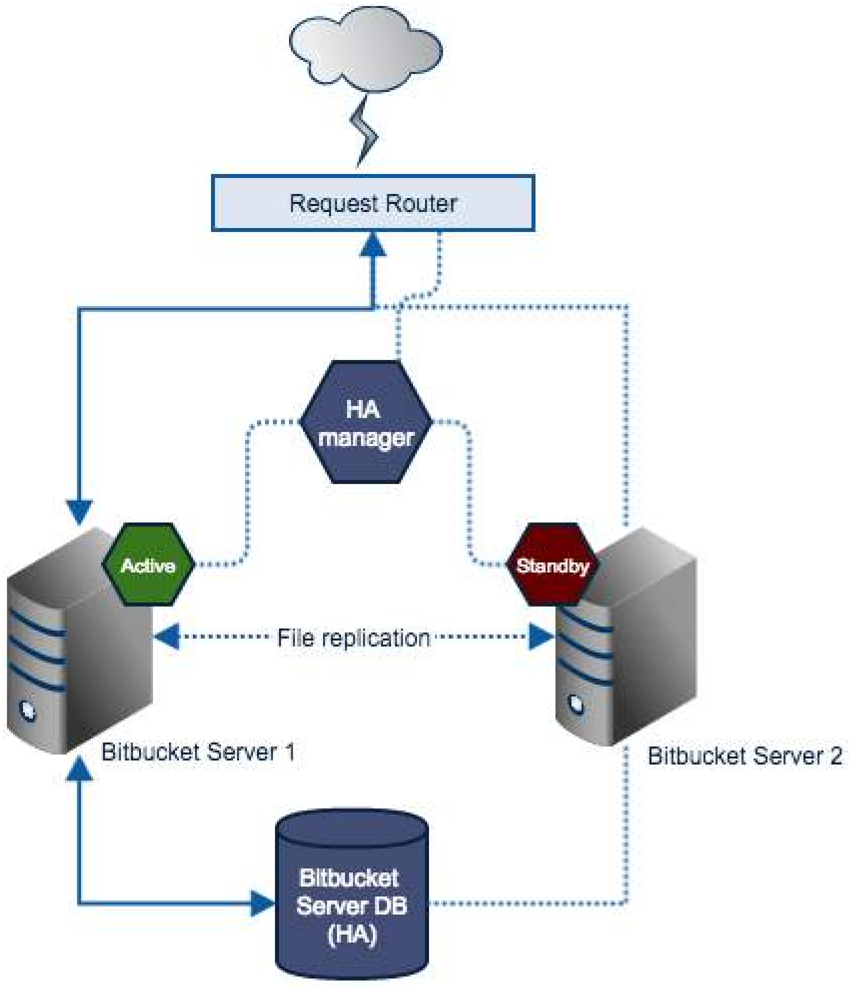
Cold standby

The cold standby (also called Active/Passive) configuration consists of two identical Bitbucket Data Center instances, where only one server is ever running at a time. The Bitbucket home directory on each of the servers is replicated from the active to the standby Bitbucket Data Center instance. When a system failure is detected, Bitbucket Data Center is restarted on the active server. If the system failure persists, a failover mechanism is started that shuts down Bitbucket Data Center on the active server and starts Bitbucket Data Center on the standby server, which is promoted to 'active'. At this time, all requests should be routed to the newly active server.

For each component in the chain of high availability measures, there are various implementation alternatives. Although Atlassian does not recommend any particular technology or product, this guide gives options for each step.

System setup

This section describes one possible configuration for how to set up a single instance of Bitbucket Data Center for high availability.



Components

Request Router
Forwards traffic from users to the active Bitbucket Data Center instance.

High Availability Manager

- Tracks the health of the application servers and decides when to fail over to a standby server and designate it as active.
- Manages failover mechanisms and sends notifications on system failure.

Bitbucket Data Center instance

- Each server hosts an identical Bitbucket Data Center installation (identical versions).
- Only one server is ever running a Bitbucket Data Center instance at any one time (know as the active server). All others are considered as standbys.
- Resides on a replicated or shared file system visible to all application servers.

- Must never be modified when the server is in standby mode.

Bitbucket Data Center database
The production database, which should be highly available. How this is achieved is not explored in this document. See the following database vendor-specific information on the HA options available to you:

- **Postgres**
  http://www.postgresql.org/docs/9.2/static/high-availability.htm
- **MySQL**
  http://dev.mysql.com/doc/refman/5.5/en/ha-overview.html
- **Oracle**
  http://www.oracle.com/technetwork/database/features/availability/index.html
- **SQLServer**
  http://technet.microsoft.com/en-us/library/ms190202.aspx

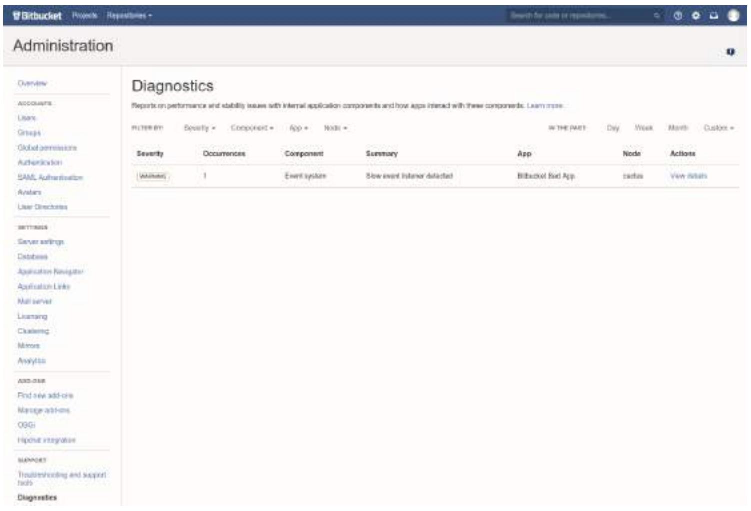
Licensing

Developer licenses can be used for non-production installations of Bitbucket Data Center deployed on a cold stand-by server. For more information see developer licenses.

Diagnostics for third-party apps

Overview

The Bitbucket Data Center diagnostics tool displays a summary of the alerts that have been raised on the instance in the past 30 days, grouped by issue and app combination.



Diagnostics

Reports on performance and stability issues with internal application components and how apps interact with these components. Learn more

FILTER BY: Severity Component App Node IN THE PAST Day Week Month Custom

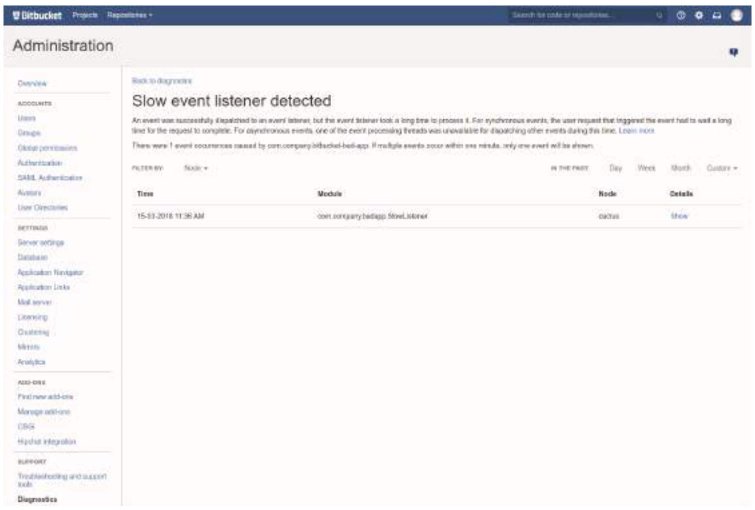
Severity	Occurrences	Component	Summary	App	Node	Actions
WARNING	1	Event system	Slow event listener detected	Bitbucket Bad App	cactus	View details

There are three levels of severity:

- **Error**: a serious problem has occurred that impacts system stability and/or availability
- **Warning**: an issue has been detected that impacts performance or can lead to more serious problems in the future
- **Info**: something worth noting has happened.

The alerts can be filtered by severity, component, app, node and time.

Alert Details



Slow event listener detected

An event was successfully dispatched to an event listener, but the event listener took a long time to process it. For synchronous events, the user request that triggered the event had to wait a long time for the request to complete. For asynchronous events, one of the event processing threads was unavailable for dispatching other events during this time. Learn more

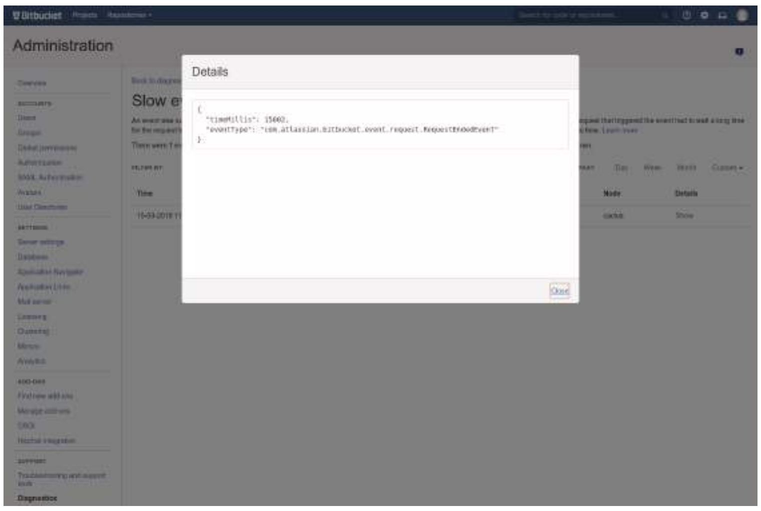
There were 1 event occurrences caused by com.company.bitbucket-bad-app. If multiple events occur within one minute, only one event will be shown.

Time	Module	Node	Details
15-03-2018 11:36 AM	com.company.badapp.SlowListener	cactus	Show

The alert details page is accessed by clicking into an alert, and displays individual alerts for the selected issue and app combination.

When many alerts are raised in a short time window, just one representative alert is displayed per 1 minute window.

Clicking **Show** displays information relating to the issue, that was collected when the alert was raised.



```
{
  "timeMillis": 15002,
  "eventType": "com.atlassian.bitbucket.event.request.RequestEndedEvent"
}
```

You can also set up alerts using JMX metric details.

Event system

Atlassian apps have an internal event system that allows core functionality and apps to respond to events such as user actions. When a user performs an action, an event is raised. The event system then dispatches the event to all registered event listeners.

There are two types of event dispatches:

- **Synchronous**: the event is dispatched to event listeners immediately and the request is blocked until all event listeners have processed the event.
- **Asynchronous**: the event is put on the event queue and is dispatched to event listeners in the background. The request that raised the event does not wait for the event listeners to complete their processing of the event.

Many core features make use of the event system as event producers, event listeners or both. In addition, many third-party apps rely on the event system to integrate with the app, or to respond to important app events.

Disruption or degradation of the event system can impact system performance, stability and availability.

Diagnostics monitors the event system for these acute problems, but also for symptoms that could cause problems under increased load.

The following issues are monitored by the diagnostics tool:

- EVENT-1001: **An event was dropped because the event queue was full.**
- EVENT-2001: **A slow event listener was detected.**

Refer to the full event descriptions below.

EVENT-1001 An event was dropped because the event queue was full ERROR

Problem

An asynchronous event could not be dispatched to registered event listeners because the event queue is full - too many events are awaiting dispatch. As a result, the event has not been processed and (core) functionality may be degraded. What functionality is degraded depends on the event type.

⚠ this only affects asynchronous dispatch of events.

Alert Details

When **EVENT-1001** is raised, the following data is collected to help diagnose the problem:

- `eventType`: the type of event that was dropped
- `queueLength`: the capacity of the event queue
- `threadDumps`: a list of thread dumps of all event processing threads that were busy when the event was dropped.

Cause

The event queue can fill up if events are being raised faster than they can be processed. This is most commonly caused by one or more event listeners taking too long to process an event, or getting completely stuck.

If this is the case, one or more EVENT-2001 (slow event listener detected) alerts have likely been raised. These EVENT-2001 alerts can help identify the offending event listener, including the app that provided it.

If EVENT-2001 alerts do not clearly identify the cause, the thread dumps in the alert details will identify what the event processing threads were doing at the time of the alert.

The event queue may fill up if a component produces too many events in a short time.

Mitigation

If a slow or blocked event listener has been detected and the event listener is provided by a non-critical app, that app could be (temporarily) disabled. For marketplace apps, report the problem with the vendor.

For Atlassian-provided apps, contact support at https://support.atlassian.com. For apps that were developed in-house, contact the relevant developer.

Configuration options

Thread dump cool-down period: Controls how often thread dumps should be generated for alerts relating to dropped events. Taking thread dumps can be computationally expensive and can produce a large amount of data when run frequently.

Add the following to the `<BITBUCKET_HOME>/shared/bitbucket.properties` configuration file:

```
# time is in seconds, default is 60s
diagnostics.issues.event.dropped.threaddump.cooldown.seconds=60
```

EVENT-2001 A slow event listener was detected WARNING

Problem

An event was dispatched to an event listener, but the event listener took a long time processing an event. For synchronous events, this means that the user request that raised the event had to wait a long time for the request to complete. For asynchronous events, this means that one of the event processing threads was unavailable for dispatching other events during this time.

EVENT-2001 does not imply that there is an acute problem. Rather, it's a warning that performance may be degraded (for **synchronous events**).

If EVENT-2001 happens frequently or if events are being raised at a high frequency (heavy load), asynchronous event processing will fall behind and the event queue can fill up. This can ultimately lead to EVENT-1001.

Alert Details

When EVENT-2001 is raised, the following data is collected to help diagnose the problem:

- `trigger`: the specific event listener that was slow, including the app that registered it
- `timeMillis`: the time in milliseconds that the event listener spent processing the event
- `eventType`: the type of event that was processed (slowly).

Cause

Event listeners can be slow for a variety of reasons. Some of the most common causes are:

- The event listener performed a long running operation on the event thread: e.g. some type of indexing or automated analysis.
- The event listener performed blocking I/O: e.g. sent a HTTP request to an external system without configuring a sufficiently short timeout.
- The event listener was blocked trying to acquire a lock: e.g. a cluster lock, a local app lock, a database lock, etc.
- A system-wide issue affected the event listener, causing it to be slow:

- The system had a long gc pause.
- The system has run out of database connections.

Mitigation

Some of the causes listed in the previous section indicate that the event listener itself is the cause (long running operation, blocking I/O, acquiring locks without a short timeout). If this is the case, the problem should be reported to the app vendor.

For marketplace vendors, the marketplace listing contains a 'Support' section with instructions on how to best report issues.

For apps provided by Atlassian, please raise an issue or contact Atlassian support if the problems are acute.

For apps that have been developed in-house, please contact the app developer (See Guidelines for Data Center App Development for guidelines on how to avoid slow event listeners).

If the triggering event listener is the cause of the issue, and the event listener is provided by a non-critical app, consider (temporarily) disabling the app.

Configuration options

Slow event listener limit: Controls when an alert is raised for a slow event listener. If an event listener is slower than the configured limit, an EVENT-2001 alert is raised.

Add the following to the `<BITBUCKET_HOME>/shared/bitbucket.properties` configuration file:

```
# time is in milliseconds, default is 15s
diagnostics.issues.event.slow.listener.time.millis=15000
```

Slow event listener limit overrides: Configures overrides for specific event listeners and/or specific apps. This setting can be used to suppress 'slow event listener detected' alerts for specific event listeners or plugins, which have been determined to not be problematic. The value should be a comma-separated list of configurations of individual triggers, where a trigger is either the plugin-key, or the plugin-key followed by the event listener class name. Overrides are only considered if they specify more lenient limits than the value specified by `diagnostics.issues.event.slow.listener.time.millis`.

Add the following to the `<BITBUCKET_HOME>/shared/bitbucket.properties` configuration file:

```
# The following example sets the trigger for com.company.example-app to 30s and sets the
# the limit for the com.company.RepositoryCreatedListener event listener in the same app to 60s.
#
# Configured values are in milliseconds
diagnostics.issues.event.slow.listener.overrides=\
    com.company.example-app:30000,\
    com.company.example-app.com.company.RepositoryCreatedListener:60000
```

Upgrade tasks

UPGRADETASK-2001 Invalid content in pull request commit backfill upgrade marker file

WARNING

Problem

With the introduction of pull request links on commit pages in 5.11, Bitbucket Data Center must run an upgrade task to index existing pull request commit relationships. The upgrade task processes a single repository at a time, and persists progress by writing an upgrade marker file with the ID of the latest repository processed. Once all repositories have been processed, the upgrade task writes `-1` to the file.

The UPGRADETASK-2001 issue indicates that the contents of this marker file are not valid. This means progress of the upgrade task cannot be confirmed, and as a result, some pull request commit relationships may not have been indexed. The contents of the file are invalid if the file is empty or the file contents cannot be converted to an integer. A missing upgrade marker file will not trigger this issue.

Alert Details

When **UPGRADETASK-2001** is raised, the following data is collected to help diagnose the problem:

`content`: the content of the marker file, truncated to 10 characters.

Cause

The upgrade marker file at `<PATH_TO_SHARED_HOME>/config/upgrade/core-backfill-pull-request-commits` is corrupted. The contents of the file are considered invalid if the file is empty or the file contents cannot be converted to an integer.

Mitigation

If this issue is encountered, the marker file can be deleted in order to run the upgrade task again next time Bitbucket is started.

Alternatively, the contents of the file can be set to `-1` in order to mark the upgrade task as completed.

However, this may result in some or all pull request links missing from commits. If the issue occurs repeatedly after manual intervention, contact support at https://support.atlassian.com.

Enabling JMX counters for performance monitoring

This article describes how to expose JMX MBeans within Bitbucket Data Center for monitoring with a JMX client.

Related reading: Understanding JMX (Oracle)

On this page:

Starting from Bitbucket 8.0, Git operations are run in the Bitbucket Mesh sidecar by default. That's why, to enable full JMX monitoring for Bitbucket 8.0 and later, you should enable JMX for both the Bitbucket main process and the Mesh sidecar process.

Learn how to do that in

BSERV-13623 - Provide better way to monitor JMX metrics for Bitbucket 8.x while using Mesh Sidecar GATHERING INTEREST

What is JMX?

JMX (Java Management eXtensions) is a technology for monitoring and managing Java applications. JMX uses objects called MBeans (Managed Beans) to expose data and resources from your application.

Why would I want to enable JMX monitoring within Bitbucket?

For large Bitbucket instances, enabling JMX allows you to more easily monitor the consumption of application resources. This enables you to make better decisions about how to maintain and optimize machine resources.

What can I monitor with JMX?

It is possible to monitor various statistics using JMX counters within Bitbucket. Below are some examples of some statistics that can be monitored.

Mail statistics (com.atlassian.bitbucket:name=MailStatistics)

Name	Description
AverageMessageSize	Average size (in bytes) of messages sent
LargestMessageSent	Largest message that has been sent (in bytes)
LastMessageFailure	Date of the last failure to send a message
LastMessageSuccess	Date of the last successful message send operation
LastQueueFullEvent	Last time the message queue was full
QueueFullEventCount	Number of times the message queue was full
QueueUsage	Queue usage as a fraction, 0.0d indicates empty and 1.0d indicates full
QueuedMessagesCount	Current count of queued (unsent) messages
QueuedMessagesSize	Current size (in bytes) of the queued (unsent) messages
TotalMailDataSent	Total size (in bytes) of messages sent
TotalMessagesFailed	Total number of messages that failed to send

TotalMessagesSent	Total number of messages sent

Diagnostics

Alerts total (com.atlassian.diagnostics:type=Alerts,name=Total)

Name	Description
LatestAlertTimestamp	Timestamp of the most recent alert
TotalCount	Total number of alerts since the JVM was started
ErrorCount	Number of alerts of severity ERROR since the JVM was started
InfoCount	Number of alerts of severity INFO since the JVM was started
WarningCount	Number of alerts of severity WARNING since the JVM was started

Plugin (com.atlassian.diagnostics:type=Alerts,Category=Plugin,name=*${PLUGIN_NAME}*)

Name	Description
LatestAlertTimestamp	Timestamp of the most recent alert
TotalCount	Total number of alerts since the JVM was started
ErrorCount	Number of alerts of severity ERROR since the JVM was started
InfoCount	Number of alerts of severity INFO since the JVM was started
WarningCount	Number of alerts of severity WARNING since the JVM was started
PluginName	Plugin name, if available

Issue (com.atlassian.diagnostics:type=Alerts,Category=Issue,name=*${ISSUE_ID}*)

Name	Description
LatestAlertTimestamp	Timestamp of the most recent alert
Component	Component the issue is defined for
Count	Number of alerts for the issue since the JVM was started
Severity	Issue's severity
Description	Issue's description

Hosting statistics

Protocol	Object name
SSH	com.atlassian.bitbucket:name=SshHostingStatistics
HTTP	com.atlassian.bitbucket:name=HttpHostingStatistics

Hosting statistic attributes

All the hosting statistics attributes are monotonically increasing since the JVM was restarted

Name	Description

CloneCacheBypass	Clone requests that have bypassed the scm-cache
CloneCacheHit	Clone requests served from the scm-cache
CloneCacheMiss	Clone requests that could not be served from the scm-cache
CloneRead	Bytes read from clients during clone operations
CloneRequestCount	Number of clone requests served
CloneWritten	bytes written to clients during <i>clone</i> operations
FetchRead	Bytes read from clients during <i>fetch</i> operations
FetchRequestCount	Number of fetch requests served
FetchWritten	Bytes written to clients during fetch operations
Requests	Total number of requests served
TotalBytesRead	Total bytes read from clients
TotalBytesWritten	Total bytes written to clients

Webhooks statistics (com.atlassian.webhooks:name=Webhooks)

Name	Description
PublishCount	A count of the total number of events that could trigger webhooks (A publish may create many dispatches)
DispatchSuccessCount	Total number of webhooks to fire successfully with a successful HTTP response
DispatchRejectedCount	A count of the number of webhook dispatches that were rejected for execution
DispatchLastRejectedTimestamp	The last time a webhook was rejected, either from circuit breaking, or due to too many webhooks being in flight
DispatchInFlightCount	Total number of dispatches that have been triggered and are awaiting resolution
DispatchFailureCount	Total number of webhooks that fired successfully, but the HTTP response indicates a failure (non 2xx code)
DispatchErrorCount	Total number of webhooks to have had an error while they were being dispatched
DispatchCount	Total number of webhooks to have been dispatched

Thread pools

Thread pool	Description	Object name
BuildActionsThreadPool	Threads that handles Integrated CI/CD build actions	com.atlassian.bitbucket.thread-pools: name=BuildActionsThreadPool
EventThreadPool	Threads that dispatch events to @EventListenermethods	com.atlassian.bitbucket.thread-pools: name=EventThreadPool
IoPumpThreadPool	Threads that handle blocking process I/O	com.atlassian.bitbucket.thread-pools: name=IoPumpThreadPool
NioPumpThreadPool	Threads that handle nonblocking process I/O	com.atlassian.bitbucket.thread-pools: name=NioPumpThreadPool

ScheduledThreadPool	Thread pool that takes care of several miscellaneous scheduled tasks	com.atlassian.bitbucket.thread-pools:name=ScheduledThreadPool
Queued	The number of requests currently waiting for an available ticket	N/A

Thread pool attributes

Name	Description
ActiveCount	Returns the approximate number of threads that are actively executing tasks
MaximumPoolSize	Returns the maximum allowed number of threads
PoolSize	Returns the current number of threads in the pool
QueueLength	The number of tasks awaiting execution by the thread pool
LargestPoolSize	The largest number of threads that have ever been simultaneously in the pool
ComplетedTaskCount	The approximate total number of tasks that have completed execution. Because the states of tasks and threads may change dynamically during computation, the returned value is only an approximation, but one that does not ever decrease across successive calls

Repositories (com.atlassian.bitbucket:name=Repositories)

Name	Description
Count	Number of repositories currently configured across all projects

Scm Statistics (com.atlassian.bitbucket:name=ScmStatistics)

Name	Description
Pulls	Number of scm pulls serviced by this instance since it was started
Pushes	Number of scm pushes received by this instance is it was started

Ticket statistics

⚠ Starting from Bitbucket 8.0, the Ticket metrics are absent from the `com.atlassian.bitbucket` property and must be fetched from the Bitbucket Mesh sidecar.

Learn how to enable JMX monitoring for the Mesh sidecar in

BSERV-13623 - Provide better way to monitor JMX metrics for Bitbucket 8.x while using Mesh Sidecar GATHERING INTEREST

Bitbucket uses *tickets* as a mechanism for creating back pressure to prevent the system from being overloaded with requests. There are two types of tickets: hosting tickets and command tickets.

- **Hosting tickets** (**com.atlassian.bitbucket:name=HostingTickets**) limits the number of SCM hosting operations, meaning pushes and pulls over HTTP or SSH, which may be running concurrently.
- **Command tickets** (**com.atlassian.bitbucket:name=CommandTickets**) limits the number of SCM commands, such as: `git diff`, `git blame`, or `git rev-list`, which may be running concurrently.

Bitbucket supports the following metrics for each ticket type.

Name	Description
Available	The number of tickets available for acquisition (lower number means higher load)
Name	The name of the ticket bucket either 'scm-command' or 'scm-hosting'
Total	The maximum number of tickets that can be acquired concurrently before back-pressure is applied
Used	The number of tickets that have been acquired (higher number means higher load)
LastRejection	The timestamp of the last rejected ticket, or null if no tickets have been rejected. ⚠ If this metric is missing, follow the public issue BSERV-19088 to stay updated on the fix.
OldestQueuedRequest	The timestamp at which the oldest queued request started waiting, or null if there are no queued requests. ⚠ If this metric is missing, follow the public issue BSERV-19088 to stay updated on the fix.

Event statistics (com.atlassian.bitbucket:name=EventStatistics)

Name	Description
DispatchedCount	Total number of listener callbacks that have been performed. An event that is delivered to 10 listeners counts as 10 dispatches
LastRejection	Date of the last event being rejected, or *null* if no event has been rejected
PublishedCount	Total number of events delivered. An event that is delivered to 10 listeners counts as 1 event
QueueCapacity	Maximum number of event callbacks that can be queued before events are rejected
QueueLength	Number of event callbacks that have been queued but haven't been dispatched yet
RejectedCount	Total number of events that were not dispatched because the event queue was full
RemainingQueueCapacity	Remaining number of event callbacks that can be queued before events are rejected

Cluster lock statistics (com.atlassian.bitbucket:name=ClusterLocks)

Name	Description
LockedCount	Number of cluster locks that are currently held by this node
QueuedThreadCount	Number of threads on this node that are currently blocked waiting for a lock

TotalAcquiredCount	Total number of times a cluster lock was acquired on this node since startup
TotalAcquireErrorCount	Number of times an exception was thrown while trying to acquire a cluster lock on this node since startup
TotalAcquireTimeMillis	Total time in milliseconds that any thread on this node has spent acquiring a lock (including time blocked waiting for a lock to become available)
TotalReleasedCount	Total number of times a cluster lock was released on this node since startup
TotalReleaseErrorCount	Total number of times an exception was thrown while releasing a cluster lock on this node since startup

SSH session statistics (com.atlassian.bitbucket:name=SshSessions)

Name	Description
ActiveSessionCount	Number of currently active SSH session
MaxActiveSessionCount	Highest number of concurrently active SSH sessions since the last startup
SessionClosedCount	Total number of SSH sessions that have been closed since the last startup
SessionCreatedCount	Total number of SSH sessions that have been created since the last startup
SessionExceptionCount	Total number of SSH sessions that have been terminated because an exception was thrown from the SSH command run
SessionDisconnectedLimitCount	Total number of SSH sessions that have been disconnected due to maximum concurrent requests
SessionDisconnectedConnectionLostCount	Total number of SSH sessions that have been disconnected due to connection loss

Rate limiting statistics (com.atlassian.bitbucket:name=RateLimitStatistics)

Name	Description
RejectedRequestCount	The number of rate limited requests
UserMapSize	The number of token buckets currently in memory

Licensed users statistics

Name	Description
LicenseCapacity	The maximum number of users for the existing license
LicensedUserCount	The number of licensed users for the existing license

Third-party library attributes

Bitbucket exposes the JMX attributes from number of third party libraries. Listed below is a sample of the attributes that are particularly interesting from an operations perspective.

HikariCP (com.zaxxer.hikari:type=Pool (bitbucket))

Name	Description
ActiveConnections	Active Connections (in use)

IdleConnections	Idle Connection count
ThreadsAwaitingConnection	The number of threads waiting for a connection (when all available connections are in use)
TotalConnections	Total Connections

Hibernate (org.hibernate.core:sessionFactory=bitbucket.core,serviceRole=org.hibernate.stat.Statistics, serviceType=org.hibernate.stat.internal.ConcurrentStatisticsImpl)

Name	Description
QueryCacheHitCount	Global number of cached queries successfully retrieved from cache
QueryCacheMissCount	Global number of cached queries *not* found in cache
SecondLevelCacheHitCount	Global number of cacheable entities/collections successfully retrieved from the cache
SecondLevelCacheMissCount	Global number of cacheable entities/collections *not* found in the cache and loaded from the database

Expose JMX MBeans within Bitbucket

To enable Bitbucket to publish specific statistics using JMX:

1. Locate and open the `bitbucket.properties` file in the `<Bitbucket home directory>/shared` directory.
   a. Add this property to the file.

   ```
   jmx.enabled=true
   ```

   b. Save and close the file.
2. Create a JMX password file for secure access to JMX monitoring.
3. Modify the `set-jmx-opts.sh` file to enable Bitbucket to expose JMX Mbeans.

These changes will not take effect until Bitbucket is restarted.

Set up the JMX password file

Set up a JMX password file to secure access to JMX monitoring.

1. Create a file named `jmx.access`.

   This file will contain password information. Ensure the file is only readable by the secure user Bitbucket will run under. However, note that if the user cannot read the file Bitbucket will fail to start.

2. Edit the `jmx.access` file to include this property and save the file.

   ```
   monitorRole <password>
   ```

   If you wish to use a username other than `monitorRole` or `controlRole` you will need to modify the *jmxremote.access* file located in the `/lib/management/` directory of the installed Java.

3. Change ownership of `jmx.access` file,

   ```
   chown bitbucket:bitbucket <path>/jmx.access
   ```

where `bitbucket` is the user that runs Bitbucket service.

4. Change file permissions of `jmx.access` file.

```
chmod 600 <path>/jmx.access
```

Modify the Bitbucket environment file

Modify the `set-jmx-opts.sh` (for Windows `set-jmx-opts.bat`) files to enable JMX monitoring:

1. Within the `bin` directory, locate the file `set-jmx-opts.sh` (for Windows `set-jmx-opts.bat`) and change these properties.

```
JMX_REMOTE_AUTH=password
JMX_REMOTE_PORT=3333
RMI_SERVER_HOSTNAME=-Djava.rmi.server.hostname=<hostname>
JMX_PASSWORD_FILE=<path>/jmx.access
```

2. Restart Bitbucket.

Docker

For Docker deployments, the properties can be passed as Docker environment variables:

Sample:

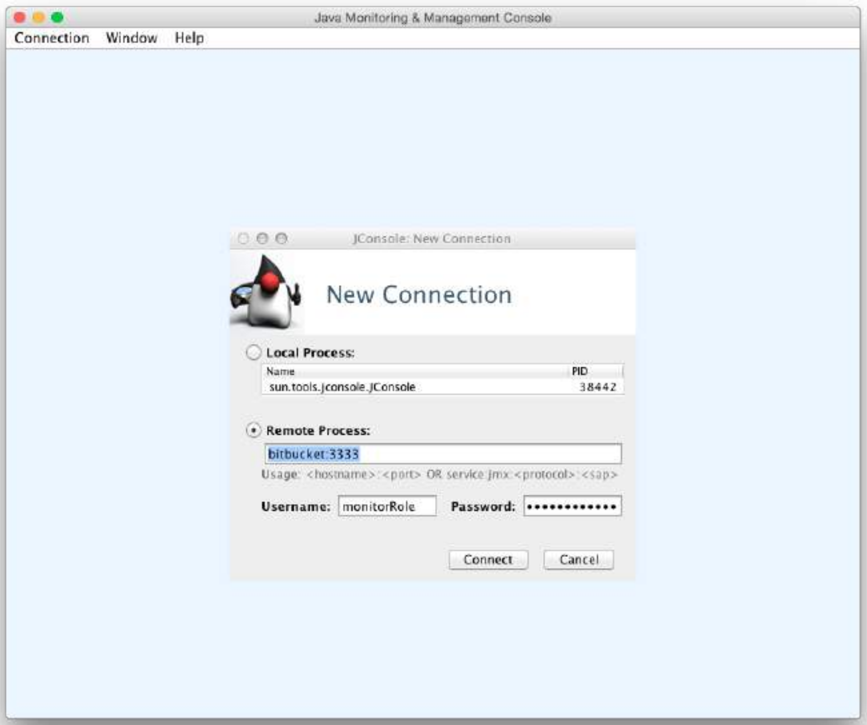
```
docker run -v /data/bitbucket:/var/atlassian/application-data/bitbucket \
  --name="bitbucket" \
  -d -p 7990:7990 -p 7999:7999 -p 3333:3333 \
  -e JMX_ENABLED=true \
  -e JMX_REMOTE_AUTH=password \
  -e JMX_REMOTE_PORT=3333 \
  -e JMX_REMOTE_RMI_PORT=3333 \
  -e RMI_SERVER_HOSTNAME=<hostname> \
  -e JMX_PASSWORD_FILE=<path>/jmx.access \
  atlassian/bitbucket
```

Verify JMX is configured correctly

These steps use JConsole to test that JMX has been configured correctly. JConsole is a utility that ships with the Oracle JDK.

1. To start the jconsole utility, from a command line prompt enter

```
jconsole
```



Local Process:

Name	PID
sun.tools.jconsole.JConsole	38442

Remote Process: bitbucket:3333

Usage: <hostname>:<port> OR service:jmx:<protocol>:<sap>

Username: monitorRole Password: ••••••••••••

2. Create a new JConsole connection with similar connection settings.

bitbucket	the hostname of the instance to monitor
3333	the JMX port number previously configured.
username, password	values configured within the JMX password file `jmx.access`.

3. Click **Connect**.

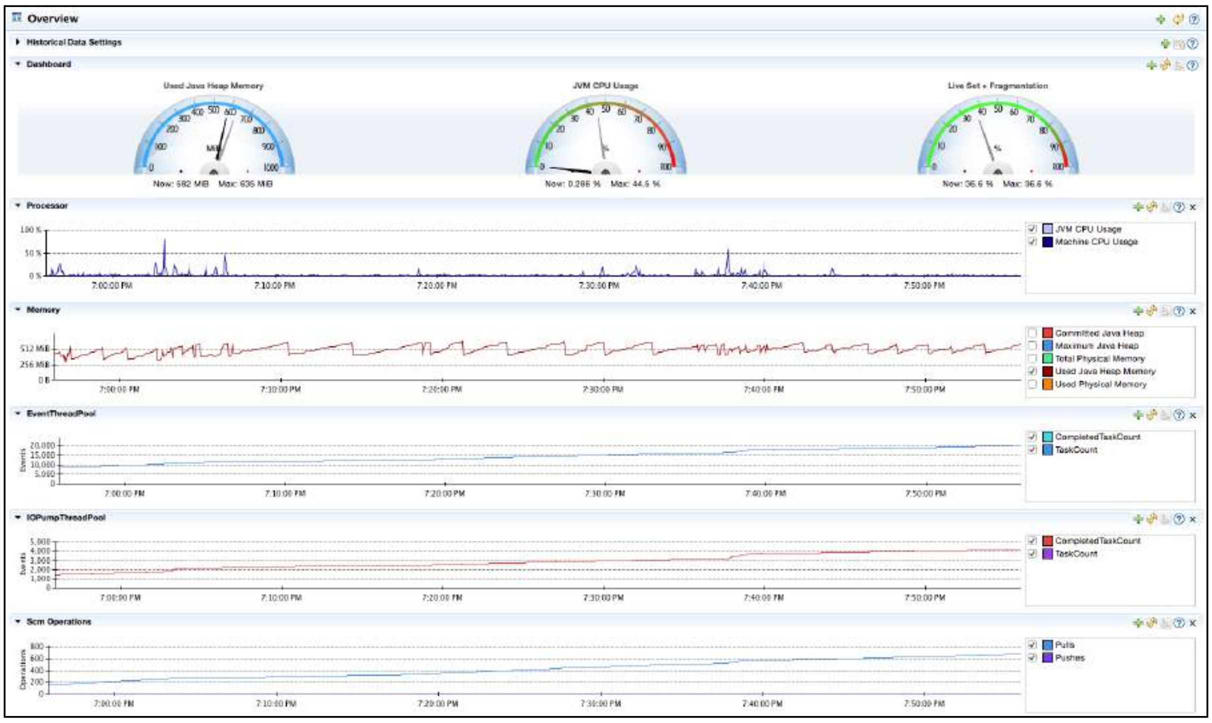
When configured correctly, you will see the following properties.

com.atlassian.bitbucket ⚠ Starting from Bitbucket 8.0, the Ticket metrics are absent from the `com.atlassian.bitbucket` property and must be fetched from the Bitbucket Mesh sidecar. Learn how to enable JMX monitoring for the Mesh sidecar in **BSERV-13623** - Provide better way to monitor JMX metrics for Bitbucket 8.x while using Mesh Sidecar GATHERING INTEREST	• CommandTickets • HostingTickets • Projects • Repositories • ScmStatistics • Tickets • EventStatistics • ClusterLocks • SshSessions
com.atlassian.bitbucket.thread-pools	• EventThreadPool

	• IoPumpThreadPool • ScheduledThreadPool

Example performance dashboard

This dashboard was generated using Java Mission Control that ships with the Oracle JDK (since 1.7u40). See the documentation that comes with your JMX client of choice for more information.



Configuring JMX to use SSL

You can find information about the options for configuring JMX to use SSL in the `set-jmx-opts` files. Comprehensive documentation is available from Oracle.

In-product diagnostics metrics

Expand the following sections to learn more about the metrics available for in-product diagnostics.

ⓘ To use these metrics, make sure you've first enabled JMX.

Bean ObjectName	Metric Description
`com.atlassian.bitbucket:type=metrics, category00=ssh, category01=sessions, category02=active, name=value`	• ssh.sessions.active.value The latest measure of the number of active SSH sessions.
`com.atlassian.bitbucket:type=metrics, category00=ssh,`	• ssh.sessions.active.statistics

`category01=sessions, category02=active, name=statistics`	Aggregated statistics of the number of active SSH sessions.
`com.atlassian.bitbucket: type=metrics, category00=ssh, category01=sessions, category02=closed, name=value`	• ssh.sessions.closed.value The latest measure of the number of closed SSH sessions.
`com.atlassian.bitbucket: type=metrics, category00=ssh, category01=sessions, category02=created, name=value`	• ssh.sessions.created.value The latest measure of the number of created SSH sessions.
`com.atlassian.bitbucket: type=metrics, category00=ssh, category01=sessions, category02=created, name=statistics`	• ssh.sessions.created.statistics Aggregated statistics of the number of created SSH sessions.
`com.atlassian.bitbucket: type=metrics, category00=ssh, category01=sessions, category02=disconnected, category03=connection, category04=lost,name=value`	• ssh.sessions.disconnected.connection.lost.value The number of disconnected SSH requests due to too many concurrent connections.
`com.atlassian.bitbucket: type=metrics, category00=ssh, category01=sessions, category02=disconnected, category03=connection, category04=lost, name=statistics`	• ssh.sessions.disconnected.connection.lost.statistics Aggregated statistics of the number of disconnected SSH requests due to too many concurrent connections.
`com.atlassian.bitbucket: type=metrics, category00=ssh, category01=sessions, category02=disconnected, category03=limit, name=value`	• ssh.sessions.disconnected.limit.value The number of disconnected SSH requests due to connection lost.
`com.atlassian.bitbucket: type=metrics, category00=ssh, category01=sessions, category02=disconnected, category03=limit, name=statistics`	• ssh.sessions.disconnected.limit.statistics Aggregated statistics of the number of disconnected SSH requests due to too many concurrent connections
`com.atlassian.bitbucket: type=metrics, category00=ssh,`	• ssh.sessions.error.counter The count of SSH connection failures since the last restart.

`category01=sessions, category02=error, name=counter`	

Bean ObjectName	Metric Description
`com.atlassian.bitbucket: type=metrics, category00=tickets, category01=command, category02=available,name=value`	• tickets.command.available.value The latest measure of the number of available Command tickets.
`com.atlassian.bitbucket: type=metrics, category00=tickets, category01=command, category02=available, name=statistics`	• tickets.command.available.statistics Aggregated statistics of the number of available Command tickets.
`com.atlassian.bitbucket: type=metrics, category00=tickets, category01=command, category02=used,name=value`	• tickets.command.used.value The latest measure of the number of used Command tickets.
`com.atlassian.bitbucket: type=metrics, category00=tickets, category01=command, category02=used,name=statistics`	• tickets.command.used.statistics Aggregated statistics of the number of used Command tickets.
`com.atlassian.bitbucket: type=metrics, category00=tickets, category01=hosting, category02=available,name=value`	• tickets.hosting.available.value The latest measure of the number of available Hosting tickets.
`com.atlassian.bitbucket: type=metrics, category00=tickets, category01=hosting, category02=available, name=statistics`	• tickets.hosting.available.statistics Aggregated statistics of the number of available Hosting tickets.
`com.atlassian.bitbucket: type=metrics, category00=tickets, category01=hosting, category02=used,name=value`	• tickets.hosting.used.value The latest measure of the number of used Hosting tickets.
`com.atlassian.bitbucket: type=metrics, category00=tickets, category01=hosting, category02=used,name=statistics`	• tickets.hosting.used.statistics Aggregated statistics of the number of used Hosting tickets.

Bean ObjectName	Metric Description
`com.atlassian.bitbucket: type=metrics, category00=storage,category01=space,`	• storage.space.local.free.value The value of the free space on the disk where the BB local storage is located.

`category02=local,category03=free, name=value`	
`com.atlassian.bitbucket: type=metrics, category00=storage,category01=space, category02=local,category03=used, name=value`	• storage.space.local.used.value The value of the used space on the disk where the BB local storage is located.
`com.atlassian.bitbucket: type=metrics, category00=storage,category01=space, category02=local, category03=caches,name=value`	• storage.space.local.caches.value The size of the `BITBUCKET_HOME/caches` directory in bytes.
`com.atlassian.bitbucket: type=metrics, category00=storage,category01=space, category02=local,category03=logs, name=value`	• storage.space.local.logs.value The size of the `BITBUCKET_HOME/log` directory in bytes.
`com.atlassian.bitbucket: type=metrics, category00=storage,category01=space, category02=local, category03=tmp,name=value`	• storage.space.local.tmp.value The size of the `BITBUCKET_HOME/tmp` directory in bytes.

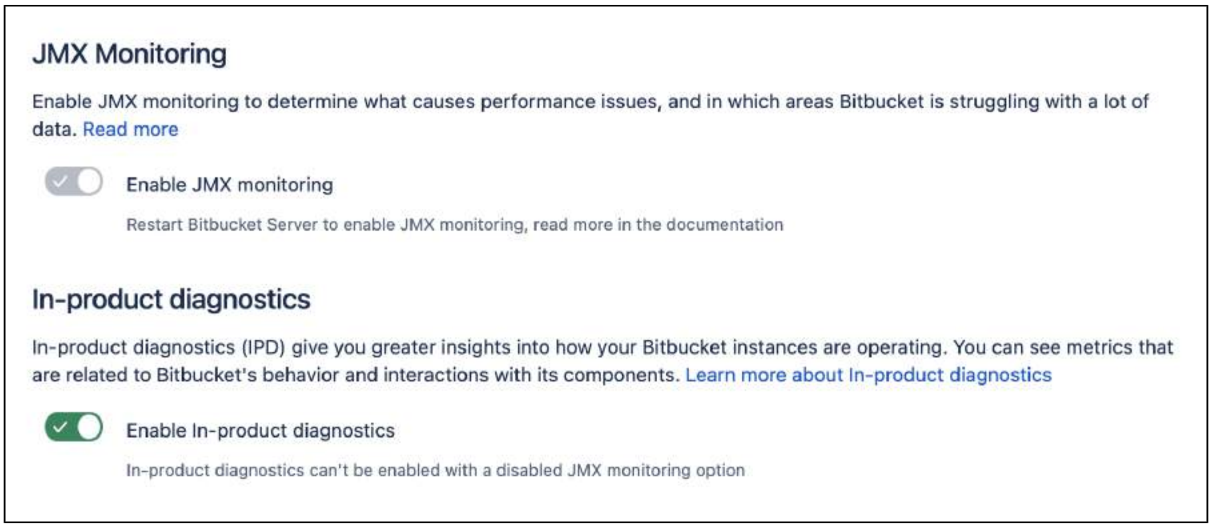
Enabling in-product diagnostics monitoring

In-product monitoring is enabled by default.

JMX logging polling interval is set to 60 seconds and can't be modified.

To manage it:

1. Go to **Administration** > **General configuration** > **Monitoring**.
2. Use the **Enable in-product diagnostics** toggle to enable or disable in-product monitoring.



JMX Monitoring

Enable JMX monitoring to determine what causes performance issues, and in which areas Bitbucket is struggling with a lot of data. Read more

Enable JMX monitoring

Restart Bitbucket Server to enable JMX monitoring, read more in the documentation

In-product diagnostics

In-product diagnostics (IPD) give you greater insights into how your Bitbucket instances are operating. You can see metrics that are related to Bitbucket's behavior and interactions with its components. Learn more about In-product diagnostics

Enable In-product diagnostics

In-product diagnostics can't be enabled with a disabled JMX monitoring option

Log formatting

Writing to `atlassian-bitbucket-ipd-monitoring.log` is done via log4j. Its configuration is managed in `logback-spring.xml`.

Log contents

By default, a concise set of data is included in each log entry. An extended set of data can be logged by enabling the `bitbucket.in.product.diagnostics.extended.logging` dark feature flag.

Learn how to enable the dark feature flag

In the following tables, see the structures of the concise and extended logging formats.

ⓘ The metrics in JMX always go in the extended data format

Concise data

MBean Type	Properties	Attributes
Counter	timestamp label attributes	_count
Value		_value
Statistics		_99thPercentile _max _min _mean

```
2023-01-13 11:51:13,106 IPDMONITORING {"timestamp":"1673610673","label":"DB.CONNECTION.POOL.NUMACTIVE.
STATISTICS","attributes":{"_max":"2.0","_mean":"1.2436699769063984","_99thPercentile":"2.0","_count":"
5","_min":"1.0"}}
```

Extended data

ⓘ The metrics in JMX always go in the extended data format. Learn more about the metric attributes

MBean Type	Properties	Attributes
Counter	timestamp label attributes objectName	_count _fifteenMinuteRate _fiveMinuteRate _meanRate _oneMinuteRate _rateUnit
Value		_value _number
Statistics		_50thPercentile

		_75thPercentile _95thPercentile _98thPercentile _99thPercentile _999thPercentile _count _min _max _mean _stdDev _durationUnit _fifteenMinuteRate _fiveMinuteRate _meanRate _oneMinuteRate _rateUnit

```
2022-09-06 18:38:48,015 IPDMONITORING {"timestamp":"1662453528","label":
"DB.CONNECTION.LATENCY.STATISTICS","objectName":
"com.atlassian.confluence:category00\u003ddb,category01\u003dconnection,category02\
u003dlatency,name\u003dstatistics,type\u003dmetrics",
"attributes":{"_oneMinuteRate":"0.02012497818617073","_50thPercentile":"0.0",
"_mean":"1.9379304604014412E-25","_max":"1.0","_stdDev":"4.40219315841711E-13",
"_98thPercentile":"0.0","_meanRate":"0.003612560785169162","_rateUnit":
"events/second","_99thPercentile":"0.0","_count":"16","_durationUnit":
"milliseconds","_75thPercentile":"0.0","_fiveMinuteRate":
"0.005912972095043379","_fifteenMinuteRate":"0.0037696657500141968",
"_999thPercentile":"0.0","_95thPercentile":"0.0","_min":"0.0"}}
```

Definitions of metric attributes

Expand the following sections to learn more about metric attributes.

Attribute	Definition
`_count`	The number of occurrences of a metric within the current time window
`_fifteenMinuteRate`	The number of occurrences of a metric over the last 15 minutes
`_fiveMinuteRate`	The number of occurrences of a metric over the last five minutes
`_meanRate`	The **mean** rate at which events have occurred since the meter was created
`_oneMinuteRate`	The number of occurrences of a metric over the last one minute
`_rateUnit`	The unit of measure used for rates

ⓘ Pay attention to the following attributes: `_oneMinuteRate`, `_fiveMinuteRate`, and `_fifteenMinuteRate`.

The _**count** gives no indication of how the measurements have changed over time. A sense of recency is provided with the minute rates.

Attribute	Definition
`_value`	A most recently sampled value of the metric
`_number`	Contains the same value as the `_value` attribute

The metrics of the statistics MBean type are also known as aggregated values. They provide statistics for the items that have been subjected to any changes over a period of time. For example, for the items that have been processed in a mail queue or added to an error mail queue.

Time window

Unless stated, aggregated values are calculated over a sliding time window. It covers the last five minutes, approximately.

Percentile values are calculated using a reservoir sampling technique. This technique uses a small, manageable set of values that is statistically representative of the data stream as a whole, hence reducing the quantity of data that must be held in memory.

Resets

Outside of the sliding time window, all aggregated values are reset:

- After each system restart.
- After each time JMX monitoring or in-product diagnostic metrics are enabled.

Learn more about JMX monitoring and in-product diagnostic in other Data Center products:

- Live monitoring using the JMX interface in Confluence
- Enabling JMX counters for performance monitoring in Bitbucket

In the following table, find the definitions of statistics metric attributes.

Attribute	Definition
`_50thPercentile`	A measured value below which 50% of all measurements can be found within the current time window; also referred to as the **median** value. This attribute provides an alternative to the **mean** as a representation of the middle measurement. The **median** is less likely to be skewed by outlier values than the **mean**.
`_75thPercentile`	The measured value below 75% of all measurements that can be found within the current time window; the **third quartile** value
`_95thPercentile`	The measured value below 95% of all measurements that can be found within the current time window
`_98thPercentile`	The measured value below 98% of all measurements that can be found within the current time window
`_99thPercentile`	The measured value below 99% of all measurements that can be found within the current time window
`_999thPercentile`	The measured value below 999% of all measurements that can be found within the current time window
`_count`	The number of occurrences of a metric within the current time window
`_min`	The minimum measured value within the current time window

`_max`	The maximum measure value within the current time window; the **statistical range** between `_max` and `_min` provides a measure of values variability
`_mean`	The average value within the current time window. This attribute can be skewed by large outlier measurements. In such cases, the `_50thPercentile` provides a better measure of the middle value.
`_stdDev`	A measure of the data variability. A low standard deviation indicates that the values tend to be close to the **mean** of the set, while a high standard deviation indicates that the values are spread out over a wider range of values.
`_durationUnit`	The unit of measure used for durations
`_fifteenMinuteRate`	The number of occurrences of a metric over the last 15 minutes
`_fiveMinuteRate`	The number of occurrences of a metric over the last five minutes
`_meanRate`	The **mean** rate at which events have occurred since the meter was created
`_oneMinuteRate`	The number of occurrences of a metric over the last one minute
`_rateUnit`	The unit of measure used for rates

Pay attention to the following attributes: `_oneMinuteRate`, `_fiveMinuteRate`, and `_fifteenMinuteRate`.

The _**count** gives no indication of how the measurements have changed over time. A sense of recency is provided with the minute rates.

Bitbucket guardrails

Background

We're committed to supporting the needs of our largest customers, and this includes continually improving the performance and scalability of our products. The amount of data in your instance can be a factor in performance and stability problems. As your instance grows, so does your risk of performance degradation over time. Often this is a gradual degradation and can go unnoticed until you reach a point where it has a significant impact on your team.

In the table below, we've described the performance and stability impacts that we've observed and suggested some actions you can take to reduce your risk. The guardrails are based on real-world experiences with some of our largest customers, but won't necessarily be representative of every organization's experience.

Ways you can reduce the risk of experiencing serious performance and stability problems may include:

- application changes, such as upgrading to a newer application version to get the benefit of performance improvements, or changing the way users are managed.
- infrastructure changes, such as increasing memory, CPU, or running a cluster or mirrors.
- data cleanup activities to reduce your footprint, such as archiving or breaking up monolith sites.

It's important to note that these aren't hard limits, and some of your product instances may already exceed these thresholds. There are a number of factors, including the interplay between different data types, and site load, which will influence whether you experience the potential impacts listed below, and to what degree. As with any type of risk, it's essential to identify the risk and make a plan, so you can prioritize those actions that will help you reduce the probability of future performance problems.

Definition

Product ***Guardrails*** are data type recommendations designed to help you identify potential risks and aid you making decisions about next steps in your instance optimization journey.

Bitbucket guardrails

The following guardrails are provided to help you identify and mitigate scale risks, and make decisions about cleaning up your instance.

LDAP users

Content type	Total number of users synchronized between LDAP and Bitbucket
Guardrail	If using Microsoft Active Directory: • 100,000 users If using another connector: • 70,000 groups
How to find this number	How to get the number of users, groups, and nested groups in Bitbucket Data Center and Server If you're not able to get this number from your user directory, you could try the workaround described in How do I find which users count against my Bitbucket license

Risks	We've observed these problems when operating above this guardrail: • Instance instability, including performance degradation and potential outages when Bitbucket is under high load. • Directory synchronization takes a long time. • User authentication can take longer than expected.
Mitigation options	• If you use Microsoft Active Directory, enable incremental synchronization. This fetches changes from LDAP, avoiding the need for a full sync. • Use Crowd to take advantage of features like: ◦ Access Based Synchronisation, which only synchronises users that have access to an application. Learn about access based synchronization ◦ Use a Delegated directory so that Crowd can import users' group memberships from LDAP each time they authenticate. Learn how to configure a delegated authentication directory • Use the User, Group, and Membership schema configuration filters to restrict the data synchronised with Bitbucket. Learn how to connect to an LDAP directory

LDAP groups

Content type	Total number of groups synchronized between LDAP and Bitbucket
Guardrail	If using Microsoft Active Directory: • 30,000 users If using another connector: • 20,000 groups
How to find this number	How to get the number of users, groups, and nested groups in Bitbucket Data Center and Server
Risks	We've observed these problems when operating above this guardrail: • Instance instability, including performance degradation and potential outages when Bitbucket is under high load. • Directory synchronization takes a long time. • User authentication can take longer than expected. • Application access and group management admin screens can become unresponsive.
Mitigation options	• If you use Microsoft Active Directory, enable incremental synchronization. This fetches changes from LDAP, avoiding the need for a full sync. • Use Crowd to take advantage of features like: ◦ Access Based Synchronisation, which only synchronises users that have access to an application. Learn about access based synchronization ◦ Use a Delegated directory so that Crowd can import users' group memberships from LDAP each time they authenticate. Learn how to configure a delegated authentication directory • Use the User, Group, and Membership schema configuration filters to restrict the data synchronised with Bitbucket. Learn how to connect to an LDAP directory

Depth of nested groups

Content type	Number of levels of hierarchy when groups are nested
Guardrail	4 levels deep. We also recommend groups do not contain a mix of users and other groups, as this can also influence performance.
How to find this number	How to get the number of users, groups, and nested groups in Bitbucket Data Center and Server
Risks	We've observed these problems when operating above this guardrail: • Instance instability, including performance degradation and potential outages when Bitbucket is under high load. • Directory synchronization takes a long time. • User authentication can take longer than expected. We’ve also observed that instances with a large number of groups and/or complex nested groups, often have a very complicated permission structure, which can also impact performance.
Mitigation options	• Change the group structure in your directory to avoid having too many levels of nesting. • Change the group structure in your directory so that groups only contain either users or other groups.

Permission grants

Content type	Number of permissions granted
Guardrail	Number of: • group global permissions: 10,000 • group project permissions: 200,000 • group repository permissions: 200,000 • user global permissions: 10,000 • user project permissions: 200,000 • user repository permissions: 200,000
How to find this number	To find this number: 1. Navigate to **Administration** > **Troubleshooting and support tools**. 2. Select **System information**. The number is displayed in the **Permissions** section under **Permission counts**.
Risks	We've observed these problems when operating above this guardrail: • Poor performance or timeouts when using user/group selectors. • Delays to all requests due to slow authorization checks. • High database load, resulting in performance impact to other requests involving database queries.

Mitigation options	<ul><li>Rather than granting permissions at the repository level to all repositories in a project, grant them at the project level.</li><li>Grant permissions to groups that contain multiple users rather than to individual users when possible.</li><li>Cleanup redundant permissions. For example:<ul><li>Where a user or group has permission on a repository and also on the project that contains the repository, the repository-level permission grant is redundant.</li><li>Where a user is granted a permission on a repository or project, and is also granted the same permission via a group, the user permission grant is redundant.</li></ul></li></ul>

Enable debug logging

This page describes how to enable various types of debug-level logging in Bitbucket Data Center.

Logs can be found in `<Bitbucket home directory>/log`.

For Bitbucket Mesh debug logging and profiling options, see Bitbucket configuration properties.

On this page

Debug logging for your instance

This section describes how to enable debug level logging in Bitbucket.

Enabling debug logging via the UI

To enable debug logging:

1. Go to the ⚙ > **Logging and Profiling.**
2. Select **Enable debug logging**.

Enabling debug logging on startup

To enable debug logging whenever Bitbucket. is started, edit the `<Bitbucket home directory>/shared/bitbucket.properties` file (if this file doesn't exist then you should create it) and add these two lines:

```
logging.logger.ROOT=DEBUG
logging.logger.com.atlassian.bitbucket=DEBUG
```

If your instance is earlier than version 3.2, the `bitbucket.properties` file is at the top level of your home directory.

Enabling debug logging at runtime

To enable debug logging for the root logger once Bitbucket. has been started, run these two commands in your terminal:

```
curl -u <ADMIN_USERNAME> -v -X PUT -d "" -H "Content-Type: application/json" <BASE_URL>/rest/api/latest
/logs/rootLogger/debug
curl -u <ADMIN_USERNAME> -v -X PUT -d "" -H "Content-Type: application/json" <BASE_URL>/rest/api/latest
/logs/logger/com.atlassian.bitbucket/debug

# e.g.
curl -u admin -v -X PUT -d "" -H "Content-Type: application/json" http://localhost:7990/rest/api/latest
/logs/rootLogger/debug
curl -u admin -v -X PUT -d "" -H "Content-Type: application/json" http://localhost:7990/rest/api/latest
/logs/logger/com.atlassian.bitbucket/debug
```

To enable debug logging for a specific logger, run this command in a terminal:

```
curl -u <ADMIN_USERNAME> -v -X PUT -d "" -H "Content-Type: application/json" <BASE_URL>/rest/api/latest
/logs/logger/<LOGGER_NAME>/debug

# e.g. embedded Crowd debug log
curl -u admin -v -X PUT -d "" -H "Content-Type: application/json" http://localhost:7990/rest/api/latest
/logs/logger/com.atlassian.crowd/debug

# e.g. LDAP debug log
curl -u admin -v -X PUT -d "" -H "Content-Type: application/json" http://localhost:7990/rest/api/latest
/logs/logger/com.atlassian.crowd.directory.SpringLDAPConnector/DEBUG
# e.g. email debug log
curl -u admin -v -X PUT -d "" -H "Content-Type: application/json" http://localhost:7990/rest/api/latest
/logs/logger/bitbucket.mail-log/debug
```

Profiling logging for your instance

This section describes how to enable profiling in Bitbucket. This log is essential when troubleshooting performance issues.

Enabling profiling logging via the UI

To enable profiling:

1. Go to the ⚙ > **Logging and Profiling.**
2. Select **Enable profiling**.

Debug logging for Git operations on the client

Atlassian Support might request debug logs for Git operations (on the client) when troubleshooting issues. You can enable debug logging on the Git client by setting the following variables. If you are using HTTP/S, remove the `Authorization` header from the output, as it contains your Basic-Auth information. Atlassian provides a set of scripts that simplify the collection of Git client debug information.

On Linux

Execute the following on the command line before executing the Git command:

```
export GIT_TRACE_PACKET=1
export GIT_TRACE=1
export GIT_CURL_VERBOSE=1
```

To measure the length of time a command takes to complete, use the `time` utility/command prior to the actual git command. For example, to test a push to branch "master":

```
time git push origin master
```

On Windows

Execute the following on the command line before executing the Git command:

```
set GIT_TRACE_PACKET=1
set GIT_TRACE=1
set GIT_CURL_VERBOSE=1
```

ⓘ Setting `GIT_CURL_VERBOSE` is only useful for connections over HTTP/S since SSH doesn't use the `libcurl` library.

Debug logging for your Backup Client

Atlassian Support might request debug logs for the Backup client when troubleshooting issues.

To enable debug logging for the Backup client, add a file named `logback.xml` to your working directory (`pwd`) with the following content:

logback.xml

```
<included><logger name="com.atlassian.bitbucket" level="DEBUG"/></included>
```

Scaling Bitbucket Data Center

This page discusses performance and hardware considerations when using Bitbucket Data Center.

Note that Bitbucket Data Center resources, not discussed on this page, uses a cluster of nodes to provide Active/Active failover, and is the deployment option of choice for larger enterprises that require high availability and performance at scale.

On this page:

Related pages:

- Use Bitbucket in the enterprise
- Resources for migrating to Git
- Bitbucket Data Center production server data
- Scaling Bitbucket Data Centre for Continuous Integration performance
- Potential performance impact of embedded Crowd directory ordering
- Configuration properties

Hardware requirements

The type of hardware you require to run Bitbucket Data Center depends on a number of factors:

- The count and concurrency of clone operations, which are the most resource-intensive operation Bitbucket Data Center performs. One major source of clone operations is continuous integration. When your CI builds involve multiple parallel stages, Bitbucket Data Center will be asked to perform multiple clones concurrently, putting significant load on your system.
- The size of your repositories. There are many operations in Bitbucket Data Center that require more CPU, memory and I/O when working with very large repositories. Furthermore, huge Git repositories (larger than a few GBs) are likely to impact the performance of Git clients as well as Bitbucket Data Center.
- The number of users.

Here are some rough guidelines for choosing your hardware:

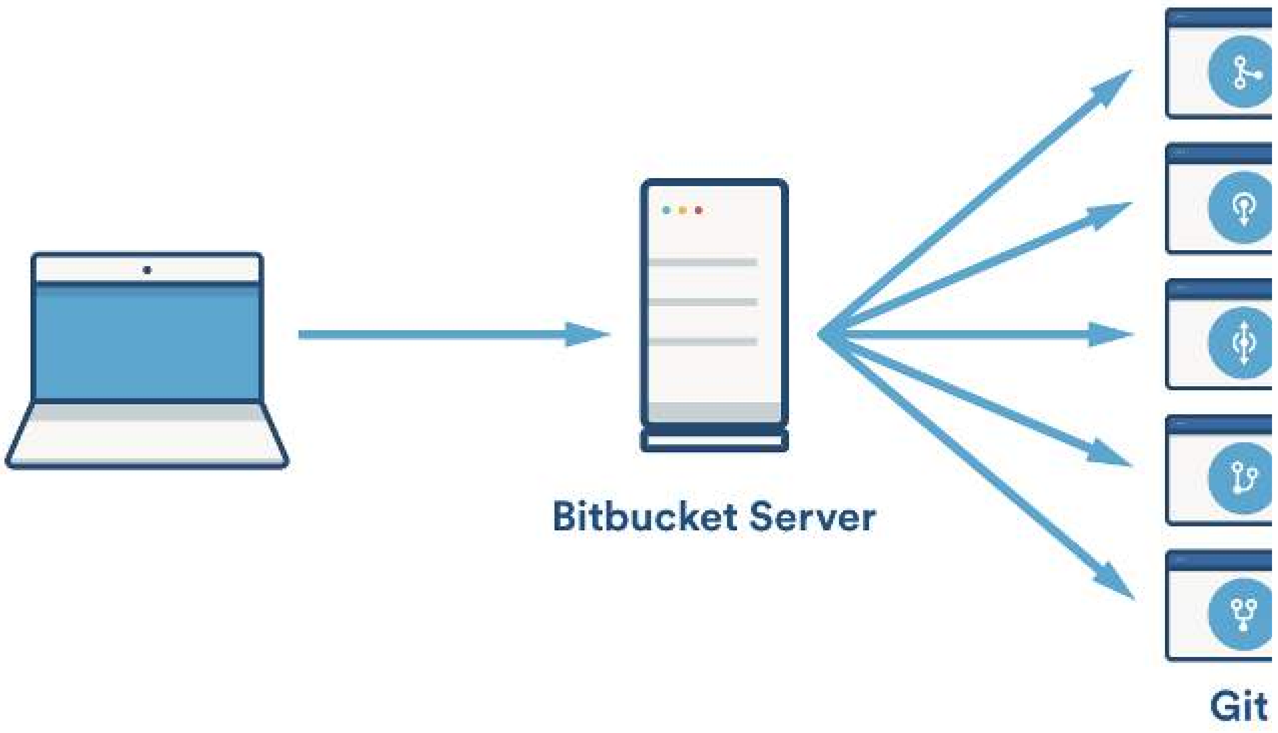
- Estimate the number of concurrent clones that are expected to happen regularly (look at continuous integration). Add one CPU for every 2 concurrent clone operations.
- Estimate or calculate the average repository size and allocate 1.5 x number of concurrent clone operations x min(repository size, 700MB) of memory.
- If you're running Bitbucket Data Center, check your size using the Bitbucket Data Center load profiles. If your instance is Large or XLarge, take a look at our infrastructure recommendations for Bitbucket Data Center AWS deployments.

See Scaling Bitbucket Data Center for Continuous Integration performance for some additional information about how Bitbucket Data Center SCM cache can help the system scale.

Understanding Bitbucket Data Center resource usage

Most of the things you do in Bitbucket Data Center involve both the Bitbucket Data Center instance and one or more Git processes. For instance, when you view a file in the web application, Bitbucket Data Center processes the incoming request, performs permission checks, creates a Git process to retrieve the file contents and formats the resulting webpage. The same is true for the 'hosting' operations like pushing commits, cloning a repository, or fetching the latest changes.

As a result, when configuring Bitbucket Data Center for performance, CPU and memory consumption for both Bitbucket Data Center *and* Git should be taken into account.



CPU

In Bitbucket Data Center, much of the heavy lifting is delegated to Git. As a result, when deciding on the required hardware to run Bitbucket Data Center, the CPU usage of the Git processes is the most important factor to consider. Cloning repositories is the most CPU intensive Git operation. When you clone a repository, Git on the server side will create a *pack file* (a compressed file containing all the commits and file versions in the repository) that is sent to the client. Git can use multiple CPUs while compressing objects to generate a pack, resulting in spikes of very high CPU usage. Other phases of the cloning process are single-threaded and will, at most, max out a single CPU.

Encryption (either SSH or HTTPS) may impose a significant CPU overhead if enabled. As for whether SSH or HTTPS should be preferred, there's no clear winner. Each has advantages and disadvantages as described in the following table:

	HTTP	HTTPS	SSH
Encryption	No CPU overhead for encryption, but plain-text transfer and basic authentication may be unacceptable for security.	Encryption has CPU overhead, but this can be offloaded to a separate proxy server (if the SSL/TLS is terminated there).	Encryption has CPU overhead.
Authentication	Authentication is slower – it requires remote authentication with the LDAP or Crowd server.		Authentication is generally faster, but may still require an LDAP or Crowd request to verify the connecting user is still active.
Cloning	Cloning a repository is slightly slower over HTTP. It requires at least 2 separate requests–and potentially significantly more–each performing its own authentication and permission checks. The extra overhead is typically small, but depends heavily on the latency between client and server.		Cloning a repository takes only a single request.

Memory

When deciding on how much memory to allocate for Bitbucket Data Center, the most important factor to consider is the amount of memory required for Git. Some Git operations are fairly expensive in terms of memory consumption, most notably the initial push of a large repository to Bitbucket Data Center and cloning large repositories from Bitbucket Data Center. For large repositories, it is not uncommon for Git to use hundreds of megabytes, or even multiple gigabytes, of memory during the clone process. The numbers vary from repository to repository, but as a rule of thumb 1.5x the repository size on disk (contents of the `.git/objects` directory) is a reasonable initial estimate of the required memory for a single clone operation. For large repositories, or repositories that contain large files, memory usage is effectively only bounded by the amount of RAM in the system.

In addition to being the most CPU-intensive, cloning repositories is also the most memory intensive Git operation. Most other Git operations, such as viewing file history, file contents and commit lists are lightweight by comparison. Clone operations also tend to retain their memory for significantly longer than other operations.

Bitbucket Data Center has been designed to have fairly stable memory usage. Pages that could show large amounts of data (e.g. viewing the source of a multi-megabyte file) perform incremental loading or have hard limits in place to prevent Bitbucket Data Center from holding on to large amounts of memory at any time. In general, the default memory settings (`-Xmx1g`) should be sufficient to run Bitbucket Data Center. Installing third-party apps may increase the system's memory usage. The maximum amount of memory available to Bitbucket Data Center can be configured in `_start-webapp.sh` or `_start-webapp.bat`.

The memory consumption of Git is not managed by the memory settings in `_start-webapp.sh` or `_start-webapp.bat`. Git processes are executed outside the Java virtual machine, so JVM memory settings do not apply.

Allocating a large heap for Bitbucket Data Center JVM may constrain the amount of memory available for Git processes, which may result in poor performance. A heap of 1-2GB is generally sufficient for Bitbucket Data Center JVM.

Disk

Git repository data is stored entirely on the filesystem. Storage with low latency/high IOPS will result in significantly better repository performance, which translates to faster overall performance and improved scaling. Storage with high latency is generally unsuitable for Git operations, even if it can provide high throughput, and will result in poor repository performance. Filesystems like Amazon EFS are not recommended for Bitbucket Data Center home or shared home due to their high latency.

Available disk space in `$BITBUCKET_HOME/caches`, where Bitbucket Data Center SCM cache stores packs to allow them to be reused to serve subsequent clones, is also important for scaling. The SCM cache allows Bitbucket Data Center to trade increased disk usage for reduced CPU and memory usage, since streaming a previously-built pack uses almost no resources compared to creating a pack. When possible, `$BITBUCKET_HOME/caches` should have a similar amount of total disk space to `$BITBUCKET_HOME/shared/data/repositories`, where the Git repositories are stored.

Network

Cloning a Git repository, by default, includes the *entire history*. As a result, Git repositories can become quite large, especially if they're used to track binary files, and serving clones can use a significant amount of network bandwidth.

There's no fixed bandwidth threshold we can document for the system since it will depend heavily on things like; repository size, how heavy CI (Bamboo, Jenkins, etc.) load is, and more. However, it's worth calling out that Bitbucket Data Center network usage will likely far exceed other Atlassian products like Jira or Confluence.

Additionally, when configuring a Data Center cluster, because repository data must be stored on a shared home which is mounted via NFS, Bitbucket Data Center's bandwidth needs are even higher -and its performance is far more sensitive to network latency. Ideally, in a Data Center installation, nodes would use separate NICs and networks for client-facing requests (like hosting) and NFS access to prevent either from starving the other. The NFS network configuration should be as *low latency* as possible, which excludes using technologies like Amazon EFS.

Database

The size of the database required for Bitbucket Data Center primarily depends on the number of repositories the system is hosting and the number of commits in those repositories.

A very rough guideline is: 100 + ((total number of commits across all repositories) / 2500) MB.

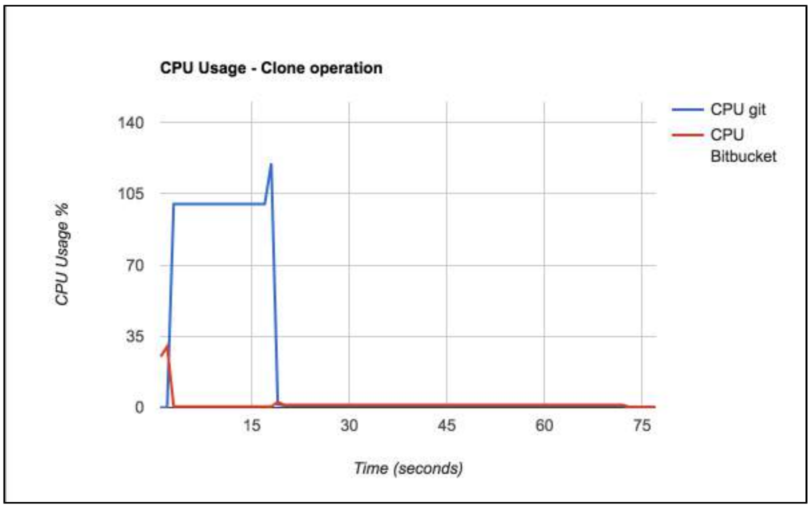
So, for example, for 20 repositories with an average of 25,000 commits each, the database would need 100 + (20 * 25,000 / 2500) = 300MB.

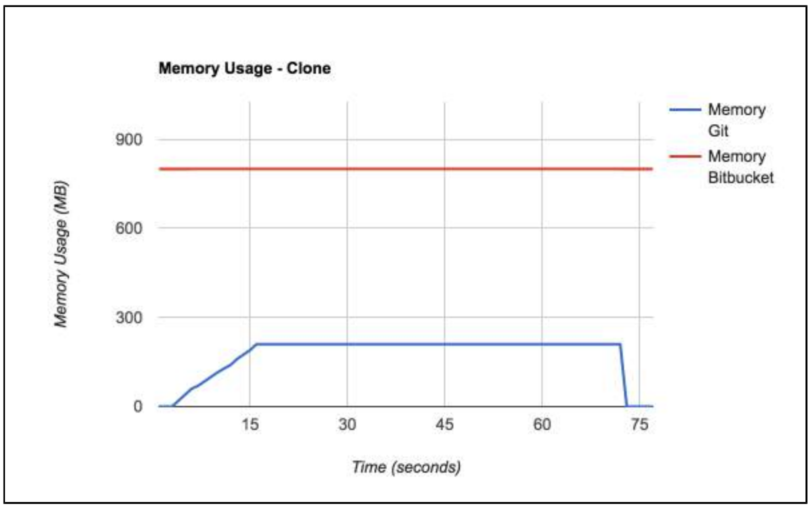
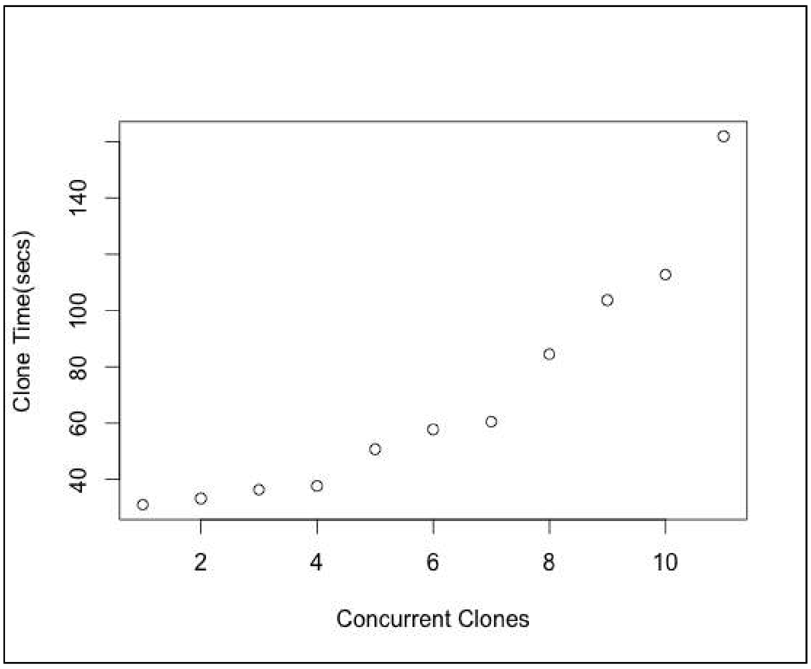
Note that repository data is *not* stored in the database; it’s stored on the filesystem. As a result, having multi-gigabyte repositories does not necessarily mean the system will use dramatically more database space.

Where possible, it is *preferable* to have Bitbucket Data Center database on a separate machine or VM, so the two are not competing for CPU, memory and disk I/O.

Clones examined

Since cloning a repository is the most demanding operation in terms of CPU and memory, it is worthwhile analyzing the clone operation a bit closer. The following graphs show the CPU and memory usage of a clone of a 220 MB repository:

	**Git process (blue line)** • CPU usage goes up to 100% while the pack file is created on the server side. • CPU peaks at 120% when the pack file is compressed (multiple CPUs used). • CPU drops back to 0.5% while the pack file is sent back to the client. **Bitbucket Data Center (red bottom line)** • CPU usage briefly peaks at 30% while the clone request is processed. • CPU drops back to 0% while Git prepares the pack file. • CPU hovers around 1% while the pack file is sent to the client.

	**Git process (blue line)** • Memory usage slowly climbs to 270 MB while preparing the pack file. • Memory stays at 270 MB while the pack file is transmitted to the client. • Memory drops back to 0 when the pack file transmission is complete. **Bitbucket Data Center (red upper line)** • Memory usage hovers around 800 MB and is not affected by the clone operation.
	This graph shows how concurrency affects average response times for clones: • Vertical axis: average response times. • Horizontal axis: number of concurrent clone operations. The measurements for this graph were done on a 4 CPU server with 12 GB of memory. Response times become exponentially worse as the number of concurrent clone operations exceed the number of CPUs.

In-memory cache sizes

Bitbucket contains a number of in-memory caches. These caches improve performance by reducing the need to query the database frequently. Many of these caches are bounded to avoid exhausting the Java heap memory, and the default sizes of these caches are designed to suit the default Java maximum heap memory configuration of 1 gigabyte.

For Bitbucket instances with a large number of users or groups, additional tuning of these in-memory cache sizes can significantly increase performance. Specifically:

- improve performance of user and group selectors
- improve performance of authorization or permission checks that are carried out for every request for a resource requiring permissions
- decrease the load on the database

Setting user and group count sizing hints

The following two properties can be used to provide sizing hints for multiple internal caches:

- `sizing-hint.cache.users`
- `sizing.hint.cache.groups`

A starting point for calculating appropriate sizes is as follows:

Property	Suggested setting
`sizing-hint.cache.users`	A reasonable starting point is to set it to between 50-100% of the licensed user count. More specifically, if all users are likely to be active during the same time of the day, then closer to 100% is better. Whereas, for a geographically distributed user-base where only a subset of users are likely to be active at a given time, a setting closer to 50% may be a good balance. If in doubt, and you have ample free system memory to apply below the Java heap size tuning, then lean towards 100%. To find the licensed user count, navigate to **Administration** > **Licensing** > **Licensed users.**

`sizing.hint.cache.groups`	A reasonable starting point is to set it to between 50-100% of group membership, specifically count of distinct groups of the set of licensed users. As this can be hard to calculate, start with the total number of distinct groups with members by running the following database query:
	
	`select count(distinct lower_parent_name)`
	`from cwd_membership`
	`where group_type='GROUP' and membership_type='GROUP_USER';`
	
	Using this value and the same logic described for users, decide if the value should be closer to 50% or 100%.

For the default values, see Bitbucket configuration properties. Decreasing these values below the default is neither necessary nor recommended. However, if you find that you need to increase these values:

1. Navigate to the directory `$BITBUCKET_HOME/shared`
2. Open the file `bitbucket.properties` in your text editor of choice.
3. Add the following lines and replace the value 1234 with the settings you've derived.

```
sizing-hint.cache.users=1234
sizing-hint.cache.groups=1234
```

4. Save the file.
5. If necessary, increase the maximum Java heap memory size. Learn how to increase Java heap memory size
6. Restart Bitbucket for this setting to take effect.

Increasing Java heap memory size

Do not set the maximum Java heap memory size (-Xmx) arbitrarily large. Bitbucket requires memory for both forked Git processes and the operating system page cache in order to perform well. Unnecessary memory allocation to the Java virtual machine reduces the memory available for the above operations.

If you've increased the value of `sizing-hint.cache.users` from its default value, it is necessary to increase the maximum Java heap memory that the Java virtual machine allows. The heap memory sizes should be set as follows:

Value of `sizing-hint.cache.users`	Maximum Java heap size (-Xmx)
Up to 5000	1g
5000-14999	2g
15000-24999	3g
25000+	4g

These values should be considered as a starting point. Other specific tuning you may have carried out or plugins you've installed **may mandate a further increase in heap memory sizes**. As always, analysis of Java garbage collection logs should be the principal guide for heap memory tuning.

To set an increased maximum Java heap size:

1. Navigate to the `bin` directory in the Bitbucket installation directory:

```
cd <Bitbucket installation directory>/bin
```

2. Open the `_start-webapp.sh` file in your editor of choice.
3. Locate the following section:

```
# The following 2 settings control the minimum and maximum memory allocated to the Java virtual
machine.
#For larger instances, the maximum amount will need to be increased.
#
if [ -z "${JVM_MINIMUM_MEMORY}" ]; then
        JVM_MINIMUM_MEMORY=512m
fi
if [ -z "${JVM_MAXIMUM_MEMORY}" ]; then
        JVM_MAXIMUM_MEMORY=1g
fi
```

4. Set the `JVM_MAXIMUM_MEMORY` variable to the desired value (for example, increase from 1g to 2g).
5. Save the file.
6. Restart Bitbucket for this setting to take effect.

Monitoring

In order to effectively diagnose performance issues and tune Bitbucket Data Center scaling settings, it is important to configure monitoring. While exactly how to set up monitoring is beyond the scope of this page, there are some guidelines that may be useful:

- At a minimum, monitoring should include data about CPU, memory, disk I/O (for any disks where Bitbucket Data Center is storing data), free disk space, and network I/O.
    - Monitoring free disk space can be very important for detecting when the SCM cache is nearing free space limits, which could result in it being automatically disabled.
    - When Bitbucket Data Center is used to host large repositories, it can consume a large amount of network bandwidth. If repositories are stored on NFS, for a cluster, bandwidth requirements are even higher.
- Bitbucket Data Center exposes many JMX counters which may be useful for assembling dashboards to monitor overall system performance and utilization.
    - In particular, tracking used/free tickets for the various buckets, described below, can be very useful for detecting unusual or escalating load.
- Retaining *historical data* for monitoring can be very useful for helping to track increases in resource usage over time as well as detecting significant shifts in performance.

  - As users create more repositories, push more commits, open more pull requests and generally just use the system, resource utilization will increase over time.
  - Historical averages can be useful in determining when the system is approaching a point where additional hardware may be required or when it may be time to consider adding another cluster node.

Tickets and throttling

Bitbucket Data Center uses a ticket-based approach to throttling requests. The system uses a limited number of different ticket buckets to throttle different types of requests independently, meaning one request type may be at or near its limit, while another type still has free capacity.

Each ticket bucket has a default size that will be sufficient in many systems, but as usage grows, the sizes may need to be tuned. In addition to a default size, each bucket has a default timeout which defines the longest a client request is allowed to wait to acquire a ticket before the request is rejected. Rejecting requests under heavy load helps prevent cascading failures, like running out of Tomcat request threads because too many requests are waiting for tickets.

Ticket buckets

The following table shows ticket buckets the system uses, the default size and acquisition timeout, and what each is used for:

Bucket	Size	Timeout	Usage
scm-command	50 (Fixed)	2 seconds	“scm-command” is used to throttle most of the day-to-day Git commands the system runs. For example: • `git diff`, used to show commit and pull request diffs • `git rev-list`, used to show commit lists and information about specific commits • `git merge`, used to merge pull requests “scm-command” tickets are typically *directly connected* to web UI and REST requests, and generally have very quick turnaround - most commands typically complete in tens to hundreds of milliseconds. Because a user is typically waiting, “scm-command” tickets apply a very short timeout in order to favor showing users an error over displaying spinners for extended periods.
scm-hosting	1x-4x (Adaptive; see below)	5 minutes	“scm-hosting” is used to throttle `git clone` and `git fetch`. During a clone or fetch, after sending a ref advertisement, the server generates a pack file (on the fly) which contains the objects the client has requested. For large repositories, this can be a very CPU, memory and I/O-intensive operation. Servicing clones and fetches produces the majority of the load on most Bitbucket Data Center instances. For SSH only, “scm-hosting” is also used to throttle `git upload-archive` requests. `git upload-archive` does not currently support HTTP(S) remotes. Generating an archive is less resource-intensive than generating a pack, but is likely to still use more resources (and for longer) than serving a ref advertisement or push. “scm-hosting” uses an adaptive throttling mechanism (described in detail below) which allows the system to dynamically adjust the number of available tickets in response to system load. The default range is proportional to a configurable scaling factor, which defaults to the number of CPUs reported by the JVM. For example, if the JVM reports 8 CPUs, the system will default to 1x8=8 tickets minimum and 4x8=32 tickets maximum.

scm-refs	8x (Fixed proportional)	1 minute	“scm-refs” is used to throttle ref advertisements, which are the first step in the process of servicing both pushes and pulls. Additionally, because most of the CPU and memory load are client side, *pushes* are throttled using the “scm-refs” bucket. Unlike a clone or a fetch, the pack for a push is generated using the client’s CPU, memory and I/O. While processing the received pack does produce load on the server side, it’s minimal compared to generating a pack for a clone or fetch. The default size for the “scm-refs” bucket is proportional to a configurable scaling factor, which defaults to the number of CPUs reported by the JVM. For example, if the JVM reports 8 CPUs, the system will default to 8x8=64 “scm-refs” tickets. Ref advertisements are generally served fairly quickly, even for repositories with large numbers of refs, so the default timeout for “scm-refs” is shorter than the default for “scm-hosting”.
git-lfs	80 (Fixed)	Immediate	“git-lfs” is used to throttle requests for large objects using Git LFS. LFS requests are much more similar to a basic file download than a pack request, and produce little system load. The primary reason they’re throttled at all is to prevent large numbers of concurrent LFS requests from consuming all of Tomcat's limited HTTP request threads, thereby blocking access to users trying to browse the web UI, or make REST or hosting operations. Because LFS is predominantly used for large objects, the amount of time a single LFS ticket may be held can vary widely. Since it’s hard to make a reasonable guess about when a ticket might become available, requests for “git-lfs” tickets timeout immediately when the available tickets are all in use.
mirror-hosting	2x (Fixed proportional)	1 hour	"mirror-hosting" is *Data Center-only* and is used to throttle `git clone` and `git fetch` requests from smart mirrors and mirror farms. Using a separate bucket for mirror requests allows different configuration, like using a longer timeout. No user would wait an hour to acquire a ticket, but mirrors will. A separate bucket ensures busy mirrors don't consume all of the system's "scm-hosting" tickets and prevent users or CI from being able to push or pull. Unlike "scm-hosting", "mirror-hosting" is *not* adaptive. It uses a fixed number of tickets based on the number of CPUs reported by the JVM. For example, if the JVM reports 8 CPUs, the system will default to 2x8=16 "mirror-hosting" tickets. The default limit is generally sufficient, but for instances with a large number of mirrors, or large mirror farms, it may be necessary to increase it. Administrators will need to balance the number of "mirror-hosting" tickets they allow against the number of "scm-hosting" tickets they allow to prevent excessive combined load between the two.

Earlier versions

Prior to Bitbucket 7.3, "scm-hosting" tickets were used to throttle all parts of hosting operations, including ref advertisements and pushes. This meant that the "scm-hosting" bucket often needed to be sized very generously to prevent fast-completing ref advertisements from getting blocked behind slow-running clones or fetches when competing for tickets. However, when the "scm-hosting" limit was very high, if a large number of clone or fetch requests were initiated concurrently, it could result in a load spike that effectively crippled or even crashed the server. "scm-refs" tickets were introduced to combat that risk. With "scm-refs", administrators can configure the system to allow for heavy polling load (typically from CI servers like Bamboo or Jenkins) without necessarily increasing the number of available "scm-hosting" tickets.

Adaptive throttling

Adaptive throttling uses a combination of total physical memory, evaluated once during startup, and CPU load, evaluated periodically while the system is running, to dynamically adjust the number of available "scm-hosting" tickets within a configurable range.

During startup, the total physical memory on the machine is used to determine the maximum number of tickets the machine can safely support. This is done by considering how much memory Bitbucket Data Center and the bundled search server need for their JVMs and an estimate of how much memory each Git hosting operation consumes on average while running, and may produce a safe upper bound that is lower (but never higher) than the configured upper bound.

To illustrate this more concretely, consider a system with 8 CPU cores and 8GB of physical RAM. With 8 CPU cores, the default adaptive range will be 8-32 tickets.

- The total is reduced by 1GB for Bitbucket Data Center default heap: 7GB
- The total is reduced by 512MB for bundled search: 6.5GB
- The remainder is divided by 256MB: 6656 / 256 = 26

In this example, the actual upper bound for the adaptive range will be 26 tickets, rather than the 32 calculated from CPU cores, because the system doesn't have enough RAM to safely handle 32 tickets.

While the system is running, Bitbucket Data Center periodically samples CPU usage (every 5 seconds by default) and increases or decreases the number of available tickets based on a target load threshold (75% by default). A smoothing factor is applied to CPU measurements so the system doesn't overreact by raising or lowering the number of available tickets too aggressively in response to bursty load.

Adaptive throttling is enabled by default, but the system may automatically revert to fixed throttling if any of the following conditions are met:

- A non-default fixed number of tickets has been set; for example
  `throttle.resource.scm-hosting=25`
- A fixed throttling strategy is configured explicitly; for example
  `throttle.resource.scm-hosting.strategy=fixed`
  `throttle.resource.scm-hosting.fixed.limit=25`
- The adaptive throttling configuration is invalid in same way
- The total physical memory on the machine is so limited that even the minimum number of tickets is considered unsafe

Adaptive throttling is only available for the "scm-hosting" ticket bucket. Other buckets, like "scm-refs", do not support adaptive throttling; they use fixed limits for the number of tickets. This prevents high CPU usage from `git clone` and `git fetch` requests from reducing the number of tickets available in other buckets, which generally don't use much CPU.

Caching

Building pack files to serve clone requests is one of the most resource-intensive operations Bitbucket Data Center performs, consuming significant amounts of CPU, memory and disk I/O. To reduce load, and allow instances to service more requests, Bitbucket Data Center can cache packs between requests so they only need to be built once. When a pack is served from the cache, no "scm-hosting" ticket is used. This can be particularly beneficial for systems with heavy continuous integration (CI) load, from systems like Bamboo or Jenkins, where a given repository may be cloned several times either concurrently or in short succession.

Cached packs are stored in `$BITBUCKET_HOME/caches/scm`, with individual subdirectories for each repository. On Data Center nodes, packs are cached *per node* and are not shared. If free space on the disk where `$BITBUCKET_HOME/caches/scm` is stored falls below a configurable threshold, pack file caching will be automatically disabled until free space increases. Cached packs will automatically be evicted using a least-recently-used (LRU) strategy to try and free up space when free space approaches the threshold.

Considerations

- Because clones typically include the full history for the repository, cached packs are often close to the same size as the repository being cloned. This means cached packs can consume a significant amount of disk space–often more than the repository itself consumes if multiple packs are cached

    - It may be desirable to use a separate disk or partition mounted at `$BITBUCKET_HOME/caches` to allow for more disk space and to ensure cached packs don't fill up the same disk where other system data is stored
- Using single-branch clones (e.g. `git clone --single-branch`) can result in a large number of distinct cached packs for a single repository. In general, for maximizing cache hits, it's better to use full clones

Limitations

- Pack files for `git fetch` requests are not cached. Unlike clones, where it's likely the same clone will be executed multiple times, fetches tend to be much more unique and are unlikely to produce many cache hits

Earlier versions

Prior to Bitbucket 7.4 the system supported caching ref advertisements as well as packs. Unlike pack file caching, enabling ref advertisement caching did little to reduce system load. Instead, the primary benefit of ref advertisement caching was reduced contention for "scm-hosting" tickets. Ref advertisement caching was disabled by default because it could result in advertising stale refs. This meant administrators had to balance the risk of stale data against the reduction in "scm-hosting" ticket usage.

Bitbucket 7.3 introduced a new "scm-refs" bucket for throttling ref advertisements, eliminating contention for "scm-hosting" tickets, and Bitbucket 7.4 introduced significant reductions in the number of threads used to service HTTP and SSH hosting operations. The combination of those improvements eliminate the benefits of ref advertisement caching, leaving only its downsides, so support for ref advertisement caching has been removed.

HTTPS and SSH

Bitbucket Data Center can serve hosting operations via HTTPS and SSH protocols. Each has its pros and cons, and it's possible to disable serving hosting operations via either protocol if desired.

HTTPS

Serving hosting operations via HTTPS requires 2 or more requests to complete the overall operation. By default Git will attempt to reuse the same connection for subsequent requests, to reduce overhead, but it's not always possible to do so. Additionally, Git does not support `upload-archive` over HTTP(S); it's only available over SSH. One advantage of HTTPS for hosting is that encryption overhead can be offloaded to a proxy to reduce CPU load on the Bitbucket Data Center instance.

Git's HTTPS support offers 2 wire protocols, referred to as "smart" and "dumb". Bitbucket Data Center only supports the "smart" wire protocol, which has 2 versions: v0 and v2 (v1 was a transitional protocol and is not generally used). The v0 "smart" wire protocol is always supported; v2 is only supported when Git 2.18+ is installed on both Bitbucket Data Center *and on clients*.

By default, Tomcat allows up to 200 threads to process incoming requests. Bitbucket 7.4 introduced the use of asynchronous requests to move processing for hosting operations to a background threadpool, freeing up Tomcat's threads to handle other requests (like web UI or REST requests). The background threadpool allows 250 threads by default. If the background threadpool is fully utilized, subsequent HTTPS hosting operations are handled directly on Tomcat's threads. When all 200 Tomcat threads are in use, a small number of additional requests are allowed to queue (50 by default) before subsequent requests are rejected.

SSH

Hosting operations via SSH are handled using a single request, with bidirectional communication between the client and server. SSH supports the full range of hosting operations: `receive-pack` (push), `upload-archive` (archive) and `upload-pack` (pull). One disadvantage of SSH is that its encryption overhead cannot be offloaded to a proxy; it must be handled by the Bitbucket Data Center JVM.

Git's SSH support only offers a single wire protocol, which is roughly equivalent to HTTPS's "smart" wire protocol. As with the HTTPS "smart" wire protocol, Git's SSH wire protocol supports 2 versions: v0 and v2.

The v0 wire protocol is always supported; v2 is only supported when Git 2.18+ is installed on both Bitbucket Data Center *and on clients*.

By default, Bitbucket Data Center allows up to 250 simultaneous SSH sessions, and sessions over that limit are rejected to prevent backlogs.

Earlier versions

Prior to Bitbucket 7.4, hosting operations via HTTPS and SSH used 5 threads per request. One of these was the actual HTTPS or SSH request thread, and the rest were overhead related to using blocking I/O to communicate with the `git` process that was servicing the request. In Bitbucket 7.4, that blocking I/O approach was replaced with a non-blocking approach which eliminated the 4 overhead threads, allowing HTTPS and SSH hosting operations to be serviced by a single thread.

Configuring Bitbucket Data Center scaling options and system properties

The sizes and timeouts for the various ticket buckets are all configurable; see Configuration properties.

When the configured limit is reached for the given resource, requests will wait until a currently running request has completed. If no request completes within a configurable timeout, the request will be rejected. When requests while accessing the Bitbucket Data Center UI are rejected, users will see either a 501 error page indicating the server is under load, or a popup indicating part of the current page failed to load. When Git client 'hosting' commands (pull/push/clone) are rejected, Bitbucket Data Center does a number of things:

- Bitbucket Data Center will return an error message to the client which the user will see on the command line: "Bitbucket is currently under heavy load and is not able to service your request. Please wait briefly and try your request again."
- A warning message will be logged for every time a request is rejected due to the resource limits, using the following format:
  "A [scm-hosting] ticket could not be acquired (0/12)"
  - The ticket bucket is shown in brackets, and may be any of the available buckets (e.g. “scm-command”, “scm-hosting”, “scm-refs” or “git-lfs”).
- For five minutes after a request is rejected, Bitbucket Data Center will display a red banner in the UI *fo r all users* to warn that the server is under load.
  - This period is also configurable.

The hard, machine-level limits throttling is intended to prevent hitting are very OS- and hardware-dependent, so you may need to tune the configured limits for your instance of Bitbucket Data Center. When hyperthreading is enabled for the server CPU, for example, the default number of “scm-hosting” and “scm-refs” tickets may be too high, since the JVM will report double the number of physical CPU cores. In such cases, we recommend starting off with a less aggressive value; the value can be increased later if hosting operations begin to back up and system monitoring shows CPU, memory and I/O still have headroom.

Scaling Bitbucket Data Centre for Continuous Integration performance

If you've got CI or other automatic tooling set up to poll Bitbucket Data Center for changes, you can end up with high load on your Bitbucket Data Center instance. Consider for instance a CI server that has a number of builds set up for a given repository. Each of those builds polls Bitbucket Data Center for changes and when it detects a change, it starts a new build. If your CI server supports parallel and/or chained build steps, each of these builds typically results in multiple clone operations of the same repository. The result: lots of polling for changes, and bursts of clones of a repository.

Caching

CI results in highly repetitive calls to Bitbucket Data Center: polling for changes typically results in the same response 90% of the time and a build triggers a number of identical clone calls to Bitbucket Data Center. Both operations can benefit greatly from caching when you experience repetitive load from CI.

On this page:

Related pages:

- Scaling Bitbucket Data Center
- Configuration properties

Limitations

- Git 2.18 introduced version 2 of the Git wire protocol, which is fully supported by Bitbucket Data Center caching. Please note, that due to differences in the protocols, Git clients using version 1 of the wire protocol cannot use caches generated for clients using version 2 of the wire protocol, and vice versa. As a result, when there's a mix of clients using version 1 and 2 of the wire protocol, disk usage for caching can be higher and cache efficiency can be lower, compared to when all clients use the same version of the wire protocol.

Considerations

Cache data is stored on disk for clone operations for a configurable period of time. Since large instances can potentially consume an entire disk the SCM Cache Plugin monitors remaining disk space and is automatically disabled when the configured minimum free disk space is reached.

See Configuration properties for descriptions of the available system properties.

Configuration

The SCM Cache Plugin for Bitbucket Data Center can be configured using either the REST endpoint (some settings, not all) or the system properties in `<BITBUCKET_HOME>/bitbucket.properties`. Settings configured through REST are considered *before* the settings in `bitbucket.properties`.

REST API

Method	Url	Description

GET	`/rest/scm-cache/latest/config/protocols`	Retrieve the protocols for which caching has been enabled.
PUT	`/rest/scm-cache/latest/config/protocols/{protocol}`	Enable caching of hosting requests for the protocol (HTTP or SSH).
DELETE	`/rest/scm-cache/latest/config/protocols/{protocol}`	Disable caching of hosting requests for the protocol (HTTP or SSH).
GET	`/rest/scm-cache/latest/config/upload-pack/enabled`	Retrieve whether clone caching is enabled (true) or disabled (false).
PUT	`/rest/scm-cache/latest/config/upload-pack/enabled/{status}`	Enable (status = true) or disable (status = false) clone caching.
GET	`/rest/scm-cache/latest/config/upload-pack/ttl`	Retrieve the expiry in seconds for the clone caches.
PUT	`/rest/scm-cache/latest/config/upload-pack/ttl/{expiryInSec}`	Set the expiry in seconds for the clone caches.
GET	`/rest/scm-cache/latest/caches`	Retrieve information about the current caches: size, number of cache hits and misses, etc.
DELETE	`/rest/scm-cache/latest/caches`	Clear all caches.
GET	`/rest/scm-cache/latest/caches/{projectKey}/{repoSlug}`	Retrieve information about the caches for the repository identified by projectKey and repoSlug: size, number of cache hits and misses, etc.
DELETE	`/rest/scm-cache/latest/caches/{projectKey}/{repoSlug}`	Clear the caches for the repository identified by projectKey and repoSlug.

Bitbucket Data Center production server data

This page provides some data around the Bitbucket Data Center production instance that we run internally at Atlassian. We're providing this to give some idea of how Bitbucket Data Center performs in a production environment. Please realize that this information is entirely specific to this particular instance – the details of your own installation may result in different performance data.

This data was collected with New Relic in February 2013, when the server was running a pre-release version of Bitbucket 2.2.

On this page:

Hardware

The performance data below was gathered from the Atlassian Bitbucket Data Center production server running on:

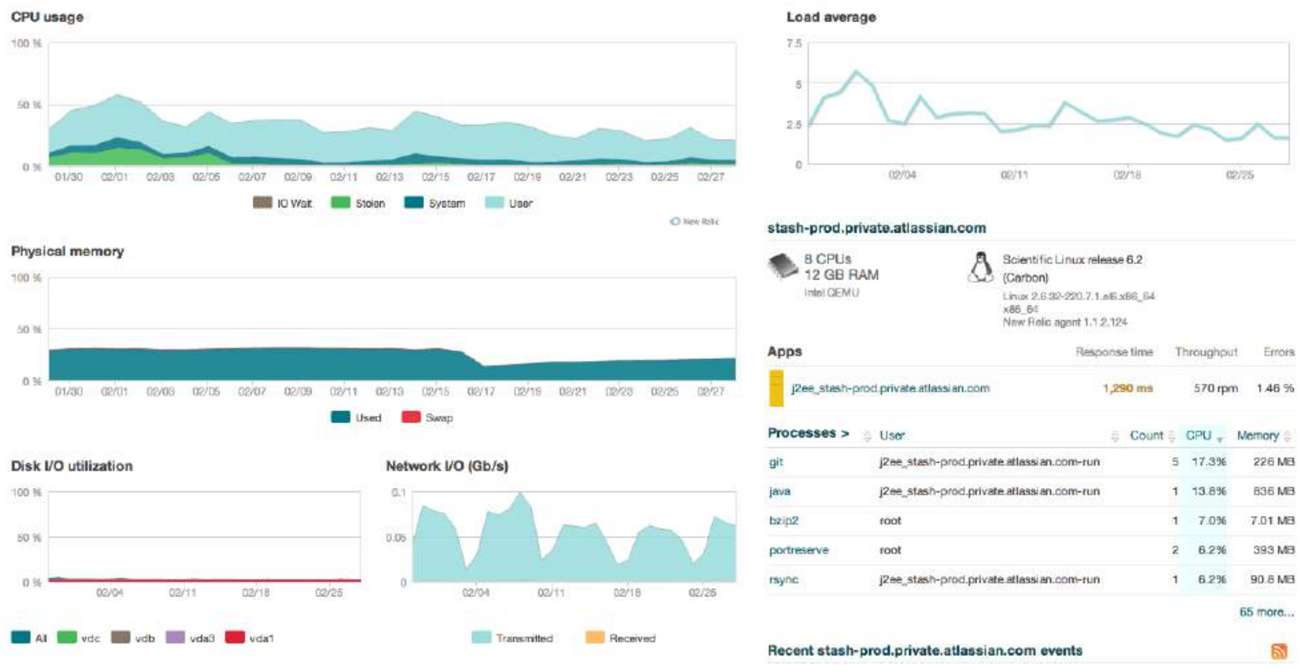
- Virtualized hardware
- 4 Hyper-threaded cores
- 12 GB RAM

Load

Load data summary for February 2013:

Type	Load
CPU usage	less than **30%** on average
Load average	less than **3** on average
Physical Memory	peaked at **31%**
Processes	Git: **17.3% CPU** Java: **18.8% CPU**
Clones	on average less than **300ms**
Git operations/hour	peaking at **11,000** with an average of about **3,500**
Concurrent connections/hour	peaking at **100** connections with an average of about **40** concurrent connections
CI running against Bitbucket instance	**3 build servers** with approximately **300 agents**

Server load



stash-prod.private.atlassian.com

8 CPUs
12 GB RAM
Intel QEMU

Scientific Linux release 6.2
(Carbon)
Linux 2.6.32-220.7.1.el6.x86_64
x86_64
New Relic agent 1.1.2.124

Apps	Response time	Throughput	Errors
j2ee_stash-prod.private.atlassian.com	1,290 ms	570 rpm	1.46 %

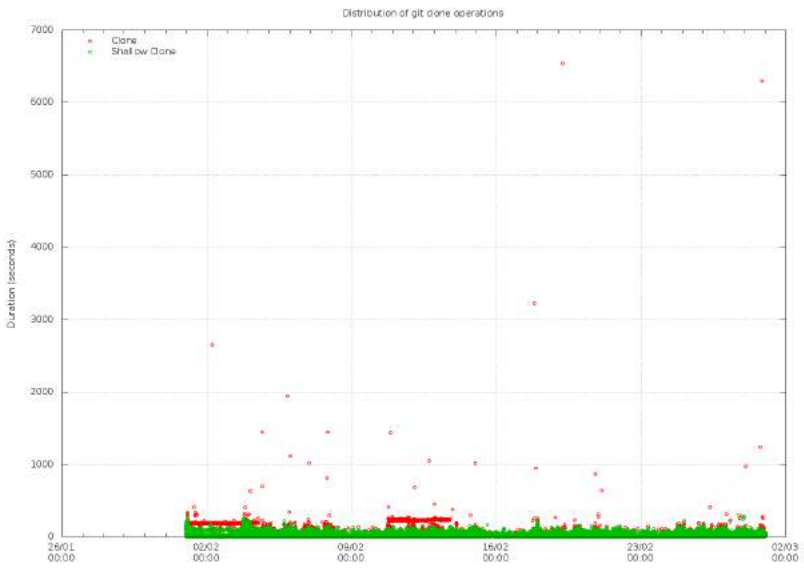
Processes >	User	Count	CPU	Memory
git	j2ee_stash-prod.private.atlassian.com-run	5	17.3%	226 MB
java	j2ee_stash-prod.private.atlassian.com-run	1	13.8%	836 MB
bzip2	root	1	7.0%	7.01 MB
portreserve	root	2	6.2%	393 MB
rsync	j2ee_stash-prod.private.atlassian.com-run	1	6.2%	90.8 MB

65 more...

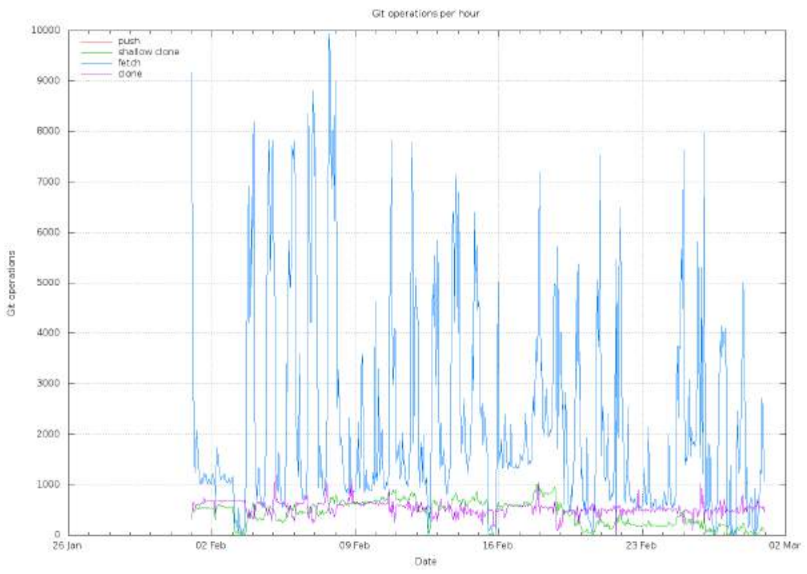
Recent stash-prod.private.atlassian.com events

Git operations

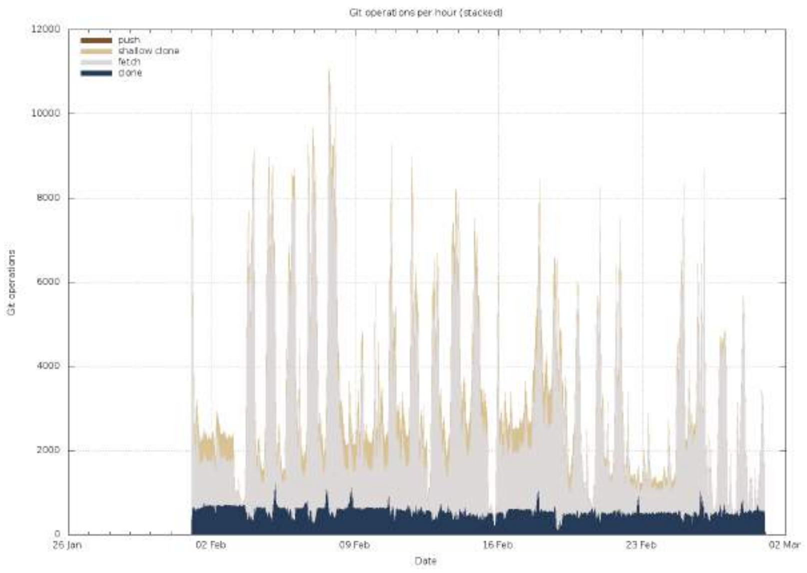
Git clone operations



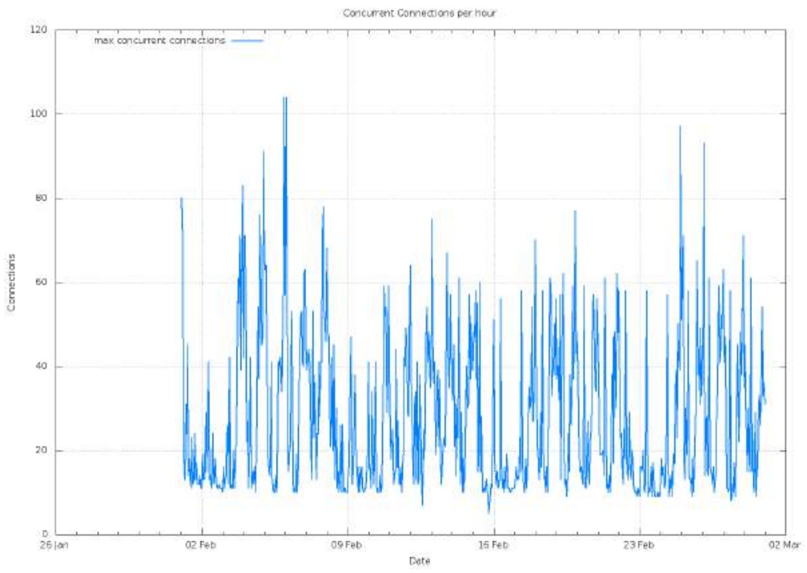
Git operations per hour



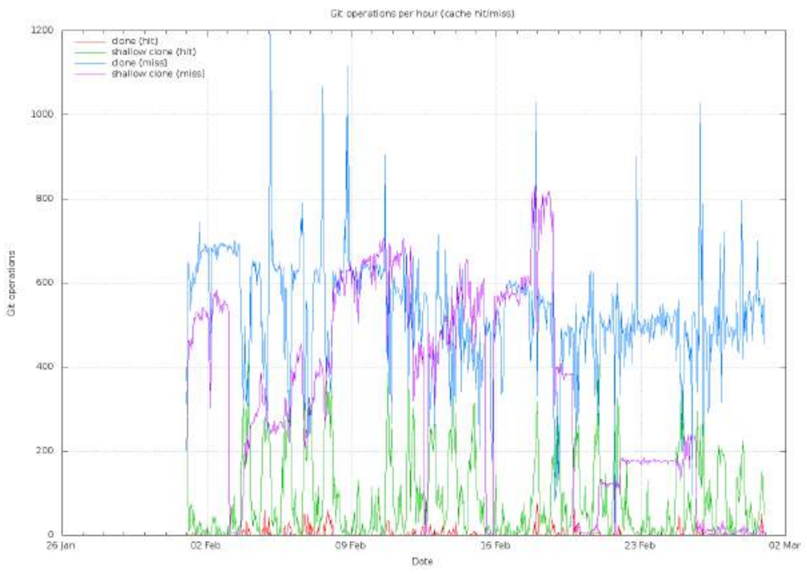
Git operations per hour (stacked)



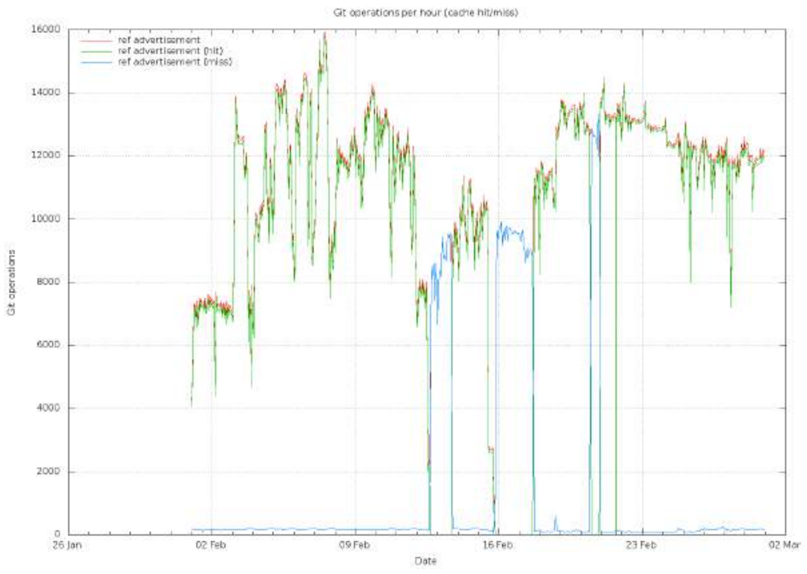
Concurrent connections per hour



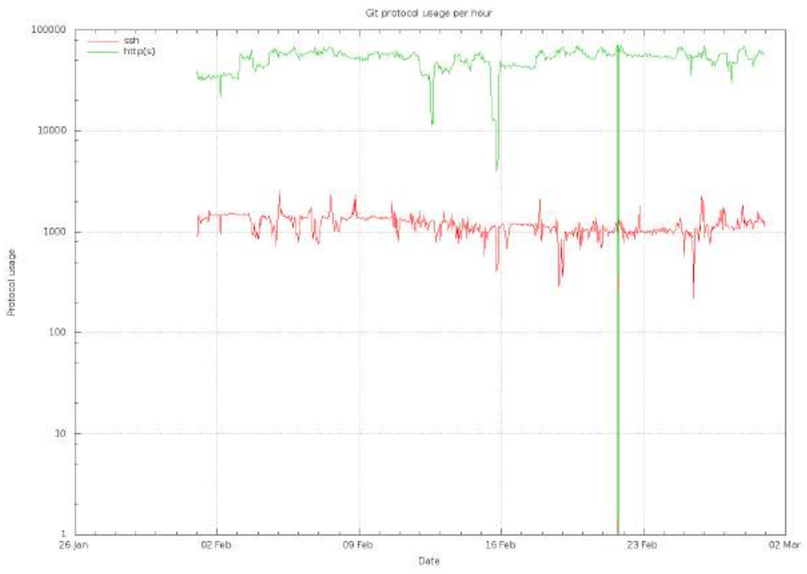
Git operations - cache hit/miss



Git operations - cache hit/miss



Git protocol usage per hour



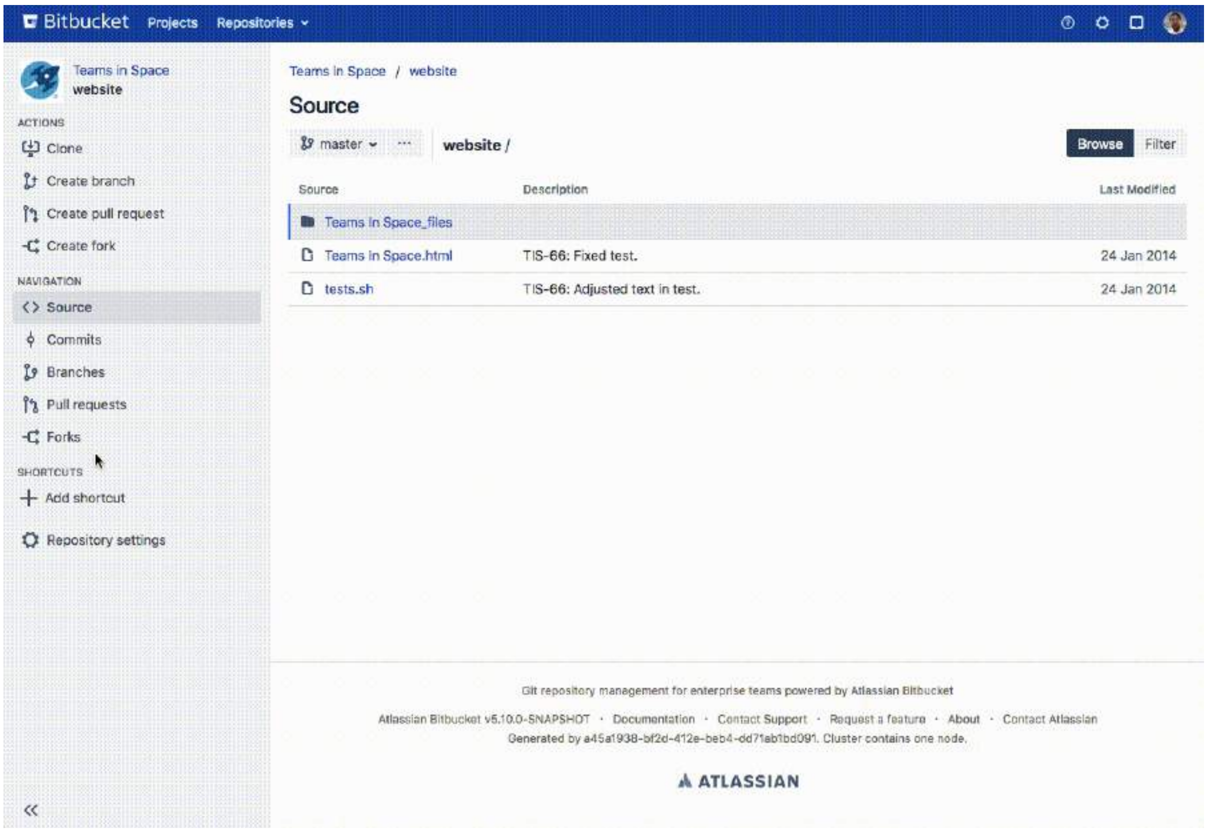
Add a shortcut link to a repository

Repository admins can add, edit, and delete shortcuts from the sidebar of a Bitbucket Data Center repository. A shortcut is a link to a site outside of Bitbucket.

To add a new shortcut link

1. From within a repository, open the sidebar.
2. Select **Add shortcut**.
3. Add the **URL** and **Label**, then select **Add**.

To delete or edit an existing shortcut link, hover over the shortcut and select **Edit** or **Delete**.



Source	Description	Last Modified
Teams in Space_files		
Teams in Space.html	TIS-66: Fixed test.	24 Jan 2014
tests.sh	TIS-66: Adjusted text in test.	24 Jan 2014

Git repository management for enterprise teams powered by Atlassian Bitbucket

Atlassian Bitbucket v5.10.0-SNAPSHOT · Documentation · Contact Support · Request a feature · About · Contact Atlassian
Generated by a45a1938-bf2d-412e-beb4-dd71ab1bd091. Cluster contains one node.

Administer code search

Bitbucket Data Center allows you to search through your code to find exactly what you're looking for right from the search bar. You can restrict your search results to a specific project or repository using search filters. You can also search for code in a particular language (e.g., `lang:java`) or with a particular file extension (e.g., `ext:css`). Learn more about Bitbucket search syntax.

This page explains how Bitbucket Data Center uses a search server, how to configure a search server to fit the needs of your organization, and provides some tips for troubleshooting common problems.

On this page:

Related pages:

- Install and configure a remote Elasticsearch server
- Install and configure a remote OpenSearch server
- Configuration properties - Search

About search servers

Code search is powered by a search server, which indexes the content of Bitbucket repositories in real time. The search server distributions supported by Bitbucket are Elasticsearch and OpenSearch.

Support for Elasticsearch has been deprecated and will be removed in Bitbucket Data Center 9.0. If you're planning to use an external search server, we recommend using OpenSearch.

A clustered Bitbucket Data Center installation requires an external search server.

Important details and requirements about Bitbucket and a search server

This section outlines important considerations for using Bitbucket and a search server.

- A search server is required to run Bitbucket Data Center (although code search can be disabled entirely if needed).
- For information on supported versions of search servers and Bitbucket, please refer to Supported platforms.
- You can configure what is indexed for code search to exclude various types of forked repositories to save disk space.
- Running a clustered Bitbucket Data Center installation requires a remote search server that you should install and configure.
    - To configure an external OpenSearch server, see Install and configure a remote OpenSearch server. Another option is Amazon OpenSearch Service. To check which search server versions are supported now, see the Supported platforms page.
    - If your organization doesn't need high availability or disaster recovery capabilities now, you can install Bitbucket Data Center without setting up a cluster (that is a single-node installation) and use a bundled search server instead.
- A clustered Bitbucket Data Center installation can have *only one* remote connection to the shared search server for your cluster. This may be a standalone search server installation or a clustered installation behind a load balancer.
- Code search is not critical for high availability. However, it is possible run a cluster of search server nodes to achieve high availability, although Atlassian can't guarantee support for such a setup in the event you encounter issues.

Change the username and password for accessing the search server

There are two ways you can change the user credentials Bitbucket uses to access the search server:

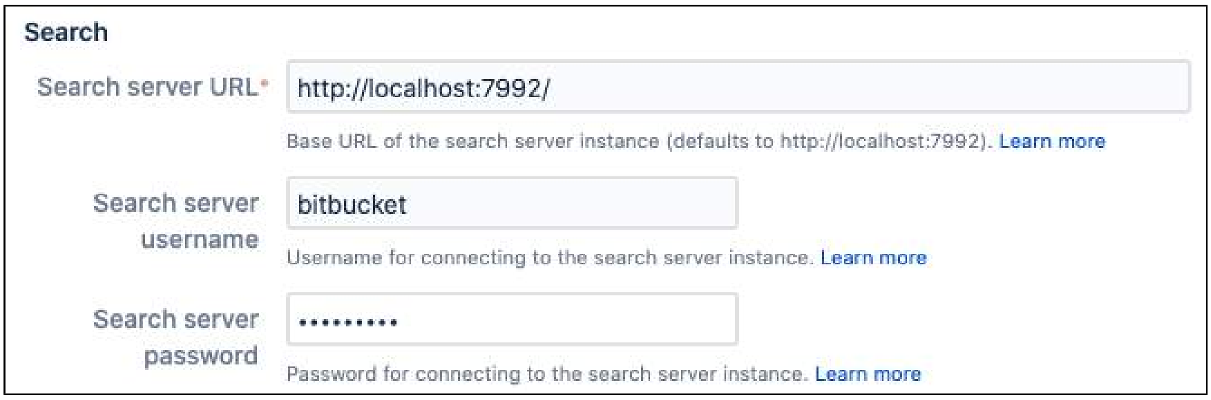
1. Configure the details of your search server within the Bitbucket UI, or

2. Configure the details of your search server within the `bitbucket.properties` file.

If a search server parameter is set from within the `bitbucket.properties` file, *it cannot be edited later from the admin UI* . Any changes that need to be made to the search server configuration, must be made within the `bitbucket.properties` file.

Go to ⚙ > **Server settings** > **Search**.

Here, you can see the current configuration of the search server, including the port and user credentials for accessing the search server.


Search

Search server URL*: http://localhost:7992/
Base URL of the search server instance (defaults to http://localhost:7992). Learn more

Search server username: bitbucket
Username for connecting to the search server instance. Learn more

Search server password: ••••••••••
Password for connecting to the search server instance. Learn more

1. Locate the `bitbucket.properties` file in the `<Bitbucket home directory>/shared` directory.
2. Add the details of your search server.

<Bitbucket home directory>/shared/bitbucket.properties

```
plugin.search.config.baseurl=http://localhost:7992/
plugin.search.config.username=<username>
plugin.search.config.password=<password>
```

* `<username>` and `<password>` are values you provide.

ⓘ If a parameter is set in the `bitbucket.properties` file, *it cannot be edited later from the admin UI* . Any changes that need to be made to the search server configuration must be made within the `bitbucket.properties` file and require a restart of Bitbucket to be applied.

Use a remote search server with Bitbucket

A clustered Bitbucket Data Center installation requires a remote search server, as no search server is bundled or installed for Bitbucket Data Center.

For instructions on setting up a single remote instance of OpenSearch to use with Bitbucket, see Install and configure a remote OpenSearch server .

For instructions on setting up a single remote instance of Elasticsearch to use with Bitbucket, see Install and configure a remote Elasticsearch server.

For guidance on using a clustered search server installation with Bitbucket Data Center, including Amazon OpenSearch Server, see Use a clustered search server with Bitbucket Data Center.

Start Bitbucket with a remote search server

To start Bitbucket when using a remote search server

Bitbucket Data Center clustered	Bitbucket Data Center clustered does not install the bundled search server, so will always start without it.
Bitbucket Data Center single node (not a service)	`start-bitbucket.sh /no-search`
Bitbucket Data Center single node (as a service)	Modify your start service script to pass `--no-search` to `start-bitbucket.sh`.

Troubleshooting and frequently asked questions about the search server

I can't configure search server settings from the UI because the fields are grayed out

Your search server was configured using the `bitbucket.properties` file. If a parameter is set in the `bitbucket.properties` file, *it cannot be edited later from the admin UI*. Any changes that need to be made to the search server configuration must be made within the `bitbucket.properties` file.

My remote search server is using up a lot of disk space

You can configure the search indexes to exclude certain types of forked repositories, which can save disk space when your company uses a fork-based workflow for development. See the page Configuration properties for the options available to change what is indexed for code search. Note that excluding content from being indexed can prevent such content from ever appearing in code search results, but will not prevent the repositories themselves from appearing in search results.

I need to disable code search entirely

If you need to turn off code search for all of your Bitbucket users, you can disable code search entirely from within the `bitbucket.properties` file. See the page Configuration properties for details.

Code search is unavailable

There are a few ways the search server may not have been configured properly. To troubleshoot the bundled search server that comes with Bitbucket Server, the page Troubleshooting steps for Bitbucket Server Code Search is a good place to start. If you're still stuck after looking at the tips on that page, you could post a question in the Atlassian Community (in case your configuration is not typical or unsupported), or contact Atlassian Support for assistance (you'll need to log in to raise a support request).

Is a search server/code search required to run Bitbucket Data Center?

Yes. A search server is required to run Bitbucket Data Center (although code search can be disabled entirely if needed).

Can I use the bundled search server with a clustered Bitbucket Data Center?

No. Clustered Bitbucket Data Center requires a remote search server as each Bitbucket node must connect to the same external search server.

If you're installing Bitbucket Data Center on a single node, you can choose a **single-node** installation type instead. This type comes with a bundled search server and is suitable for a non-clustered Bitbucket Data Center deployment.

Can I use a clustered installation of a search server with Bitbucket Data Center?

Yes, however, Bitbucket Data Center can have *only one* remote connection to the shared search server for your cluster. This may be a search server installation or a clustered installation behind a load balancer. For guidance on using a clustered search server installation with Bitbucket Data Center, see the page Use a clustered search server with Bitbucket Data Center.

How do I secure my remote search server?

Atlassian strongly recommends you secure access to your remote search server with a username and password, and a minimum of basic HTTP authentication. See Secure your search server for details.

Install and configure a remote Elasticsearch server

This page describes how to configure a remote Elasticsearch server to work with *Bitbucket Data Center*.

Bitbucket Data Center requires a remote Elasticsearch server, as no search server is bundled or installed for Bitbucket Data Center. Elasticsearch is a supported search server distribution for Bitbucket Data Center.

Bitbucket Data Center can have *only one* remote connection to Elasticsearch for your cluster. This may be a standalone Elasticsearch installation or a clustered installation behind a load balancer.

For details of about how Bitbucket uses the search server, including troubleshooting tips and frequently asked questions, see Administer code search.

On this page

Related pages

- Administer code search
- Bitbucket Server config properties - Search

Step 1: Install Elasticsearch on a remote machine

We don't provide specific instructions for installing Elasticsearch, but a good place to start is the Elasticsearch guide for installation. Elastic provides installation packages in several different formats here. Note that the authentication plugin – Buckler, described within the Secure Elasticsearch section – only supports specific versions of Elasticsearch. Refer to the Supported platforms - Additional Tools section to see the current Elasticsearch release we support.

Step 2: Configure Elasticsearch

The `elasticsearch.yml` file contains configuration details for your Elasticsearch server.

> The location of your Elasticsearch configuration directory varies depending on how you installed Elasticsearch. For installations from an archive the configuration is `$ES_HOME/config`, while for packaged installations (e.g. from a `deb` or `rpm` package) the the configuration directory is typically `/etc/elasticsearch`.

To configure your remote Elasticsearch server

1. Locate the `elasticsearch.yml` file within the configuration directory of your Elasticsearch server.
2. Add these properties to your `elasticsearch.yml` file:

   elasticsearch.yml

   ```
   action.auto_create_index: ".watches,.triggered_watches,.watcher-history-*"
   xpack.security.enabled: false
   ```

   > Third party plugins, such as Elastic's Shield plugin, may require specific exceptions to be set for `action.auto_create_index`. Consult your provider's documentation for more information.

Step 3: Secure Elasticsearch

You need to secure access to your remote Elasticsearch server with a username and password. We recommend securing your remote Elasticsearch server with a security plugin that requires anyone connecting to it to provide authentication credentials. Atlassian provides a free Elasticsearch plugin called Buckler for this purpose.

Follow the instructions below to secure your remote Elasticsearch server with the Buckler plugin.

Install the Buckler plugin

Select the version of Buckler that matches the version of Elasticsearch you are using. Versions of Elasticsearch not listed in the table below are not supported with Buckler, but may be still be supported for use with Bitbucket Data Center by using a different plugin to provide basic authentication, like Elastic's Shield plugin. For details on supported search server versions, see the Supported platforms page.

The URL for Buckler can be copied to your clipboard easily with right click > **Copy Link Address**.

Elasticsearch version	Buckler plugin
Elasticsearch 7.17.6	Buckler 3.1.0
Elasticsearch 7.16.3	Buckler 3.0.1
Elasticsearch 7.16.2	Buckler 3.0.0
Elasticsearch 7.10.2	Buckler 2.1.5
Elasticsearch 7.17.10	Buckler 3.1.1

Buckler can then be installed into your remote Elasticsearch server using the plugin helper in the Elasticsearch `/bin` directory:

```
./elasticsearch-plugin install -b "<link from table above>"
```

Configure basic authentication for Bitbucket to access your remote Elasticsearch installation. We strongly suggest enabling basic HTTP authentication, at minimum, for a remote Elasticsearch server working with Bitbucket Data Center.

1. Create a directory called buckler within the Elasticsearch configuration directory.
2. Within the `<Elasticsearch config>/buckler` directory, create a file named `buckler.yml`.
3. To configure the Buckler for basic HTTP authentication, the following properties need to be added to `buckler.yml`. This includes selecting a username and password that Bitbucket will use to access Elasticsearch (which is configured in Bitbucket in a later step).

<Elasticsearch config directory>/buckler/buckler.yml

```
auth.basic.http.enabled: true
auth.basic.username: <username>
auth.basic.password: <password>
```

<Elasticsearch config directory>/buckler/buckler.yml

```
auth.basic.http.enabled: true
auth.basic.tcp.enabled: true
auth.basic.username: admin
auth.basic.password: basicpassword
tls.http.enabled: true
tls.tcp.enabled: true
tls.keystore.path: /path/to/keystore
tls.keystore.password: keystorepassword
```

Parameter	Value	Description
`auth.basic.http.enabled:`	`true`	Enables basic authentication for HTTP.
`auth.basic.tcp.enabled:`	`true`	Enables basic authentication for TCP.
`auth.basic.username:`	`<username>`	Username to access Elasticsearch server.
`auth.basic.password:`	`<password>`	Password to access Elasticsearch server.
`tls.http.enabled:`	`true`	Enables TLS for HTTP.
`tls.tcp.enabled:`	`true`	Enables TLS for TCP.
`tls.keystore.path:`	`<path/to/keystore>`	Absolute filesystem path to the keystore.
`tls.keystore.password:`	`<keystorepassword>`	Password for accessing the keystore.

4. To configure Elasticsearch to use Buckler for security, the following properties need to be added to `elasticsearch.yml`:

elasticsearch.yml

```
http.type: buckler
transport.type: buckler
```

5. Start your remote Elasticsearch server.

Step 4: Connect Elasticsearch to Bitbucket

If you're on a version lower than 7.21, refer to the documentation for that version.

Once you've configured your remote Elasticsearch server, you then need to connect it to Bitbucket. You can complete the following steps from your Bitbucket GUI or using the `bitbucket.properties` file.

To configure your remote Elasticsearch server using the `bitbucket.properties` file:

Once a parameter is set in the `bitbucket.properties` file, *it cannot be edited later from the admin UI*. Any changes that need to be made to the Elasticsearch configuration must be made within the `bitbucket.properties` file and require a restart of Bitbucket to be applied.

1. Locate the `bitbucket.properties` file in the `<Bitbucket home directory>/shared` directory.
2. Add the details of your Elasticsearch server (created in step 3.3 above):

<Bitbucket home directory>/shared/bitbucket.properties

```
plugin.search.config.baseurl=<search server URL> #e.g. http://localhost:9200/
plugin.search.config.username=<username>
plugin.search.config.password=<password
```

3. Start (or restart) Bitbucket without starting the bundled search server.

Bitbucket Data Center clustered	Bitbucket Data Center clustered does not install the bundled search server, so will always start without it.
Bitbucket Data Center single node (not a service)	`start-bitbucket.sh --no-search`
Bitbucket Data Center single node (as a service)	Modify your start service script to pass `--no-search` to `start-bitbucket.sh`.

Your remote Elasticsearch server is now configured to work with Bitbucket.

Install and configure a remote OpenSearch server

This page describes how to provision a remote OpenSearch server to work with *Bitbucket Data Center*.

Bitbucket Data Center requires a remote search server, as no search server is bundled or installed for Bitbucket Data Center. OpenSearch is a supported search server distribution for Bitbucket Data Center.

Bitbucket Data Center can have *only one* remote connection to OpenSearch for your cluster. This may be a standalone OpenSearch installation or a clustered installation behind a load balancer.

For details on how Bitbucket uses the search server, including troubleshooting tips and frequently asked questions, see Administer code search.

On this page

Related pages

- Administer code search
- Bitbucket Server config properties - Search

Step 1: Install OpenSearch on a remote machine

We don't provide specific instructions for installing OpenSearch, but a good place to start is the OpenSearch guide for installation.

Step 2: Configure OpenSearch

The `opensearch.yml` file contains configuration details for your OpenSearch server.

The location of your OpenSearch configuration directory varies depending on how you installed OpenSearch. For installations from an archive the configuration is `$OPENSEARCH_HOME/config`.

To configure your remote OpenSearch server

1. Locate the `opensearch.yml` file within the configuration directory of your OpenSearch server.
2. Add these properties to your opensearch.yml file:

opensearch.yml

```
action.auto_create_index: ".watches,.triggered_watches,.watcher-history-*"
network.host: 0.0.0.0
```

Step 3: Secure OpenSearch

Bitbucket communicates to OpenSearch over HTTP using the OpenSearch REST API and can be configured to use basic authentication (a username and password). The OpenSearch provided security plugin can be configured for this purpose.

The minimal distribution of OpenSearch does not contain the OpenSearch security plugin. A custom security solution is required to use the minimal OpenSearch distribution with Bitbucket.

The instructions below describe a simple way to configure the OpenSearch security plugin for the minimum requirements that Bitbucket needs to connect to OpenSearch securely. **This is useful if you are migrating from using Elasticsearch with Buckler and want the search server security configuration to work in a similar way**, or just want a basic configuration to begin with.

The OpenSearch security plugin also supports many additional features and methods of configuration, which are documented in the OpenSearch security plugin documentation.

Follow the instructions below to secure your remote OpenSearch server with the OpenSearch security plugin. This will involve configuring the OpenSearch security plugin to include a single user in its internal users database called `bitbucket` with a selected hashed password which has access to the entire search cluster, and a single authentication domain providing basic authentication against the internal users database.

Transport layer TLS

Transport layer TLS is mandatory to use the OpenSearch security plugin (and optionally TLS can also be applied at the REST layer). See the OpenSearch security plugin Configure TLS certificates documentation on how TLS can be configured. Self-signed certificates can be used (provided the `plugins.security.ssl.transport.enforce_hostname_verification: false` property is set in `opensearch.yml`) and can be generated using a tool like OpenSSL. Place the generated certificates or keystore/truststore files in the `$OPENSEARCH_HOME/config` directory.

Security configuration

Replace the configuration files in `$OPENSEARCH_HOME/plugins/opensearch-security/securityconfig/` with the following:

action_groups.yml

```
_meta:
  type: "actiongroups"
  config_version: 2
```

audit.yml

```
_meta:
  type: "audit"
  config_version: 2

config:
  # enable/disable audit logging
  enabled: false
```

config.yml

```
_meta:
  type: "config"
  config_version: 2

config:
  dynamic:
    authc:
      basic_internal_auth_domain:
        description: "Authenticate via HTTP Basic against internal users database"
        http_enabled: true
        transport_enabled: true
        order: 1
        http_authenticator:
          type: basic
          challenge: true
        authentication_backend:
          type: intern
```

internal_users.yml

```
_meta:
  type: "internalusers"
  config_version: 2

bitbucket:
  hash: "##REPLACE WITH HASHED PASSWORD##"
  backend_roles:
  - "admin"
  description: "Admin user"
```

nodes_dn.yml

```
_meta:
  type: "nodesdn"
  config_version: 2
```

roles.yml

```
_meta:
  type: "roles"
  config_version: 2
```

roles_mapping.yml

```
_meta:
  type: "rolesmapping"
  config_version: 2

all_access:
  reserved: false
  backend_roles:
  - "admin"
  description: "Maps admin to all_access"
```

tenants.yml

```
_meta:
  type: "tenants"
  config_version: 2
```

whitelist.yml

```
_meta:
  type: "whitelist"
  config_version: 2

config:
  enabled: false
```

The important files are `config.yml`, `internal_users.yml`, and `roles_mapping.yml`:

a. `config.yml`: defines a single authenticator, which is using basic authentication on both HTTP and transport, backed by the internal user database

b. `internal_users.yml`: creates a single user with username **bitbucket** (and a provided hashed password, see Generate a password step below), and this user is assigned the admin back-end role

c. `roles_mapping.yml`: assigns the admin backend role (that the bitbucket user has) the all_access role, which is a pre-defined role by the OpenSearch security plugin that gives access to the entire search server

d. The remaining files are empty placeholders that the OpenSearch security plugin requires.

Generate a password

Generate a hashed password for the `bitbucket` user using the OpenSearch provided hashing tool `$OPENSEARCH_HOME/plugins/opensearch-security/tools/hash.sh`. Copy the hashed password into `internal_users.yml`, replacing the password placeholder.

This password is what Bitbucket will use to connect to OpenSearch.

OpenSearch configuration

To configure OpenSearch security the following properties also need to be added to `opensearch.yml`:

opensearch.yml

```
#This property causes the OpenSearch security plugin to configure itself based on
#the security configuration yml files if no security configuration exists in on the
#search server yet (e.g. on first start).
plugins.security.allow_default_init_securityindex: true

#The REST API is locked down by default, even to the 'all_access' roll, so enable
#the 'all_access' role to be able to use it here.
plugins.security.restapi.roles_enabled: ["all_access"]

#Transport layer TLS is mandatory. The certificates need to be manually added to the
#OpenSearch config folder. The example settings below are for X.509 certificates and
#PKCD #8 keys, but a keystore and truststore approach can also be used. Refer to the
#OpenSearch security plugin documentation for more information.
plugins.security.ssl.transport.pemcert_filepath: node.pem
plugins.security.ssl.transport.pemkey_filepath: node-key.pem
plugins.security.ssl.transport.pemtrustedcas_filepath: root-ca.pem

#If the generated certificates are self-signed then hostname verification must be
#disabled.
#plugins.security.ssl.transport.enforce_hostname_verification: false
```

Start your remote OpenSearch server.

When using `plugins.security.allow_default_init_securityindex: true`, changing the configuration files in `$OPENSEARCH_HOME/plugins/opensearch-security/securityconfig/` after the first startup of OpenSearch will not have any effect, as the files are only used automatically for the default initialisation of the security index.

To modify configuration later, you can either use the securityadmin.sh script or the REST API.

Step 4: Connect OpenSearch to Bitbucket

Once you've configured your OpenSearch server, you then need to connect it to Bitbucket.

To configure your remote OpenSearch server using the `bitbucket.properties` file

Once a parameter is set in the `bitbucket.properties` file, *it cannot be edited later from the admin UI*. Any changes that need to be made to the OpenSearch configuration, must be made within the `bitbucket.properties` file and require a restart of Bitbucket to be applied.

1. Locate the `bitbucket.properties` file in the `<Bitbucket home directory>/shared` directory.
2. Add the details of your OpenSearch server:

<Bitbucket home directory>/shared/bitbucket.properties

```
plugin.search.config.baseurl=<search server URL> #e.g. http://localhost:9200/
plugin.search.config.username=<username> #e.g. bitbucket
plugin.search.config.password=<password> #e.g. the password that was hashed
```

3. Start Bitbucket without starting the bundled search server.

Bitbucket Data Center clustered	Bitbucket Data Center clustered does not install the bundled search server, so will always start without it.
Bitbucket Data Center single node (not a service)	`start-bitbucket.sh --no-search`
Bitbucket Data Center single node (as a service)	Modify your start service script to pass --no-search to start-bitbucket.sh.

Your remote OpenSearch server is now configured to work with Bitbucket.

Configure Bitbucket's code search index

This page describes how to configure what is indexed within the Bitbucket Data Center code search index. This could be beneficial for your instance if you need to reduce the amount of disk space used by the search server, which provides the functionality for Bitbucket's code search.

There are various options you can use to optimize disk usage. Which configuration you choose depends on your needs, however organizations with a fork-based workflow are the most likely to see the benefits of changing code search index properties.

To change what is indexed for Bitbucket's code search

1. Locate the `bitbucket.properties` file in the `<Bitbucket home directory>/shared` directory.
2. In the `bitbucket.properties` file, set a value for the property **`plugin.search.codesearch.indexing.exclude`**. These are the options for configuring what code is indexed. You can only set one value at a time.

Value	Description
`all-forks`	Code in forked repositories will not appear in code search results.
`personal-forks`	Code in forked repositories of personal projects will not appear in code search results.
`synced-forks`	Code in forked repositories with syncing enabled will not appear in code search results.
`undiverged-forks`	Same as synced-forks, except if the default branch is ever changed, the entire forked repository will be indexed

3. Restart Bitbucket.
4. If you've changed to a more restrictive setting (eg no exclusions, to `forks` exclusion) then you'll need to kick off a manual reindex. We will not automatically remove your data from the index, and only by running the search sync job will data be removed. The search server should be running when you execute this command. This will iterate through your repositories and remove all those from the search server where they would otherwise not be indexed with your new setting. In our example case this would mean all repositories that were forks would have their repository content removed from the search server instance.

```
curl -XPOST -H 'Content-Type: application/json' -H 'Accept: application/json' -u <adminUsername>
http://<BitbucketURL>/rest/indexing/latest/sync
```

Disable code search

You can also choose to disable code search entirely by changing the value of `plugin.search.codesearch.indexing.enabled=` to `false`. When code search is disabled, no repository content is indexed from the time at which the property is set. This does not disable Bitbucket's search box, or delete any existing indexes. Repository and project metadata will also still be indexed, allowing you to use the dashboard and search box repository quick search.

To remove the data from the index after disabling code search you must run the search sync job. Bitbucket will not remove data from the index until you specify you're ready via the following command.

```
curl -XPOST -H 'Content-Type: application/json' -H 'Accept: application/json' -u <adminUsername>
http://<BitbucketURL>/rest/indexing/latest/sync
```

⚠ You still must have a search server to use Bitbucket Data Center.

Use a clustered search server with Bitbucket Data Center

Bitbucket Data Center requires a connection to a remote search server like OpenSearch or Elasticsearch to enable code search. Although code search is not critical for high availability, it is possible run a cluster of search server nodes to achieve high availability for the Bitbucket's code search index. This page provides guidance on deploying a cluster of search server nodes that run behind a load balancer connected to Bitbucket application nodes.

Bitbucket Data Center can have *only one* remote connection to a shared search server for your cluster. This may be a standalone search server installation or a clustered installation behind a load balancer.

Bitbucket Data Center allows the use of clustered search server installation. However, Atlassian Support does not provide assistance for configuring them. Consequently, Atlassian **cannot guarantee providing any support for them**. If assistance with configuration is required, raise a question in the Atlassian Community.

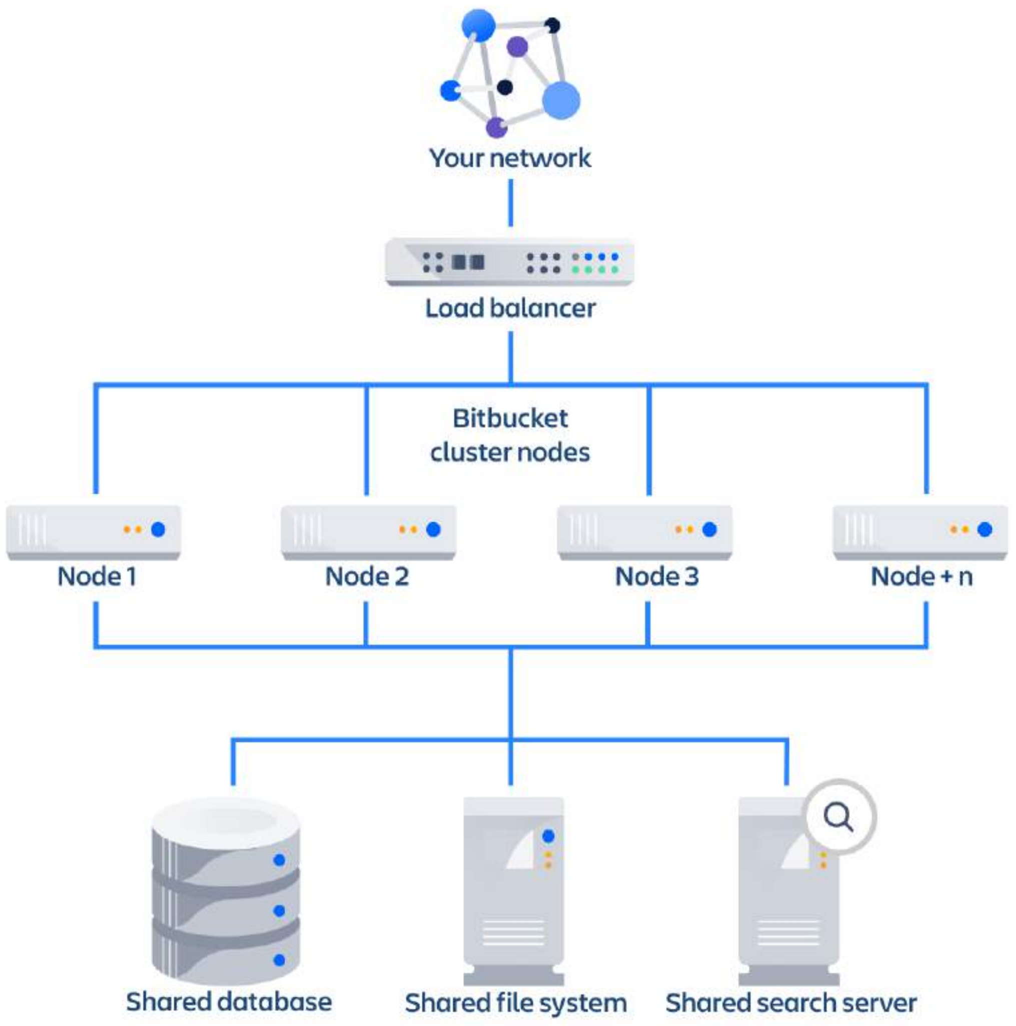
Standard Bitbucket Data Center component diagram

Before thinking about deploying a search server cluster to use with Bitbucket Data Center, it helps to understand what a standard Bitbucket Data Center installation looks like. The page Bitbucket Data Center requirements outlines the detailed requirements.

At minimum, a standard Bitbucket Data Center installation must have these components, each on a dedicated machine, and connected by a high speed LAN.

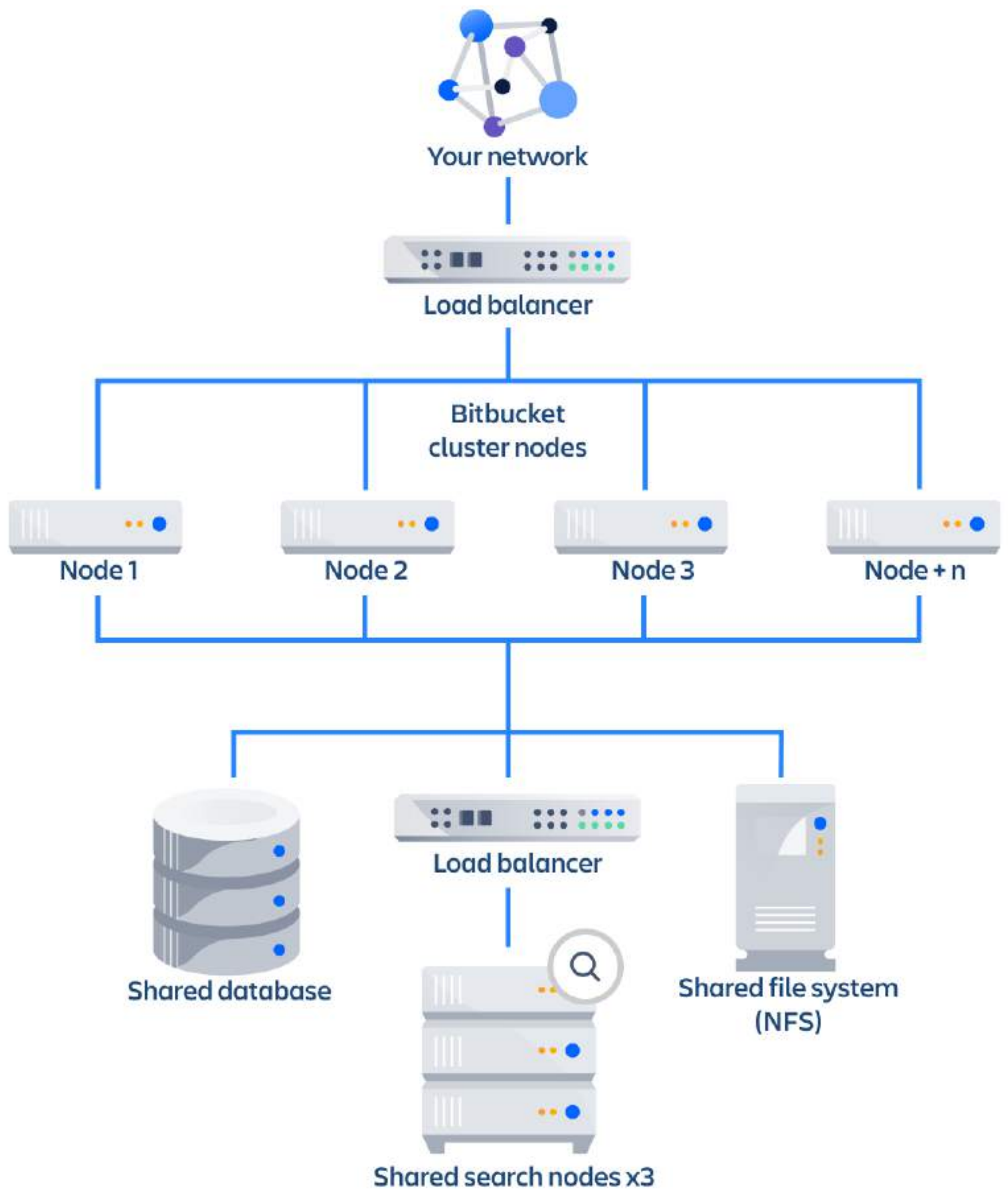
For detailed requirements on each component below, see Bitbucket Data Center requirements:

- **Bitbucket applications nodes**, all running the same version of Bitbucket Data Center.
- **Load balancer** that supports session affinity (or, "sticky sessions").
- **Shared database**, able to take block-level snapshots.
- **Shared filesystem**, accessible via NFS as a single mount point.
- **Shared search server**, with a single connection to the Bitbucket application nodes.



Bitbucket Data Center component diagram with an Elasticsearch cluster

This component diagram provides an example configuration of a Bitbucket Data Center installation deployed with a cluster of Elasticsearch nodes behind a load balancer.



Use Amazon's OpenSearch Service with Bitbucket Data Center

The easiest way to set up and deploy a search service cluster for Bitbucket Data Center is to use the Amazon OpenSearch service. Atlassian cannot provide direct support, but a good place to start is with Amazon's documentation: What is Amazon OpenSearch Service?

Be sure to use a supported version of Amazon OpenSearch Service. For details on supported versions, see the Supported platforms page.

Set up a standalone search server cluster with Bitbucket Data Center

If you're not using Amazon OpenSearch service, and instead are setting up a cluster of search server nodes yourself, you generally want to set up a cluster of at *least* two nodes. Two nodes allows each node to have a replica on it, meaning that if one node goes down for a short period, you'll still have all of your search results available to you while you repair or replace the other node. If you require more fault tolerance, you can increase the number of nodes in your cluster.

- Elastic's official documentation for installing Elasticsearch (make sure to select the version you're installing): Installing Elasticsearch
- Amazon's official documentation for installing OpenSearch (make sure to select the version you're using): Install and configure OpenSearch

Secure your search server cluster

After setting up your search server cluster, it's important you secure your cluster. See Secure your search server for details.

Secure your search server

Atlassian strongly recommends you secure access to your remote search server instance with a username and password, and a minimum of basic HTTP authentication. Bitbucket also supports Amazon’s request signing.

Secure Amazon OpenSearch Service with Amazon's request signing

AWS request signing allows you to use Amazon OpenSearch Service with Bitbucket. This will allow you to secure your Amazon OpenSearch Service cluster to only allow requests from the IAM user that the node Bitbucket is running on inside of AWS EC2 has. To use Amazon OpenSearch Service you must set the AWS region in the `bitbucket.properties` file to enable request signing.

<Bitbucket home directory>/shared/bitbucket.properties

```
plugin.search.config.aws.region=
```

Secure OpenSearch with OpenSearch's security plugin

For instructions on how to configure the OpenSearch security plugin, see the page Install and configure a remote OpenSearch server - Step 3: Secure OpenSearch. The OpenSearch security plugin needs to be installed on every node in the cluster.

Secure Elasticsearch with Atlassian's Buckler plugin

For instructions on how to configure Buckler, see the page Install and configure a remote Elasticsearch server - Step 3: Secure Elasticsearch. Buckler needs to be installed on every node in the cluster.

Secure Elasticsearch with Elastic's Shield plugin

Bitbucket also supports authentication to Elasticsearch through other plugins that provide basic authentication, like Elastic's Shield plugin. This plugin isn't directly supported by Atlassian, but Bitbucket can still connect to Elasticsearch secured by the Shield plugin if basic authentication is configured.

Secure Elasticsearch with Elastic's IP filtering

You can also secure the connection between Elasticsearch and Bitbucket by configuring IP filtering.

Adding additional storage for your repository data

As your repository data grows it may become too large to hold in a single storage location. When this happens, you'll need to add additional storage space . There are two ways to do this:

1. Increase the storage space allocated to your shared home directory
2. Add additional data stores

Increasing the storage space allocated to your shared home directory is the most straightforward option, and we recommend it for most customers. If this is not an option for you (for example, because of a company policy limiting the size of disks or partitions), you should add a data store.

Before adding a data store, read through the considerations below.

On this page:

Data store considerations

The ability to add data stores is aimed at organizations with limitations on disk partition size. It's not intended as a way to increase disk performance. In addition:

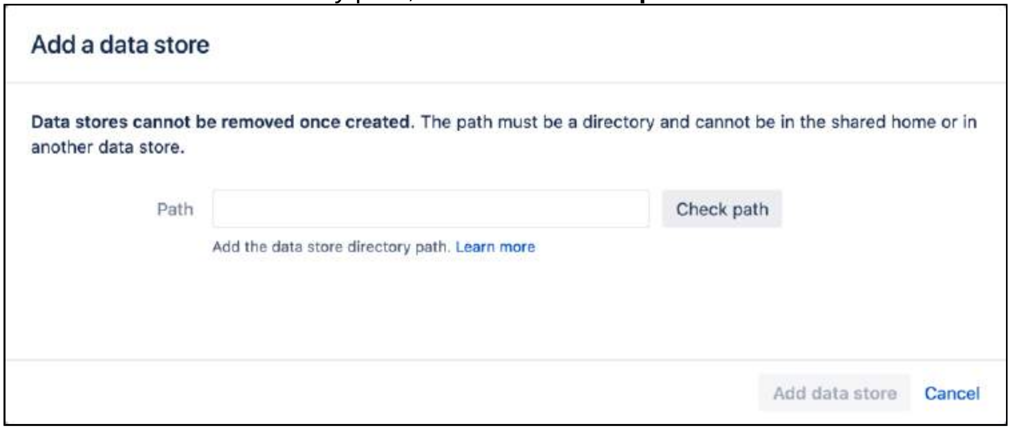
- Data stores **cannot** be moved or removed, once added.
- Any nodes that don't have access to the data store won't join the cluster until it's mounted and the node is restarted.
- Repository data cannot be moved between data stores. Once a repository has been created in the shared home directory or on a data store, all of its data will stay there, including the data in its forks, any pull request attachments, and Git LFS data.

Adding a data store using Storage Management

You don't need to stop Bitbucket to add a data store.

To add a new data store:

1. Create a new shared filesystem.
2. Mount the shared filesystem on all nodes making sure that:
   - the filesystem is writeable by the user running the Bitbucket process.
   - the data store is not a subdirectory or parent directory of the shared home or another data store.
   - the data store is mounted on all nodes in the same location using NFS.
3. Go to ⚙ > **Storage > Add a data store.**
4. Enter the data store directory path, and select **Check path**.



Add a data store

Data stores cannot be removed once created. The path must be a directory and cannot be in the shared home or in another data store.

5. Select **Add data store.**

- If you get an error use the IP address included below the message to find the affected node and fix the problem.

Shared home use after adding a data store

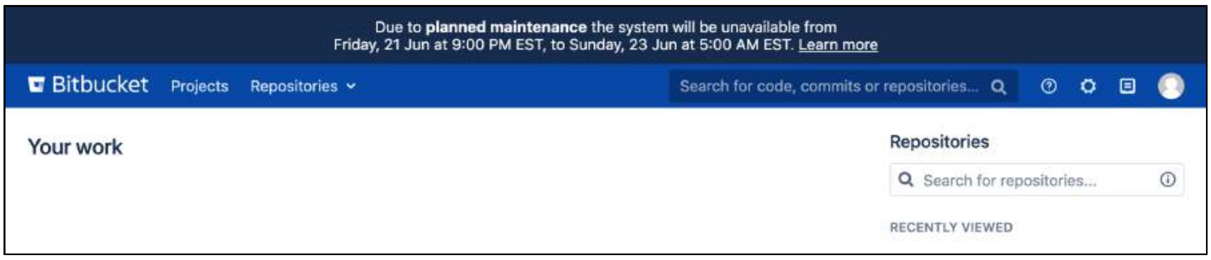
After one or more data stores have been added to Bitbucket, the system will not use the shared home directory to store new repositories, except in a few situations.

For example, new forks of repositories stored in the shared home directory will still be created in this directory. This is because Bitbucket stores forks in the same location as their origin repository to save disk space. New attachments and new LFS objects for repository hierarchies stored on the shared home will also continue to be added to the shared home. Lastly, the shared home will continue to hold data that is not related to a single repository, such as user avatars.

Add a system-wide announcement banner

An announcement banner is a great way to communicate important information like scheduled downtime or upcoming maintenance periods. When turned on, it appears in Bitbucket Data Center at the top of every page until you turn it off, helping to make sure you get your message out.

On this page:



Due to **planned maintenance** the system will be unavailable from
Friday, 21 Jun at 9:00 PM EST, to Sunday, 23 Jun at 5:00 AM EST. Learn more

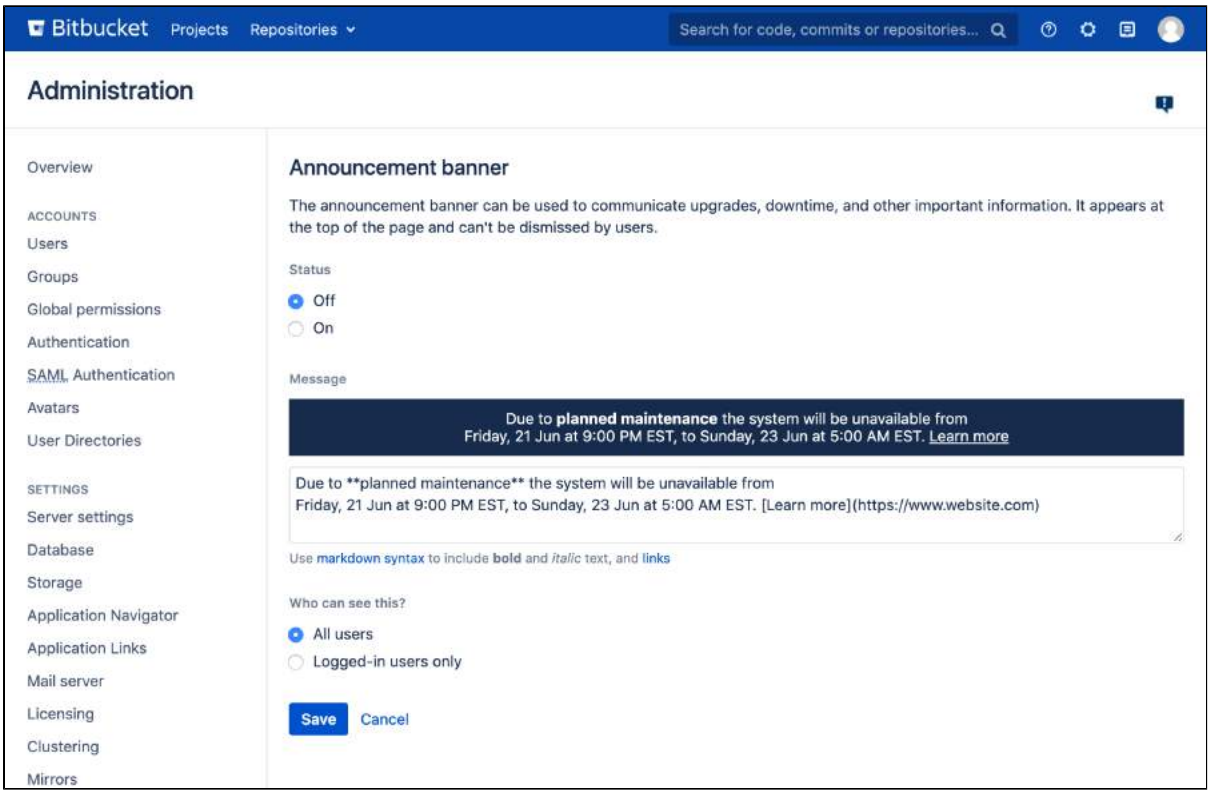
Bitbucket
Projects
Repositories
Search for code, commits or repositories...
Your work
Repositories
Search for repositories...
RECENTLY VIEWED

When setting up your banner, you can:

- use markdown syntax to add **bold** and *italic* text, and to add a link to where users can find more information
- control whether all users or only logged-in users can see it

Turning on the announcement banner

You can set up and turn on the announcement banner through the Bitbucket settings page.



Announcement banner

The announcement banner can be used to communicate upgrades, downtime, and other important information. It appears at the top of the page and can't be dismissed by users.

Status

[✓ Off]
On

Message

Due to **planned maintenance** the system will be unavailable from
Friday, 21 Jun at 9:00 PM EST, to Sunday, 23 Jun at 5:00 AM EST. Learn more

```
Due to **planned maintenance** the system will be unavailable from
Friday, 21 Jun at 9:00 PM EST, to Sunday, 23 Jun at 5:00 AM EST. [Learn more](https://www.website.com)
```

Use markdown syntax to include **bold** and *italic* text, and links

Who can see this?

[✓ All users]
Logged-in users only

Save Cancel

To turn on the announcement banner:

1. Go to ⚙ > **Announcement Banner**
2. Change the status to **On**
3. Write your message
4. Select who should see it
5. Select **Save**

Your announcement banner will appear immediately.

When writing your message, use the banner preview to make sure it fits inside the banner. If it doesn’t, you won’t be able to save it.

Turning off the announcement banner

Once you turn on your announcement banner it will be shown to users until you turn it off.

To turn off the announcement banner:

1. Go to ⚙ > **Announcement Banner**
2. Change the status to **Off**
3. Select **Save**

Configuring Project links across Applications

After connecting your Atlassian applications using Application Links, you can also connect the areas of those applications that contain information relating to your project or team using Project Links.

Below are some selection priority advantages you'll get from Project Links that connect Jira and Bitbucket Data Center:

- When you create a feature branch from Jira, repositories from a linked Jira project will be prioritized in the list of repositories.
- When you create a Jira issue from a comment in Bitbucket, the linked Jira project is pre-selected from the list of projects.
- When you check the details of a Jira issue in Bitbucket, issues from linked Jira projects are shown higher in the issue view dialog. This is helpful when there are multiple issues with the same issue-key from different Jira instances.
- When you check development details in Jira, commits and branches are shown higher in the development details dialog.

On this page:

Related pages:

- Creating projects

Creating an Application Link

You won't be able to create a Project Link until you link Bitbucket to another application using Application Links.

1. Go to ⚙ > **Application links**.
2. Enter the URL of the application you want to link to and then click **Create link**.
3. Finish configuring the link.

For more information on creating and using Application Links, see Link Atlassian applications to work together.

Creating a Project Link

There are two types of Project Links:

- 2-way Project Links are are reciprocal links that provide authorized access for Project Links to be created or deleted from both linked applications.
- 1-way Project Links do not share authorized access to delete or create Project Links between linked applications.

To link a Bitbucket project to a project or space in another application when there are Application Links (requires project admin permissions):

1. Go to **Project settings** > **Project links**.
2. Click **Create Project Link**.
3. The instructions for creating a Project Link will vary depending on whether Bitbucket has authorization:

- If Bitbucket has authorization to create the Project Link:
    1. Choose the application that contains the project you want to link to.
    2. Choose a project to link to. If there are no projects listed, then all possible projects have already been linked.

3. Select the **Make this a 2-way Project Link** checkbox if you want to create a reciprocal link from the target application to Bitbucket.

4. Click **Create link**.

- If Bitbucket doesn't have authorization to create the Project Link:
    1. Choose the application that contains the project you want to link to.
    2. Choose one of the following options:
        - **Don’t authorize Bitbucket Server** - Click this option if you only need to create links to public projects.
        - **Authorize Bitbucket Server** - Click this option if you want to allow Bitbucket to create links to all projects on this application.

Making a Project Link the Primary link

Making a project link the primary link gives it priority over other links. If you’ve set up Project Links to more than one project in the same application, for example you have linked your Bitbucket project to two Jira projects, then one of the Project Links will be marked as *Primary*.

To make a Project Link the Primary link (requires project admin permissions):

1. Go to **Project settings** > **Project links**.
2. Next to the Project Link that you want to make *Primary*, select ••• > **Make primary link**.

Deleting a Project Link

Deleting a project link stops the two projects from sharing information.

To delete a project link (requires project admin permissions):

1. Go to **Project settings** > **Project links**.
2. Next to the Project Link that you want to delete, select ••• > **Delete**. If authorization is required, choose one of the following:
    - **Authorize** - Granting Bitbucket authorization to access to the linked application allows you to delete the 2-way Project Links between those applications.
    - **Delete** - Deleting without granting Bitbucket authorization to access to the linked application will restrict you to being able to delete only the 1-way link from Bitbucket to the linked applications. Links back to Bitbucket will need to be deleted in the linked applications Administration settings.
3. (Optional) Select the option to delete the reciprocal link from the linked application to Bitbucket.
4. Click **Delete** to delete the project link.

Improving instance stability with rate limiting

A Data Center license is required to use this feature. Learn more

When automated integrations or scripts send requests to Bitbucket in huge bursts, it can affect its stability, leading to drops in performance or even downtime. Rate limiting allows your instance to self-protect. It keeps it stable by giving you control over how many requests automations can make, and how often they can make them.

On this page:

Related pages:

- Enabling JMX counters for performance monitoring

How rate limiting works

Rate limiting targets HTTP requests with basic or bearer authentication (such as REST API requests). It operates using the token bucket algorithm. When it's turned on:

- Each user is given a 'token bucket' containing the maximum number of tokens they can hold (this is their token bucket size).
- Every time they make an HTTP request one token is taken out of their bucket.
- New tokens are added into their bucket at a constant rate until it is full (this is their token bucket refill rate)
- If their bucket is empty, they cannot make requests.

When rate limiting is on and set up correctly for your instance, your users should experience improved stability and performance, and those using it reasonably won't experience any change in their ability to send it requests. The only time users will be rate limited is when they act in a way that will negatively impact Bitbucket, such as when they make requests in large bursts or when they make requests too frequently.

Note that rate limiting is applicable to HTTP requests with basic or bearer authentication (such as REST API requests and Git over HTTP). Rate limit for Git SSH operations is a separate feature. You can track it from **BSERV-12496** - Rate limit for git operations GATHERING INTEREST

Example

An admin has turned on rate limiting and has set a token bucket size of 60 and a refill rate of 5.

One of their developers sends Bitbucket 60 requests in a single burst. As this developer starts with a full token bucket, all 60 requests will be successful. Their token bucket, however, will now be empty and it will begin refilling at a speed of 5 tokens per second. As it refills, they can send more requests and they won't be rate limited as long as they have enough tokens in their bucket.

Another developer sends Bitbucket 100 requests in a single burst. As their bucket can only hold 60 tokens, only their first 60 requests will be successful and then they'll be rate limited. Their token bucket will now be empty and it will begin refilling at 5 tokens per second. If they try to send the remaining 40 requests and they don't have enough tokens in their bucket they'll be rate limited again. To send all their requests successfully they'll have to rewrite their script.

How to turn on rate limiting

You need to be a System Admin or Admin to turn on rate limiting. The first time you do this you'll see default values for:

1. Token bucket size - This is the number of tokens that are available to a user. It determines the maximum number of requests they can send in a burst. By default, this is set to 60
2. Token bucket refill rate - This is the number of tokens added to a user's bucket per second. It determines their throughput. By default, this is set to 5

These values should be suitable for most instances and we recommend starting with them before adjusting up or down.

To turn on rate limiting:

1. Go to ⚙ > **Rate limiting**.
2. Change the status to **On**.
3. If necessary, change the **token bucket size** and **token bucket fill rate**.
4. Click **Save**.

Rate limiting can be disabled instance-wide

If required, System Admins can disable rate limiting instance-wide through the Bitbucket properties file. To find out how to do this, look for `feature.rate.limiting` in the config properties documentation.

How rate limiting works in a cluster

If your instance consists of a cluster of nodes behind a load balancer, each of your users will have a separate token bucket on each node. In other words, if you have three nodes, your users will have three token buckets.

In addition, the global settings for *token bucket size* and *refill rate* apply separately to each of these buckets. In other words, If you've set them to 60 and 5, they'll be 60 and 5 on each bucket, unless the user has an exemption.

This means that each user's ability to send requests won't change, and Bitbucket will remain protected and stable regardless of which node their requests are routed to.

Identifying users who have been rate limited

When a user is rate limited, they'll know immediately as they'll receive an HTTP 429 error message (too many requests).

There are also two ways you can identify which users have been rate limited:

1. You can look at the *Users rate limited in the past 24 hours table* on the rate limiting settings page.
2. For more detailed information you can look in the Bitbucket access log. Every time a user is rate limited an event with the label `rate-limited` will be recorded.

Lastly, you can use JMX metrics for an aggregated view of how many users have been rate limited. To allow you to do this, metrics for the number of rate limited requests and current user map size have been exposed.

Adding and editing rate limiting exemptions

To allow users to send Bitbucket a different number of requests than the global settings allow, you can add an exemption. There are two types of exemptions:

- Allow custom settings - Use this to give a user a different token bucket size and refill rate.
- Allow unlimited requests - Use this to remove users from rate limiting altogether.

To add an exemption:

1. Open the **Exemptions** tab.
2. Click **Add exemption**.
3. Find the user and choose their new settings.

4. Click **Save**.

It will be applied to the user, and will show up in the list of exemptions.

To edit or remove an exemption:

1. Open the **Exemptions** tab.
2. Find the user in the list of exemptions
3. Click the **…**
4. Choose what you’d like to do.

You can also add, edit, and remove exemptions using our REST API.

How to help users avoid being rate limited

If rate limiting is set up correctly, users who send Bitbucket requests in a reasonable way won’t experience any change besides improved system stability and performance. As for those users who are being rate limited, there are simple changes they can make to stop this from happening, and at the same time help out their team. They can:

- Avoid tight loops by writing scripts that wait for each REST request to finish before a new one is fired. For example, if these REST requests are being used to populate a wallboard, they can consider sending them one at a time, and only sending a new request after the previous one has finished.
- Avoid spawning multiple threads all making requests.

Use a CDN with Atlassian Data Center applications

On this page:

If your users are distributed across the world and experience poor performance when using Data Center products, you may be able to improve their experience by using a Content Delivery Network (CDN). Common CDNs include AWS CloudFront, Cloudflare, Akamai, and others.

CDN support is available in **Data Center** editions of:

- Jira Software 8.3
- Jira Service Management (formerly Jira Service Desk) 4.3
- Confluence 7.0
- Bitbucket 6.8.

Get started with CDN

Here's a quick summary of what's involved to enable your CDN in Bitbucket Data Center:

1. Use our template to spin up an AWS CloudFront distribution, or create an account with the CDN vendor of your choice.
2. Update your load balancer and firewall to allow the CDN to reach your site.
3. In Bitbucket Data Center, provide the CDN URL, and enable CDN support.

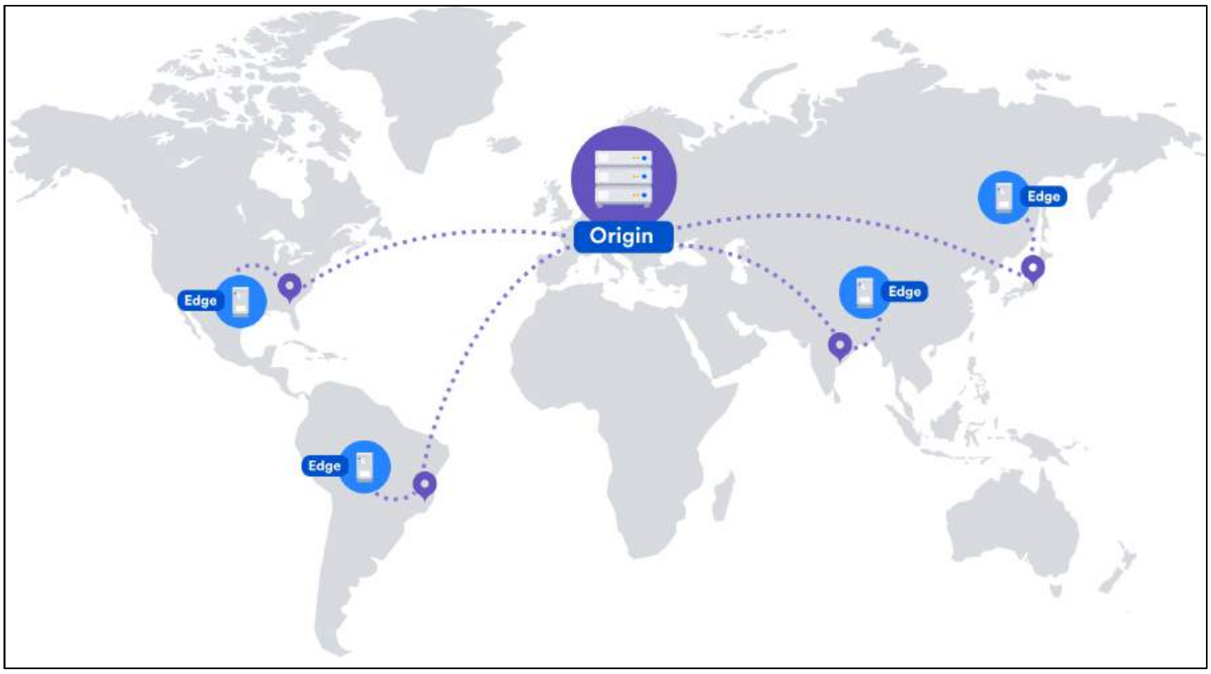
As end users access your site, static assets will be cached on the edge server closest to them, and served from there until they expire. This means it might take some time before you can start measuring the impact of the CDN, depending on when your users are online and accessing the site in each location. We don't provide the ability to preload the cache, so assets will be cached as they are served for the first time.

See Configure your CDN for Bitbucket Data Center for the full step-by-step guide.

As always, we recommend testing this on your staging environment, before making any changes to your production site.

How it works

Static assets (such as JavaScript, , and fonts) are cached on edge servers provided by a vendor that are geographically closer to the user. This means when someone views a page, some of the assets needed to display the page are delivered by a server in their region, rather than from your server, known as the origin server. This can speed up page load times.



For example, if your server (known as the origin) is in Germany, a can improve page load time by as much as 50% for users located in Rio de Janeiro, as static assets can be served from an edge server in Brazil. If you're new to CDNs and would like to learn more about how they work, CloudFlare provides a great introduction, see https://www.cloudflare.com/learning/cdn/performance/.

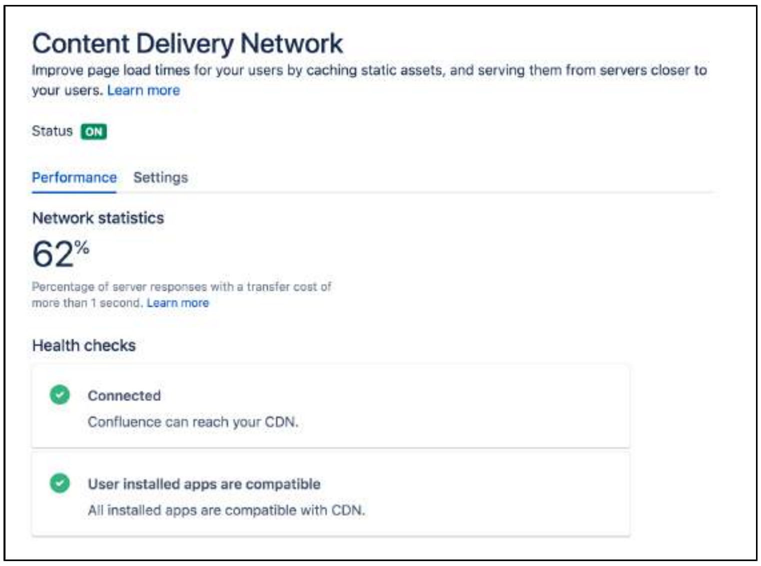
It's important to note that using a will not make your application inherently faster, what it will do is reduce the load on your cluster, and reduce the latency experienced by some users, which should result in faster page load times for users.

Tests on our internal dogfooding instances located in Gdask, Poland have shown the response time for the View Issue action in Jira Data Center is ~50% faster for people accessing from US East, when is enabled.

How to determine whether a CDN will help your users

A good starting point when assessing whether a CDN will help your users, is to take a look at the network overhead experienced in your site.

Go to **Content Delivery Network** in the admin console of your Data Center application. On the **Performance** tab you'll see the percentage of requests that had a transfer cost of more than one second. Put simply, the higher the percentage, the more likely it is that your users requests are being affected by network conditions, such as latency and connection quality.


Content Delivery Network

Improve page load times for your users by caching static assets, and serving them from servers closer to your users. Learn more

Status ON

Network statistics

62%

Percentage of server responses with a transfer cost of more than 1 second. Learn more

Health checks

Connected

Confluence can reach your CDN.

User installed apps are compatible

All installed apps are compatible with CDN.

This network statistic is a useful indicator of the network conditions your users experience when using the product. If the percentage is high, it's likely that using a will benefit your users in these conditions.

As users access pages in your site (for example a Confluence page, Jira issue, or Bitbucket pull request page), we measure the amount of time the browser has to wait to get the content of that page. We then subtract the time required to render the page on the server. This leaves us with the time it took to send the request and retrieve the response.

This time is dependent mostly on the latency between the server and the browser, but also includes things like SSL connection setup time.

This metric is collected on requests that don't use , so it will continue to provide consistent statistics on your network, even after you enable .

You should also consider where your users are geographically located. For example, if your servers are located in Frankfurt, and the majority of your teams are located in Germany and Austria, your team based in Malaysia may be suffering from high latency, resulting in slow page load times.

Network diagnostic tools such as `traceroute`, `ping`, and `mtr` can be helpful to determine the amount of latency being experienced.

In these examples we'll use traceroute to display some basic network statistics, including latency information. Remember to replace yoursite.com with your base URL.

In Windows, open Command Prompt and enter the following:

```
> tracert yoursite.com
```

In Linux or Mac OS, open Terminal and enter the following:

```
$ traceroute yoursite.com
```

This will display the number of hops, and three latency times, in milliseconds, for each server. Average the three figures to get the latency for that server.

The `mtr` command (my traceroute) is a useful combination of `ping` and `traceroute`. You will need to install `mtr` to be able to use it in MacOS or Windows.

What is cached?

We only cache static assets served by a Data Center application or Marketplace app. These are things that are only going to change when you upgrade your Data Center application or app. Dynamic content is not cached.

Here's a summary of what will be cached when you enable :

Cached	Not cached
• JavaScript • Fonts	• attached files • pages or issues • personal information, including avatars • assets that are part of a theme

You shouldn't need to ever manually invalidate the cache, as we handle this when you upgrade your Data Center product, or an app.

⚠ If you're performing ZDU (Zero Downtime Upgrade), we highly recommend that you disable CDN before the upgrade and enable it after the cluster is in a stable state. Otherwise, you might experience some issues related to the CDN performance.

Planning your implementation

Infrastructure requirements

You can use any origin pull. You're responsible for any costs associated with your CDN.

We've prepared a CloudFormation template that you can use to configure Amazon CloudFront with minimal effort. You can find all our deployment resources in this repository https://bitbucket.org/atlassian/atlassian-aws-deployment/src/master/templates/cdn/.

There are some other infrastructure requirements that you need to be aware of before you start:

- **HTTP/2 is highly recommended**
  Your load balancer, firewall, or proxy should allow HTTP/2 traffic. Using HTTP/2 will provide the best performance for your end users. Check the documentation for your particular provider to find out how to do this.
- **Firewall considerations**
  Your must be able to access and cache static assets. If your instance is not publicly accessible will you need to make some changes to your firewall to allow requests from the to pass through. We recommend using application firewalls instead of standard IP range filtering, as IP ranges can change without notice.

Considerations for private instances

If your site is publicly accessible on the internet, you should be able to enable without any problems.

If your site is not publicly accessible you can:

- configure your firewall to allow requests from your to pass through. More information on how to do this is provided in our step-by-step guides below.
- set up your own caching servers closer to your users which will not require opening any traffic to the internet, instead of using a vendor. See How to configure Apache for caching and HTTP/2 to learn more about this workaround.

Marketplace apps and third party customizations

Some marketplace apps or customizations may not be compatible with the feature. A health check, on the Content Delivery Network admin screen will let you know if any of your apps are not compatible.

See User-installed apps health check fails in Data Center when configuring CDN to find out what to do if any of your apps are incompatible.

Configure your CDN for Bitbucket Data Center

On this page:

If your users are distributed across the world and experience high latency when using Bitbucket Data Center, you may be able to improve their experience by using a Content Delivery Network (CDN). Common CDNs include AWS CloudFront, Cloudflare, Azure CDN, Akamai, and others.

Head to Use a CDN with Atlassian Data Center applications to learn about our CDN capabilities, and how to assess whether it will improve your users' experience.

Once you're ready to start using a CDN, there are three main steps:

1. Configure an internet-facing load balancer (optional)
2. Configure your CDN.
3. Enable the CDN feature in Bitbucket Data Center.

Configure an internet facing load balancer (optional)

If your site is not publicly accessible, you'll need to make sure that your CDN can reach it, but only to access and cache static assets. The way you do this depends on your particular load balancer and web application firewall. Refer to the documentation for your load balancer and firewall for detailed guidance.

Add an internet-facing load balancer

Add an internet-facing load balancer to your setup. This is in addition to your primary load balancer. Your CDN is the only entity that will interact with this load balancer. We recommend you:

- Enable HTTPS - the traffic from this load balancer will be sent over the public internet and should be encrypted.
- Enable HTTP/1.1 - currently, the caching proxies and CDNs do not handle HTTP/2 well (or at all) on the way to the origin.
- For AWS deployments, you would set up an internet-facing application load balancer.

Update your firewall rules for the internet-facing load balancer

Unlike your primary load balancer, this internet-facing load balancer must be locked down to ensure that your CDN can only pull data it is allowed to cache. When configuring your firewall rules we recommend:

1. The configuration should only allow requests for paths that start with "/s/". If your application is deployed with a context path (for example yoursite.com/wiki or yoursite.com/jira) you will need to include it in the path. All other requests must be blocked.
2. You can also choose to limit the allowed HTTP methods to GET, HEAD, OPTIONS.

For AWS deployments, you will configure a Web Access Control List (WebACL) in the Web Application Firewall attached to your application load balancer. The condition to use is a "string match condition" applied to "URI".

To check that your setup is secure, perform the following manual tests:

1. A GET on `https://internet-facing-proxy/` should return "403 FORBIDDEN".
2. A GET on `https://internet-facing-proxy/s` should return "403 FORBIDDEN".

3. A GET on `https://internet-facing-proxy/s/` should return "404 NOT FOUND".
4. A GET on `https://internet-facing-proxy/s/.` should return "403 FORBIDDEN".
5. A GET on `https://internet-facing-proxy/s/../s/` should return "404 NOT FOUND".

Configure your CDN to cache assets

You'll need an account with a CDN provider. You're responsible for all costs associated with your CDN. We only support serving static assets from a CDN at this time. This means page content, attached files, and personally identifiable information, including things like user avatars, won't be cached by your CDN.

We've prepared a CloudFormation template that you can use to configure Amazon CloudFront with minimal effort. You can find all our AWS deployment resources in this repository https://bitbucket.org/atlassian/atlassian-aws-deployment/src/master/templates/cdn/.

If you choose not to use our template, define the following in your CDN configuration. This example is based on AWS CloudFront.

Origin domain name	This is your Atlassian application base URL, including the context path if you've configured one. For example: `mycompany.com/confluence`
Origin path	Leave blank. There is no need to specify a path.
Allowed HTTP methods	Optionally limit to: GET, HEAD, OPTIONS
Viewer protocol policy	redirect HTTP to HTTPS
Object caching	Use origin cache headers
Forward cookies	None This is important to make sure static assets are cached without the user context.
Query String Forwarding and Caching	Forward all, cache based on all
HTTP protocols	Must include HTTP/2
Error pages/Error Caching Minimum TTL (seconds)	The default error page caching time for CloudFront is 5 minutes. Consider lowering it to a value in the range of 10-30 seconds to decrease the time required to recover from an outage.
Compress Objects Automatically	Yes

Using the default should be fine for most of the other settings.

You will need to adapt this information for your particular CDN provider. You should refer to the documentation for your CDN for details, as we've found that terminology differs between CDNs.

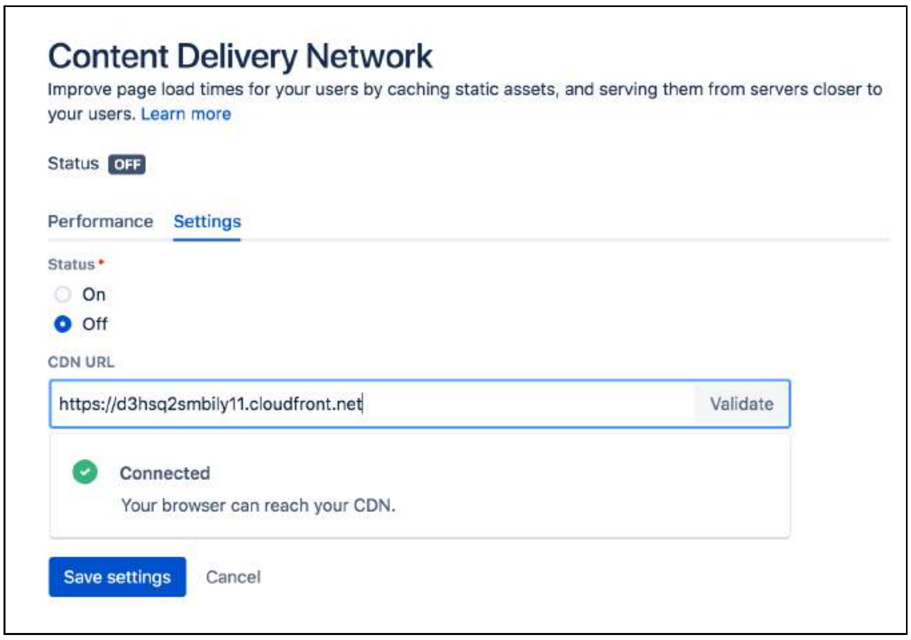
Enable CDN in Bitbucket Data Center

Once you've configured your CDN, you can enable the CDN option in Bitbucket Data Center.

To turn on CDN:

1. Go to **Admin** > **Content Delivery Network**.
2. Navigate to the **Settings** tab.
3. Set the status to **On**
4. Paste the URL generated by your CDN into the URL field and hit **Validate**.

5. If successful, save your changes.


Content Delivery Network

Improve page load times for your users by caching static assets, and serving them from servers closer to your users. Learn more

Status OFF

Status*
On
Off [✓]

CDN URL
https://d3hsq2smbily11.cloudfront.net

Connected
Your browser can reach your CDN.

As end users access Bitbucket in their browser, static assets will be cached on the edge server closest to them, and served from there until they expire. This means it might take some time before you can start measuring the impact of the CDN, depending on when your users are online and accessing the site in each location.

Configure CDN in Bitbucket via REST

You can also interact with the CDN feature using the following REST endpoint: `<base-url>/rest/static-asset-caching/configuration`

- **GET** - returns the current CDN status, and URL.
- **DELETE** - deletes the existing configuration and reverts to the default state (CDN disabled, no URL). This is useful if you can't access the UI because of a caching problem.
- **PUT** - sets the CDN URL and status to the values passed in the body of the request as follows:

```
{
  “enabled”: true,
  “url”: “https://yourcdnurl.com”
}
```

Troubleshooting

Here are some common problems that you may encounter.

- **We only accept HTTPS CDN URLs**
  This is particularly important if you're using Azure CDN, as Azure CDN will mirror the same protocol as the originating request, which means your Data Center application will need to be provisioned with HTTPS.
- **Data Center application UI is inaccessible or not functional**
  Although unlikely, a misconfiguration of your CDN or a CDN service outage may mean your application's UI is not accessible. If this happens, you will need to disable the CDN feature using the REST API, as follows.

```
curl -v -u <admin username>:<admin password> -X DELETE http://<your-base-url>/rest/static-asset-
caching/configuration
```

This example uses Curl, but you can use any language. Don't forget to replace the username, password, and base URL placeholders with your own details.

- **HTTP/2 disabled**
  Your load balancer, firewall, or reverse proxy should allow HTTP/2 traffic. Using HTTP/2 will provide the best performance for your end users. See HTTP/2 health check fails in Data Center when configuring CDN for more information.
- **User-installed apps may not be compatible**
  This warning is displayed when we detect that a Marketplace or other user-installed app is using a deprecated method, which may result in assets being cached incorrectly. See User-installed apps health check fails in Data Center when configuring CDN for more information on what to do if you see this warning.

Frequently asked questions

Can I control what static assets are cached?

No, the application controls this. All requests for static assets are routed to the CDN. Requests for non-static assets are routed directly to your product.

Is personally identifiable information cached?

User created content, usernames, mentions, avatars etc are not static assets, so are not cached. Your CDN should also be configured to pull content from your product with cookies stripped to make sure it operates without user context.

Is dynamic content such as `batch.js` cached?

Although dynamically generated, `batch.js` is considered static content, so is cached.

Manage keys and tokens

You can manage settings (such as automatic expiry, allowed key types, and minimum key lengths) for SSH keys and HTTP access tokens to increase code security.

Learn more about how to manage HTTP access tokens

Learn more about how to manage SSH keys

Managing HTTP access tokens

Project and repository administrators can create HTTP access tokens for their projects and repositories. Users can create personal HTTP access tokens and use them in place of passwords for Git over HTTPS, or to authenticate when using the Bitbucket Data Center REST API. As an administrator, you can edit and revoke tokens, and set global token settings.

On this page:

Related pages:

- HTTP access tokens
- Controlling access to code
- SSH access keys for system use

Editing and deleting tokens

As an administrator, you can’t create tokens for users. However, once a user has created a token, you can edit or delete it.

To edit or delete a personal HTTP token:

1. Go to ⚙ > **Users**.
2. Search for the user and click on them.
3. Open the **HTTP access tokens** tab.
4. Select **Edit** or **Delete**.

To edit or delete a project or repository's HTTP token:

1. From either the **Project** or **Repository settings**, select **HTTP access tokens**.
2. Select **Edit** or **Delete**.

Selecting **Edit** will allow you to change a token’s name or its permissions. If it has an expiry date, however, you will not be able to modify it. Once a token’s expiry date has been set, it can’t be changed.

Require token expiry

By default, when a user is creating a personal access token, they can choose whether they want it to expire. As a system administrator, for added security you can make setting a token expiry a requirement.

To require token expiry:

1. Go to ⚙ > **Keys and tokens** (under System).
2. Select **Yes** for **Automatic expiry**.
3. Enter the **HTTP access token expiry (in days)**.
4. Select **Save**.

Managing keys

Users and other systems can use SSH keys to authenticate and access repositories without using or storing credentials such as username and password.

- Project and repository administrators can create SSH keys for their projects and repositories. Learn more about creating SSH keys for system use
- Users can create personal SSH keys to perform Git operations. Learn more about creating personal SSH keys

As an admin, you can can restrict specific SSH key types, mandate minimum key lengths, and also set automatic expiry to meet your compliance and security needs.

Editing and deleting keys

As an administrator, you can create, edit, and delete personal SSH keys.

To edit or delete a personal SSH key:

1. Go to **Administration** > **Users**.
2. Search and select the user.
3. Open the **SSH keys** tab.
4. Select **Edit** or **Delete**.

To edit a project or repository’s access key:

1. From either the **Project** or **Repository settings**, select **Access keys**.
2. Select **Edit**.

Selecting **Edit** will allow you to change a key’s label or permissions in all places where that access key is used. You can’t change the key value or expiry date. To delete a project or repository's access key, see SSH access keys for system use.

Before you set the global expiry for SSH keys

As all SSH keys created before 8.7 aren’t associated with a created date, we’ll set their creation date to the day you first turn on the global expiry for SSH keys.

Before you set the global expiry for SSH keys, we recommend that you:

- review the **Created** date of SSH keys created for personal use and keys within projects and repositories to gauge which keys will be impacted.
- notify your developers, project, and repository admins in advance so they can plan to rotate their keys and minimise the loss of their access to repositories or any other integration workflows (for example, keys that integrate with other systems like Bamboo). Learn how to regenerate SSH keys for Bitbucket Data Center and Server

Require key expiry

When an SSH key is created for personal or system use, users have the option of setting an expiry date. As a system admin, you can set a global expiry for SSH keys. If you set a global expiry, users can only set a lower expiry date when they create personal SSH keys or system access keys; otherwise, the default expiry you’ve configured is used.

To set the global expiry:

1. Go to **Settings** > **Keys and tokens** (under System).
2. Select **Yes** for **Automatic expiry**.
3. Enter the **SSH key expiry (in days)**.
4. Select **Save**.

This setting is applied to all existing keys too in Bitbucket.

Control allowed key types and lengths

To make sure that unsafe keys are not used, you can restrict specific key types and mandate minimum key lengths.

1. Go to **Settings** > **Keys and tokens**.
2. Use the options within the various key type lists to set the minimum key lengths or restrict the key type.

These changes are applied to all existing keys too in Bitbucket. Users will see an error message in the keys list within projects, repositories, and their personal keys list and will be unable to use keys nor create new keys that don’t meet the requirements you’ve set.

Link to other applications

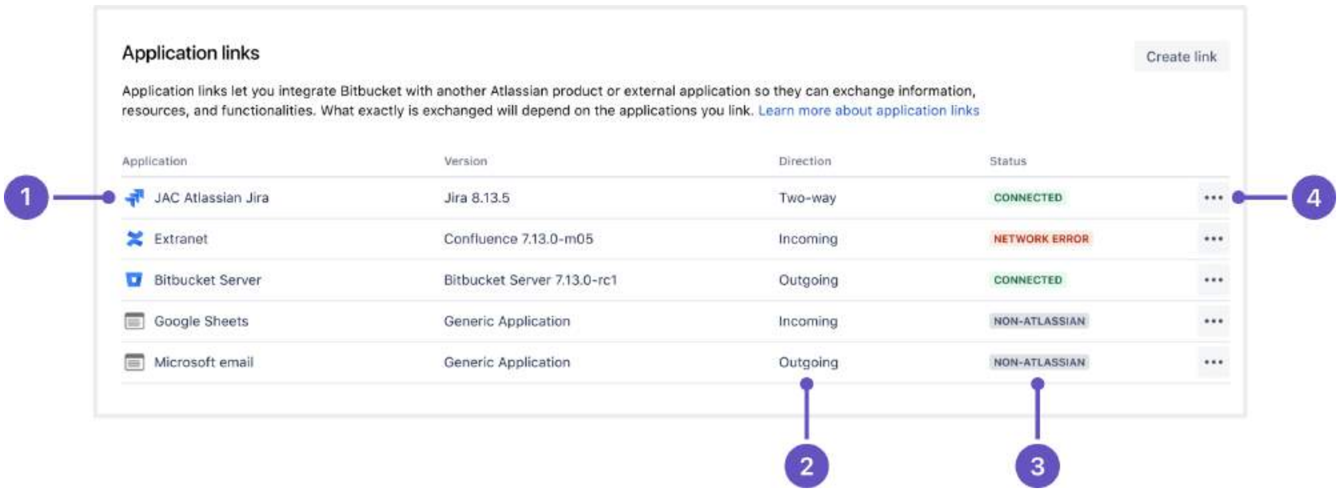
Application links is a bundled app that allows you to link Bitbucket Data Center to other Atlassian products or external applications. Thanks to this, they can exchange information or give access to certain resources or functionalities.

You can also link Bitbucket to external applications using either OAuth 1.0 or OAuth 2.0. These integrations are typically used for internal integrations and require that your application is compatible with application links. We’ve created such an integration with Jenkins – you can use it to connect to this application or take as an example of how to create your own integrations.

View application links

To view application links:

1. Go to **Administration > Applications**.
2. Select **Application links**. You’ll see the following page:



Application links

Application links let you integrate Bitbucket with another Atlassian product or external application so they can exchange information, resources, and functionalities. What exactly is exchanged will depend on the applications you link. Learn more about application links

Application	Version	Direction	Status
JAC Atlassian Jira	Jira 8.13.5	Two-way	CONNECTED
Extranet	Confluence 7.13.0-m05	Incoming	NETWORK ERROR
Bitbucket Server	Bitbucket Server 7.13.0-rc1	Outgoing	CONNECTED
Google Sheets	Generic Application	Incoming	NON-ATLASSIAN
Microsoft email	Generic Application	Outgoing	NON-ATLASSIAN

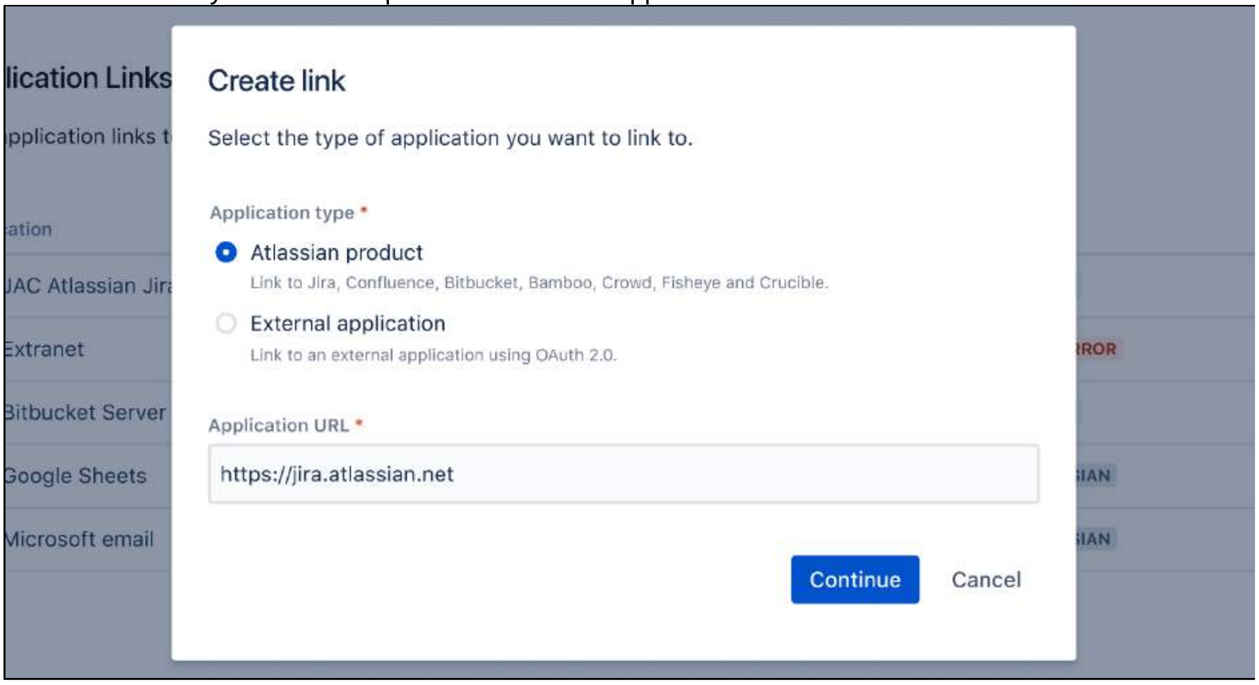
1. **Application:** Name of the linked application and its version. For external applications, it always shows *Generic application*.
2. **Direction:** Communication direction, either *Incoming*, *Outgoing*, or *Two-way*. For Atlassian products, you should configure two-way communication, but some external applications won’t need it.
3. **Status:** Connection status. For external applications, it always shows *Non-Atlassian*.
4. **Actions:** Actions you can do on your links, such as edit or delete. For OAuth 2.0 connections, you can additionally view your OAuth credentials.

Link to Atlassian products or external applications using OAuth 1.0

To link to other Atlassian products or external applications:

1. In application links, select **Create link**.
2. Select **Atlassian product** as the link type. This option also works for external applications. This is the original application links mechanism – we’ve left it under this option so users can still use their OAuth 1.0 integrations.

3. Enter the URL of your Atlassian product or external application.



Create link

Select the type of application you want to link to.

Application type *

Atlassian product (selected)
Link to Jira, Confluence, Bitbucket, Bamboo, Crowd, Fisheye and Crucible.

External application
Link to an external application using OAuth 2.0.

Application URL *

https://jira.atlassian.net

4. Follow the steps in the wizard. You'll be redirected between Bitbucket and the product you're linking to to authorize the two-way connection.

Make your 3rd party application compatible with application links

We've created an integration plugin that lets you connect Bitbucket to Jenkins using OAuth 1.0. You can also use this plugin as an example of how you can make your other 3rd party applications compatible with application links. For details, see Make your 3rd party application compatible with application links.

Link to external applications using OAuth 2.0

You can also link Bitbucket to external applications using OAuth 2.0.

Configure Bitbucket as an OAuth 2.0 provider (incoming link)

In this scenario, Bitbucket acts as an OAuth provider, allowing the external application to access its data.

For more information, see Configure an incoming link.

Configure Bitbucket as an OAuth 2.0 client (outgoing link)

In this scenario, Bitbucket acts as an OAuth client, requesting data from the external application.

For more information, see Configure an outgoing link.

ⓘ We've added support for this scenario for future use. Currently, none of the functionalities in Bitbucket use the OAuth 2.0 client role.

Make your 3rd party application compatible with application links

Application Links is a bundled app that allows you to connect Bitbucket Data Center and other Atlassian tools to set up links, share information, and provide access to resources or functionality.

On this page we use Jenkins as an example to explain how to:

- Make your 3rd party application compatible with application links using OAuth 1.0
- Create an outgoing application link from Bitbucket to your 3rd party application.

This page explains how to set up a 3rd party application as an OAuth provider. It doesn't explain how to set it up as an OAuth consumer as this can be done easily using existing libraries.

What about OAuth 2.0?

Application links now also support OAuth 2.0 when linking to external applications. If you're looking to update your integrations to use this protocol, you can find the details of our OAuth 2.0 implementation in Bitbucket OAuth 2.0 provider API.

Terms used in this article

- **OAuth 1.0a** - OAuth is an open standard for access delegation. It's commonly used as a way for Internet users to grant websites or applications access to their information on other websites without giving them their passwords. Application Links is based on OAuth 1.0a, and all references to OAuth in this article relate to this protocol.
- **Resource owner** - An end user who owns the resource. For example, a Jenkins Job.
- **Client** - An application that makes OAuth calls on behalf of a resource owner.
- **OAuth provider** - An application that allows a client to create a token that will be used later for authentication.
- **OAuth consumer** - A client that is an OAuth consumer. The OAuth consumer will ask the OAuth provider for various tokens. These tokens will be explained later.
- **3-legged OAuth dance** - This process is explained on Github in these diagrams.

Application link options

Before you jump into making your application compatible with application links, it's useful to understand some details about app links themselves.

Your application link can be:

- Outgoing/incoming, or both.
- Automatically created or manually created.

Outgoing/incoming, or both

If an Application Link is outgoing/incoming (outgoing for one application, incoming for the other application), only one party can perform actions on the other. If it's both outgoing and incoming, like in Atlassian products, both parties can perform actions on each other.

In our Jenkins example, the Application Link is outgoing/incoming. It is:

Outgoing from Bitbucket, the OAuth consumer		Incoming for Jenkins, the OAuth provider

In this arrangement:

- Jenkins *provides* access tokens to Bitbucket. Jenkins users are resource owners while the Jenkins server acts as an OAuth provider.
- Bitbucket *consumes* these tokens and uses them to perform actions on Jenkins.

- Jenkins, however, cannot perform actions on Bitbucket.

This also means that Jenkins needs to manage token creation and handling, and it needs to expose endpoints to generate request tokens, to generate access tokens, and for authorization.

Automatically created or manually created

When connecting Atlassian applications, Application Link creation is automatic. How this works is explained in the Jira documentation.

When connecting Atlassian applications with 3rd party applications, the Application Link must be created manually. An example of how to do this is explained in our plugin readme.

In our Jenkins example, Jenkins is an OAuth provider only, so the Application Link needs to be created manually. This process can be tedious, but it only needs to be done once.

Making your 3rd party application compatible with application links

To make your 3rd party application compatible with application links:

1. Decide if the Application Link from Bitbucket needs to be outgoing, incoming, or both.
2. Implement OAuth:
    - For an outgoing link from Bitbucket, your 3rd party application needs to be configured as an OAuth provider.
    - For a bidirectional link from Bitbucket, your 3rd party application needs to be configured as an OAuth provider and also needs to act as an OAuth Consumer.

See below for how to do this:

Configuring your 3rd party application as an OAuth provider

To be an OAuth provider, your 3rd party application needs to:

1. Do token handling.
2. Have exposed endpoints:
    - To generate request tokens
    - To generate access tokens
    - For authorization to generate authorization code.]

For a more concrete example of how this can be done, take a look at the OAuth provider guide that we've written for our integration plugin for Jenkins. It explains how you can potentially copy and reuse the Application Link module to quickly configure your 3rd party application as an OAuth provider.

Configuring your 3rd party application as an OAuth consumer

There are many libraries that work out of the box for configuring your 3rd party application as an OAuth consumer. For example, Scribe.

Once your 3rd party application is an OAuth provider and consumer, you can manually create a bidirectional Application Link between it and Bitbucket and perform actions on both ends.

Configure an outgoing link

When you configure an outgoing link to an external application, Bitbucket requests data from this application, which means that it acts as the OAuth client.

We've added support for this scenario for future use. Currently, none of the functionalities in Bitbucket use the OAuth 2.0 client role. If you'd like to use Bitbucket as the OAuth 2.0 provider, see Configuring an incoming link.

Before you begin

You need to ensure the following:

- Your server needs to run over HTTPS. If it doesn't, you will not be able to configure OAuth 2.0.
- Your base URL needs to be configured correctly. This is important as the redirect URL you'll need to provide is based on the Bitbucket's base URL.

Create an outgoing link using application links

To create an outgoing link:

1. Go to **Administration > Applications > Application links**.
2. Select **Create link**.
3. Select **External application**, and then choose **Outgoing** as the direction.
4. Fill in the details as described in the sections below.

Configure your outgoing link

Follow these steps to configure your link.

1. Choose a service provider

Choose one of the following providers that you want to configure. For Google and Microsoft, some of the fields will be pre-filled.

- Google
- Microsoft
- Custom (for internal tools or other providers)

2. Copy the Redirect URL and register it in your external application

Copy the Redirect URL and register it in your external application to obtain the client ID and client secret required to complete the configuration.

If you're using Google or Microsoft as service providers, you'll be able to copy the Redirect URL right away. For custom providers, you need to first provide the *Authorization endpoint* and *Token endpoint*. For more info on registering the URL with Google or Microsoft, see:

- OAuth 2.0 in Google
- OAuth 2.0 in Microsoft

Different providers might have different requirements related to the redirect URL. For example, Google does not allow it to be a private IP address. Make sure you provide an external URL (for example of a load balancer for Data Center).

3. Provide remaining application details

Provide the remaining details. Here you can find descriptions for all the fields:

Name	Description
Client ID	The client ID generated by the external application after registering Bitbucket's Redirect URL. This is the public identifier of the application.
Client secret	The client secret generated by the external application after registering Bitbucket's Redirect URL. This is the shared secret between Jira and the application, which ensures the authorization is secure.
Scopes	The required OAuth 2.0 scopes (permissions) that control what Bitbucket can do in the external application.
Authorization endpoint	The HTTPS URL where authorization to use OAuth 2.0 is started.
Token endpoint	The HTTPS URL where refresh token requests are sent. As OAuth 2.0 tokens have an expiry, Bitbucket will periodically update the token.
Redirect URL	The Redirect URL that must be registered in the external application to obtain its client ID and client secret. This redirects the authentication flow back to Bitbucket.

3. Save your outgoing link

After you save the link, it will appear on the list together with other application links.

Troubleshooting

- I fail to get an OAuth 2.0 refresh token

Configure an incoming link

When you configure an incoming link with an external application, you allow this application to access Bitbucket data, which means that Bitbucket acts as the OAuth provider. To learn more about the type of links and additional details, see Link to other applications.

Before you begin

- If you're creating an OAuth 2.0 integration and want to use Bitbucket as the provider, you can find the details of our OAuth 2.0 implementation in Bitbucket OAuth 2.0 provider API.
- You can configure additional details using OAuth 2.0 provider system properties.

Create an incoming link using application links

To create an incoming link:

1. Go to **Administration > Applications > Application links**.
2. Select **Create link**.
3. Select **External application**, and then choose **Incoming** as the direction.
4. Fill in the details as described in the sections below.

Provide application details

In this type of link, you only need to provide the Redirect URL (also known as Callback URL) from your external application. After authorizing the application, the user will be redirected to this URL with the authorization code.

Provide application permissions

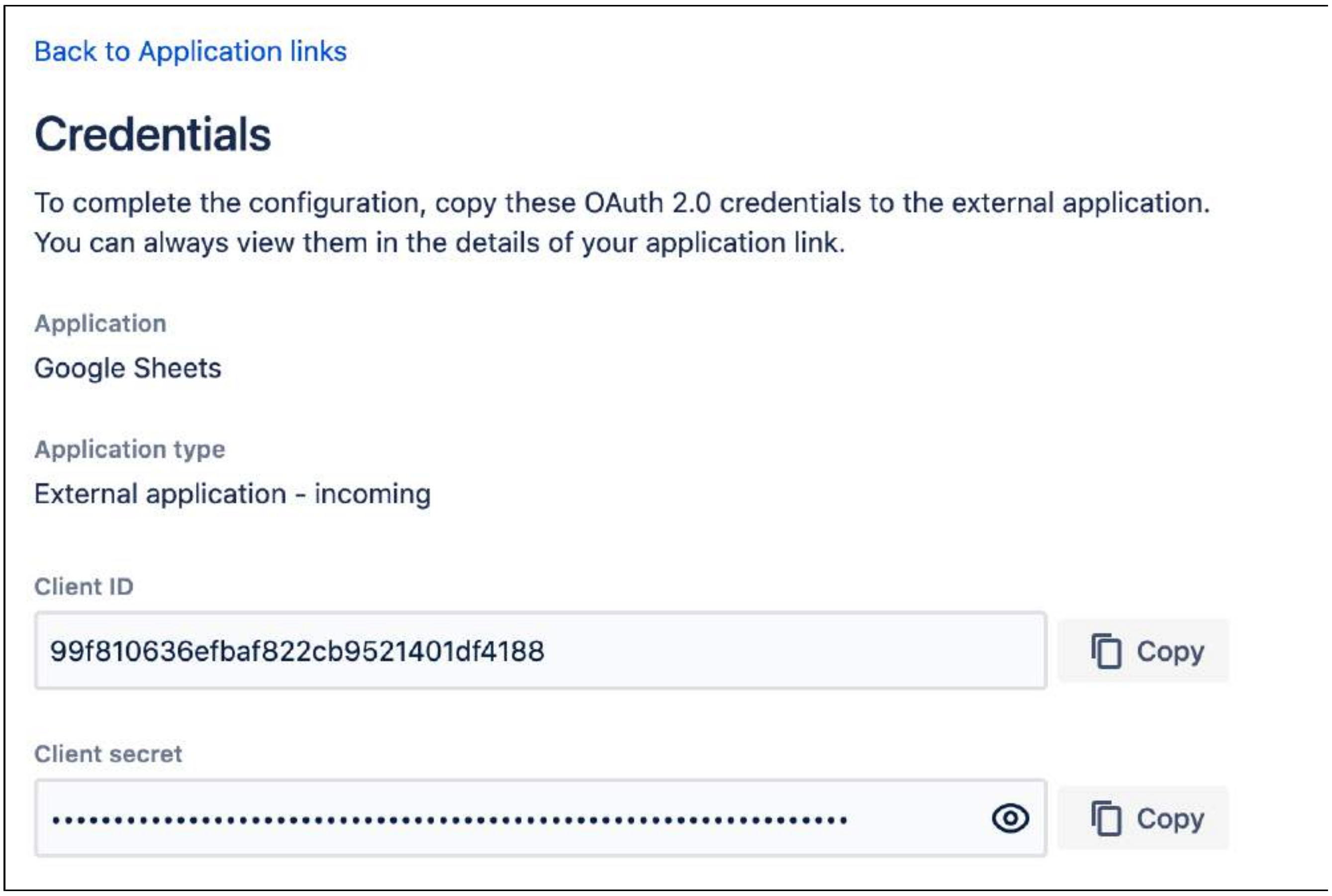
Select permissions the application can have on your instance. You can choose the following permission scopes:

Account	Repositories	Projects	Admin	System admin
▪ Write	▪ Read ▪ Write ▪ Admin	▪ Admin	▪ Write	▪ Write

Note that even if you grant higher permissions, the application won't be able to do more than the user authorizing it. For more info on what each of these scopes do, see OAuth 2.0 scopes for incoming links.

Copy OAuth credentials to the application

After providing the Redirect URL and selecting the scopes, Bitbucket will generate the OAuth credentials that include these details. You need to copy the credentials to your external application to complete the link.


Back to Application links

Credentials

To complete the configuration, copy these OAuth 2.0 credentials to the external application. You can always view them in the details of your application link.

Application
Google Sheets

Application type
External application - incoming

Client ID
99f810636efbaf822cb9521401df4188

Client secret
••

At this point, the application link has already been created in Bitbucket. You can view its details in Application links, including the OAuth credentials in case you needed to access them later.

View OAuth credentials for an existing link

If you lose your OAuth credentials, you can access them any time in the details of the application link you created.

To view OAuth credentials:

1. Go to **Administration > Application links**.
2. Find the application link you're interested in, and select **More actions > View credentials**.

OAuth 2.0 scopes for incoming links

When creating incoming links from external application, you need to select scopes, which are permissions the application can have on your instance.

What the application can do with scopes

As an admin, you can select which scopes the application can request from the authorizing user, but the actual permissions will always be capped at what this user can do. For example, even if you select the `ADMIN` permissions, the application won't be able to use them if the authorizing user only has `WRITE` permissions.

Scopes

Here are the scopes you can select when configuring the link. The same scopes will be displayed to users when they authorize the integration. They can later be accessed in their user profile in **Authorized applications**, where they can also revoke the granted access.

Scope	Description
No scopes selected	**View public projects and repositories** View projects and repositories that are publicly accessible, including pulling code and cloning repositories.
Account	
Write	**Update your account** Update your user account settings.
Repositories	
Read	**View projects and repositories** View projects and repositories your account can view, including pulling code, cloning, and forking repositories. Create and comment on pull requests.
Write	**Update projects and repositories** Update projects and repositories your account can change, including pushing code and merging pull requests.
Admin	**Administer repositories** Perform administrative functions on repositories and pull requests your account can change, including deleting pull requests and updating repository settings and permissions.
Projects	
Admin	**Administer projects** Perform administrative functions on projects, repositories, and pull requests your account can change, including creating new repositories and updating project settings and permissions.
Admin	
Write	**Administer Bitbucket** Perform most administrative functions on the entire Bitbucket instance, excluding functions such as backups, imports, and infrastructure settings which are limited to system administrators.
System admin	

Write	**Administer Bitbucket system** Perform all administrative functions on the entire Bitbucket instance, including functions such as backups, imports, and infrastructure settings.

OAuth 2.0 provider system properties

When configuring Bitbucket as an OAuth 2.0 provider (incoming link), you can use these system properties.

`atlassian.oauth2.provider.enable.access.tokens`	
Default	`true`
Description	Disables the ability to authenticate using access tokens for that node.
`atlassian.oauth2.provider.skip.base.url.https.requirement`	
Default	`false`
Description	Disables the HTTPS requirement for the base URL. If this is disabled, the OAuth 2.0 provider will be enabled even if the product is using HTTP.
atlassian.oauth2.provider.skip.redirect.url.https.requirement	
Default	`false`
Description	Disables the HTTPS requirement for the Redirect URL. If this is disabled, the OAuth 2.0 provider will allow Redirect URLs using HTTP.
atlassian.oauth2.provider.max.lock.timeout.seconds	
Default	10
Description	Number of seconds a request will await lock access before timing out.
atlassian.oauth2.provider.max.client.delay.seconds	
Default	10
Description	Max lifetime of authorization codes (seconds). The limit is 600 seconds.
atlassian.oauth2.provider.prune.expired.authorizations.schedule	
Default	`* * * * * ?`
Description	Cron expression for a job that removes expired authorization codes. Default is 1 minute.
atlassian.oauth2.provider.access.token.expiration.seconds	
Default	`3600` (1 hour)
Description	Max lifetime of access tokens (seconds).
atlassian.oauth2.provider.prune.expired.tokens.schedule	
Default	`* * * * * ?`
Description	Cron expression for a job that removes expired access tokens. Default is 1 minute.
atlassian.oauth2.provider.access.token.expiration.seconds	
Default	`7776000` (90 days)
Description	Max lifetime of refresh tokens (seconds).
atlassian.oauth2.provider.invalidate.session.enabled	

Default	`true`
Description	Invalidates a session after a successful authentication using an OAuth token.
atlassian.oauth2.provider.validate.client.secret	
Default	`true`
Description	Validates the client ID and client secret when revoking and creating tokens.
atlassian.oauth2.provider.use.quotes.in.sql	
Default	`false`
Description	Controls whether to add quotes to SQL statements. This is a sanity system property used for database requirements. PostgreSQL will always use quotes unless the `atlassian.oauth2.provider.do.not.use.quotes.in.sql` property (below) is enabled.
atlassian.oauth2.provider.do.not.use.quotes.in.sql	
Default	`false`
Description	Controls whether to add quotes to SQL statements. This is a sanity system property used for database requirements.
atlassian.oauth2.provider.token.via.basic.authentication	
Default	`true`
Description	Enables extracting tokens through the basic authentication password field for access token authentication.

Bitbucket OAuth 2.0 provider API

Bitbucket Data Center provides APIs to allow external services to access resources on a user's behalf with the OAuth 2.0 protocol.

If you already have an integration that you'd like to add to Bitbucket, see Configure an incoming link for detailed steps. If not, this page will help you understand the details of our OAuth 2.0 implementation so you can create such an integration.

Supported OAuth 2.0 flows

We support the following OAuth 2.0 flows:

- Authorization code with Proof Key for Code Exchange (PKCE)
- Authorization code

We don't support Implicit Grant and Resource Owner Password Credentials flows, as they will be deprecated in the next OAuth specification version.

For more information on how these flows work, see OAuth RFC. This should help you understand the flows and choose the right one for you.

Security recommendations

Here are some recommendations on how to improve security:

Preventing CSRF attacks

To protect redirect-based flows, the OAuth specification recommends the use of "One-time use CSRF tokens carried in the state parameter, which are securely bound to the user agent" using the `state` query parameter, with each request to the `/rest/oauth2/latest/authorize` endpoint. This can prevent CSRF attacks.

Using HTTPS in production

For production environments, use HTTPS for the `redirect uri`. This is important, as OAuth 2.0 bases its security on the transport layer. For more info, see the OAuth 2.0 RFC and the OAuth 2.0 Threat Model RFC.

For the same reason, we also enforce HTTPS for the base URL of production environments. You can use insecure URIs and base URLs for staging or development environments by enabling the relevant system properties.

Authorization code with Proof Key for Code Exchange (PKCE)

This flow lets you securely perform the OAuth exchange of client credentials for access tokens on public clients. The following steps and parameters describe our implementation of this flow.

Parameters

Here are parameters you'll use in this flow:

Parameter	Description	Required
redirect_uri	URL the user is redirected to after authorizing the request.	Yes
client_id	Client ID received from Jira after registering your application.	Yes
response_time	Authorization code.	Yes
scope	Scopes that define application's permissions to the user account. For more info, see Scopes.	Yes

code_challenge	• For `sha256`, generate this using the following pseudocode: `BASE64URL-ENCODE(SHA256(ASCII(code_verifier)))` • For `plain`, this can be the generated `code_verifier`.	Yes
code_challenge_method	Can be `plain` or `sha256` depending on how the `code_challenge` was generated.	Yes
code_verifier	High-entropy cryptographic random STRING using the unreserved characters: `[A-Z] / [a-z] / [0-9] / "-" / "." / "_" / "~"`. It must be between 43-127 characters. For more info, see the RFC.	Yes
state	A value that can't be predicted. It will be used by the client to maintain state between the request and callback. It should also be used as a CSRF token. It can be generated in a similar manner to `code_verifier`.	No

Before you begin

- Register your application in Bitbucket by creating an incoming link in application links. During registration, you can enable proper scopes to limit the range of resources which the application can access. After creating the link, you should receive the OAuth credentials: Client ID and Client secret - keep them secure. For more info, see Configure an incoming link.
- Before starting the flow, generate the `state` (optional), `code_verifier`, `code_challenge`, and `code_challenge_method`.

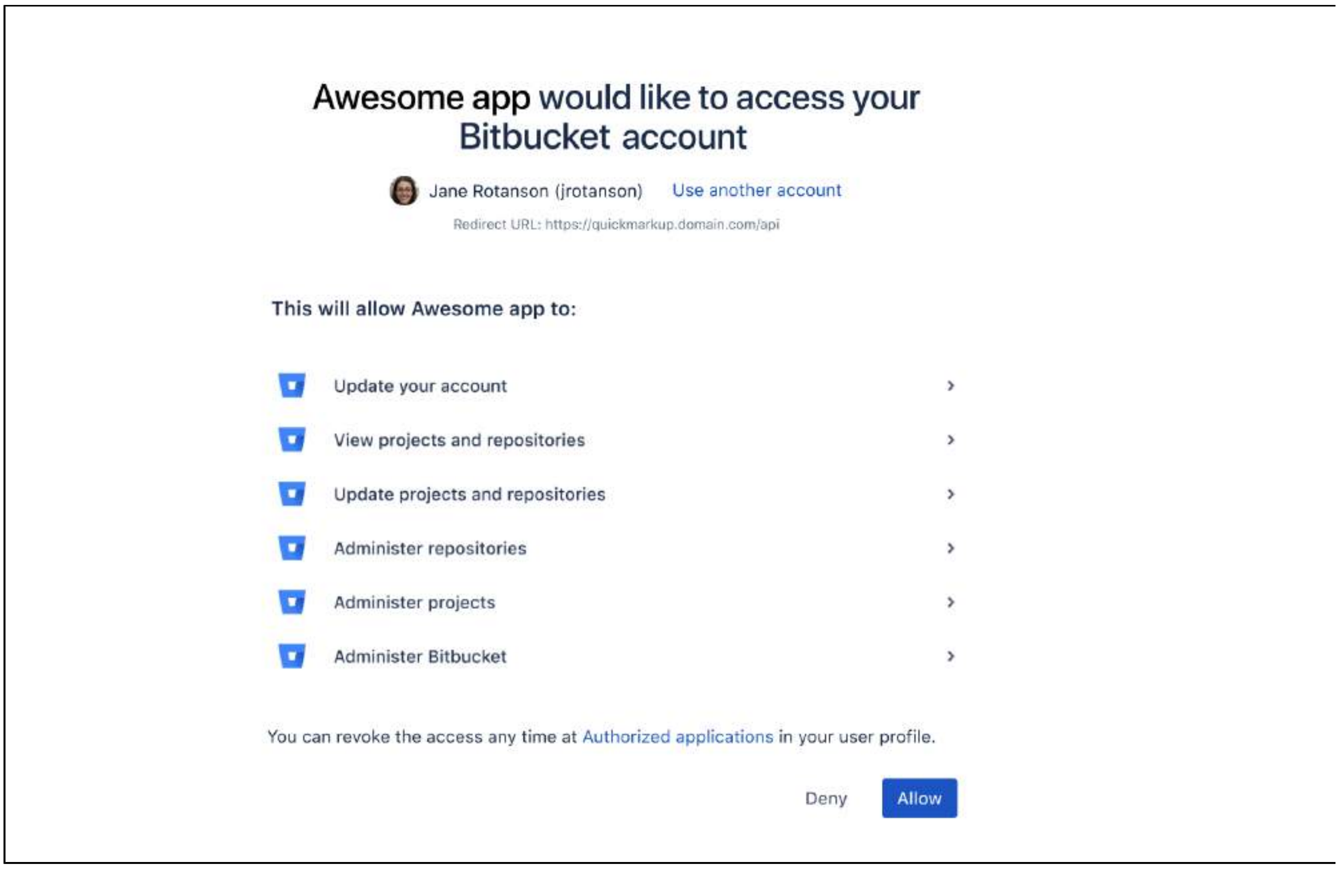
Steps

1. Request authorization code by redirecting the user to the `/rest/oauth2/latest/authorize` page with the following query parameters:

```
curl https://atlassian.example.com/rest/oauth2/latest/authorize?
client_id=CLIENT_ID&redirect_uri=REDIRECT_URI&response_type=code&state=STATE&scope=SCOPE&code_challenge=CODE
_CHALLENGE&code_challenge_method=S256
```

This is the consent screen that asks the user to approve the application’s request to access their account with the scopes specified in `scope`. The user is then redirected to the URL specified in `redirect_uri`. The redirect includes the authorization code, like in the following example:

```
https://atlassian.example.com/plugins/servlet/oauth2/consent?
client_id=CLIENT_ID&redirect_uri=REDIRECT_URI&response_type=code&scope=SCOPE&state=STATE&code_challenge_meth
od=CODE_CHALLENGE_METHOD&code_challenge=CODE_CHALLENGE
```



Awesome app would like to access your Bitbucket account

Jane Rotanson (jrotanson) Use another account

Redirect URL: https://quickmarkup.domain.com/api

This will allow Awesome app to:

- Update your account
- View projects and repositories
- Update projects and repositories
- Administer repositories
- Administer projects
- Administer Bitbucket

You can revoke the access any time at Authorized applications in your user profile.

2. With the authorization code returned from the previous request, you can request an access_token, with any HTTP client. The following example uses curl:

```
curl -X POST https://atlassian.example.com/rest/oauth2/latest/token?
client_id=CLIENT_ID&client_secret=CLIENT_SECRET&code=CODE&grant_type=authorization_code&redirect_uri=REDIREC
T_URI&code_verifier=CODE_VERIFIER
```

Example response

```
{
 "access_token": "eyJhbGciOiJIUzI1NiJ9.eyJpZCI6IjNmMTQ3NTUzYjg3OTQ2Y2FhMWJhYWJkZWQ0MzgwYTM4In0.
EDnpBl0hd1BQzIRP--xEvyW1F6gDuiFranQCvi98b2c",
 "token_type": "bearer",
 "expires_in": 7200,
 "refresh_token": "eyJhbGciOiJIUzI1NiJ9.eyJpZCI6ImMwZTMxYmZjYTI2NWI0YTkwMzBiOGM2OTJjNWIyMTYwIn0.
grHOsso3B3kaSxNd0QJfj1H3ayjRUuA75SiEt0usmiM",
 "created_at": 1607635748
}
```

3. To retrieve a new access_token, use the refresh_token parameter. Refresh tokens may be used even after the access_token itself expires. The following request:

- Invalidates the existing access_token and refresh_token.
- Sends new tokens in the response

```
curl -X POST https://atlassian.example.com/rest/oauth2/latest/token?
client_id=CLIENT_ID&client_secret=CLIENT_SECRET&refresh_token=REFRESH_TOKEN&grant_type=refresh_token&redirec
t_uri=REDIRECT_URI
```

Example response

```
{
  "access_token": "eyJhbGciOiJIUzI1NiJ9.eyJpZCI6ImJmZjg4MzU5YTVkNGUyZmQ3ZmYwOTEwOGIxNjg4MDA0In0.
BocpI91mpUzWskyjxHp57hnyl8ZcHehGJwmaBsGJEMg",
  "token_type": "bearer",
  "expires_in": 7200,
  "refresh_token": "eyJhbGciOiJIUzI1NiJ9.eyJpZCI6Ijg1NjQ1YjA1NGJiYmZkNjVmMDNkMzliYzM0YzQ4MzZjIn0.
4MSMIG46zjB9QCV-qCCglgojM5dL7_E2kcqmiV46YQ4",
  "created_at": 1628711391
}
```

You can now make requests to the API with the access token. For more info, see Access Bitbucket API with access token below.

Authorization code

This flow lets you securely perform the OAuth exchange of client credentials for access tokens on public clients.

Parameters

Here are parameters you'll use in this flow:

Parameter	Description	Required
`redirect_uri`	URL the user is redirected to after authorizing the request.	Yes
`client_id`	Client ID received from Jira after registering your application.	Yes
`response_type`	Authorization code.	Yes
`scope`	Scopes that define application's permissions to the user account. For more info, see Scopes.	Yes
`state`	A value that can't be predicted. It will be used by the client to maintain state between the request and callback. It should also be used as a CSRF token.	No

Before you begin

- Register your application in Bitbucket by creating an incoming link in application links. During registration, you can enable proper scopes to limit the range of resources which the application can access. After creating the link, you should receive the OAuth credentials: Client ID and Client secret - keep them secure. For more info, see Configure an incoming link.
- If you want to use the optional `state` parameter, generate it before starting the flow.

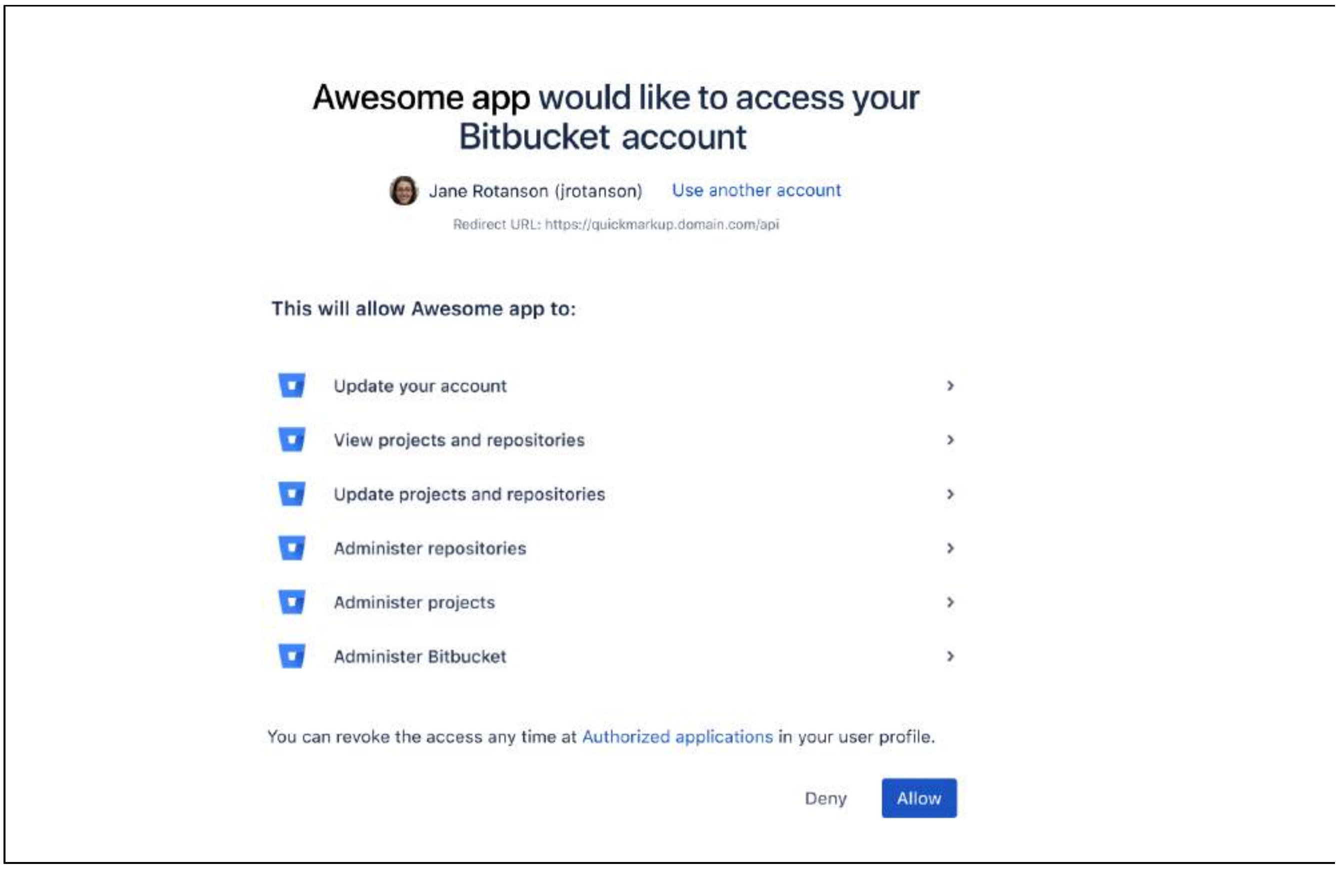
Steps

1. Request the authorization code by redirecting the user to the `/oauth/authorize` page with the following query parameters:

```
curl https://atlassian.example.com/rest/oauth2/latest/authorize?
client_id=CLIENT_ID&redirect_uri=REDIRECT_URI&response_type=code&state=STATE&scope=SCOPE
```

This is the consent screen that asks the user to approve the application's request to access their account with the scopes specified in `scope`. The user is then redirected to the URL specified in `redirect_uri`. The redirect includes the authorization code, like in the following example:

```
https://atlassian.example.com/plugins/servlet/oauth2/consent?
client_id=CLIENT_ID&redirect_uri=REDIRECT_URI&response_type=code&scope=SCOPE&state=STATE
```


Awesome app would like to access your Bitbucket account

Jane Rotanson (jrotanson) Use another account

Redirect URL: https://quickmarkup.domain.com/api

This will allow Awesome app to:

- Update your account
- View projects and repositories
- Update projects and repositories
- Administer repositories
- Administer projects
- Administer Bitbucket

You can revoke the access any time at Authorized applications in your user profile.

2. With the authorization code (response_type) returned from the previous request, you can request an `access_token`, with any HTTP client. The following example uses Ruby's `rest-client`:

```
curl -X POST https://atlassian.example.com/rest/oauth2/latest/token?
client_id=CLIENT_ID&client_secret=CLIENT_SECRET&code=CODE&grant_type=authorization_code&redirect_uri=REDIREC
T_URI
```

Example response

```
{
 "access_token": "eyJhbGciOiJIUzI1NiJ9.eyJpZCI6IjNmMTQ3NTUzYjg3OTQ2Y2FhMWJhYWJkZWQ0MzgwYTM4In0.
EDnpBl0hd1BQzIRP--xEvyW1F6gDuiFranQCvi98b2c",
 "token_type": "bearer",
 "expires_in": 7200,
 "refresh_token": "eyJhbGciOiJIUzI1NiJ9.eyJpZCI6ImMwZTMxYmZjYTI2NWI0YTkwMzBiOGM2OTJjNWIyMTYwIn0.
grHOsso3B3kaSxNd0QJfj1H3ayjRUuA75SiEt0usmiM",
 "created_at": 1607635748
}
```

3. To retrieve a new `access_token`, use the `refresh_token` parameter. Refresh tokens may be used even after the `access_token` itself expires. This request:

- Invalidates the existing `access_token` and `refresh_token`.
- Sends new tokens in the response.

```
curl -X POST https://atlassian.example.com/rest/oauth2/latest/token?
client_id=CLIENT_ID&client_secret=CLIENT_SECRET&refresh_token=REFRESH_TOKEN&grant_type=refresh_token&redirec
t_uri=REDIRECT_URI
```

Example response

```
{
  "access_token": "eyJhbGciOiJIUzI1NiJ9.eyJpZCI6ImJmZjg4MzU5YTVkNGUyZmQ3ZmYwOTEwOGIxNjg4MDA0In0.
BocpI91mpUzWskyjxHp57hnyl8ZcHehGJwmaBsGJEMg",
  "token_type": "bearer",
  "expires_in": 7200,
  "refresh_token": "eyJhbGciOiJIUzI1NiJ9.eyJpZCI6Ijg1NjQ1YjA1NGJiYmZkNjVmMDNkMzliYzM0YzQ4MzZjIn0.
4MSMIG46zjB9QCV-qCCglgojM5dL7_E2kcqmiV46YQ4",
  "created_at": 1628711391
}
```

You can now make requests to the API with the access token returned. For more info, see Access Bitbucket API with access token below.

Access Bitbucket API with access token

The access token allows you to make requests to the API on behalf of a user. You can put the token in the Authorization header:

```
curl --header "Authorization: Bearer OAUTH2-TOKEN" "https://atlassian.example.com/rest/api/latest/issue/JRA-
9"
```

Scopes

The `scope` parameter is required in both flows. It allows you to specify the permission scopes your application can request from the authorizing user. Note that regardless of which scopes you choose, the actual permissions will always be capped at what the user can actually do.

Here you can find the scope keys you can use in your requests, as values of the `scope` parameter:

Scope key	Description
No scope / `PUBLIC_REPOS`	**View public projects and repositories** View projects and repositories that are publicly accessible, including pulling code and cloning repositories.
`ACCOUNT_WRITE`	**Update user account** Update the user account settings.
`REPO_READ`	**View projects and repositories** View projects and repositories the user account can view, including pulling code, cloning, and forking repositories. Create and comment on pull requests.
`REPO_WRITE`	**Update projects and repositories** Update projects and repositories the user account can change, including pushing code and merging pull requests.
`REPO_ADMIN`	**Administer repositories** Perform administrative functions on repositories and pull requests the user account can change, including deleting pull requests and updating repository settings and permissions.
`PROJECT_ADMIN`	**Administer projects** Perform administrative functions on projects, repositories, and pull requests the user account can change, including creating new repositories and updating project settings and permissions.

`ADMIN_WRITE`	**Administer Bitbucket** Perform most administrative functions on the entire Bitbucket instance, excluding functions such as backups, imports, and infrastructure settings which are limited to system administrators.
`SYSTEM_ADMIN`	**Administer Bitbucket system** Perform all administrative functions on the entire Bitbucket instance, including functions such as backups, imports, and infrastructure settings.

Setting a system-wide default branch name

The default branch for a repository is its integration branch for work. In pull request workflows, its where feature branches are targeted. It's also the first branch created in a new repository.

As a Bitbucket Data Center administrator, you can s elect how this branch is named by going to ⚙ > **Def ault branch name.** On this page your options are:

On this page:

Related pages:

- Branches

Option	Description
Use the Git default name	The name given to the default branch is based on the installed Git version: • In Git 2.27 and below, the default name is hard-coded as master. • In Git 2.28+, the default name is master, but can be configured.
Set a custom default name	You can set an set an instance-wide custom default name for this branch. This custom name will be used instead of the Git name, and when a user creates a new repository they'll see it prefilled in the default branch name field. They can then use this name, or enter a branch name of their own.

When creating a new repository, users can leave the Default branch name field empty. If they do, the name given to the default branch will be the default branch name that has been configured for the instance.

Automatically decline inactive pull requests

Bitbucket Data Center can automatically decline pull requests that are inactive, reducing the number of pull requests in the list that can add up. For example, if an older pull request has not had any activity (like commits, comments or approvals) in a set amount of time, it will be declined. By default, the option is on and set to 4 weeks. This period of inactivity can be overwritten for projects and repositories.

On this page:

Automatically decline inactive pull requests for all repositories in a project

To configure the automatic declining of inactive pull requests in a project:

1. Select **Project settings** > **Auto-decline**.
2. Select the **Auto-decline pull requests** check-box to enable it.
3. Set the amount of time before a pull request will be automatically declined from 1, 2, 4, 8, or 12 weeks.
4. Select **Save**.

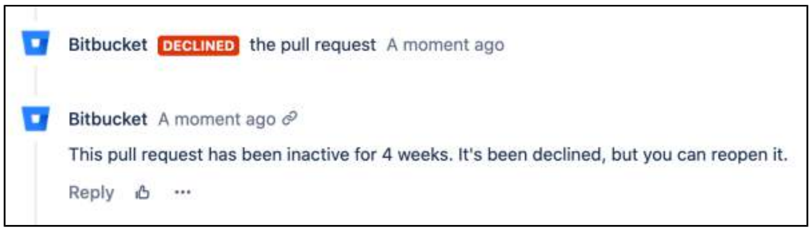
Automatically decline inactive pull requests for a repository

Configuring this setting at the repository level, will override the setting for it at the project level.

To configure the automatic declining of inactive pull requests in a single repository:

1. Select **Repository settings** > **Auto-decline**.
   a. By default, settings are inherited from the project settings.
2. Select **Use custom settings**.
3. Select the **Auto-decline pull requests** check-box to enable it.
4. Set the amount of time before a pull request will be automatically declined from 1, 2, 4, 8, or 12 weeks.
5. Select **Save**.

Once the configuration is saved, inactive pull requests will become declined by the Bitbucket system user. This will add a comment indicating that the reason for the decline is due to inactivity.


Bitbucket DECLINED the pull request A moment ago

Bitbucket A moment ago

This pull request has been inactive for 4 weeks. It's been declined, but you can reopen it.

Modify the global default

You can control the global default behavior for the auto-decline pull requests setting with the following properties:

- `pullrequest.auto.decline.settings.global.enabled` - controls whether or not auto-decline setting is enabled by default for all repositories.
- `pullrequest.auto.decline.settings.global.inactivityWeeks` - sets the global default inactivity period.

For a complete list of properties that can be used to control behavior in Bitbucket, see Configuration properties.

Secure Bitbucket configuration properties

For additional security, you can protect the database password that Bitbucket Data Center uses to access your database, which is stored in the configuration file. We've prepared different encryption methods from ba sic to advanced. Additionally, you can create your own encryption mechanism based on our SecretStore interface.

> The solutions outlined below provide a level of obfuscation for encrypting property values but do not offer complete security. The configuration files will still contain the necessary data to decrypt the values, which means that an attacker with access to these files could potentially decrypt the property values.
>
> These approaches are intended to provide an additional layer of protection against accidental exposure of sensitive data but should not be relied upon as a comprehensive security solution.
>
> We recommend that you secure the server where Bitbucket and the database reside.

Basic encryption

This method uses a Base64 encoding, which is simple obfuscation. It is a straightforward solution for users who don't want to store sensitive passwords in plaintext.

Learn more about basic encryption

Advanced encryption

This method allows you to choose an algorithm to encrypt sensitive information. It provides more security as you don't have to store encrypted information anywhere in the configuration file, which makes it difficult for unauthorized parties to find and decrypt it.

Learn more about advanced encryption

AWS Secrets Manager

AWS Secrets Manager provides a high-level secure storage option for your sensitive information. This service retrieves credentials through a runtime call, eliminating hard-coded credentials, such as keys and tokens, altogether.

Learn more about AWS Secrets Manager for encryption

HashiCorp Vault

HashiCorp Vault is a tool that secures, stores, and controls access to sensitive data such as passwords, tokens, and keys. It acts like a digital safe, keeping your secrets locked away from unauthorized users while being readily available to services with the right permissions.

Learn more about HashiCorp Vault for encryption

Custom implementation

If you have extra requirements for encryption, you can create your own SecretStore implementation based on our implementation and examples. To do this, you will need Java knowledge and some basic knowledge of Maven.

Learn more about custom encryption

Basic encryption

This type of encoding is suitable for users who don’t want to store passwords in plaintext, but don't have to meet specific requirements to encode them.

Encode the sensitive data

For this method, we'll use Base64 encoding, which is a way to achieve simple obfuscation of sensitive data.

Step 1. Encode the sensitive data

When you encode the database password, you can supply some optional arguments, as shown in the table below.

Argument	Description
`-c,--class <arg>`	Canonical class name of the cipher. Leave empty to use the default: `com.atlassian.secrets.store.base64.Base64SecretStore`
`-h,--help`	Output the help message, which displays these optional arguments
`-m,--mode <arg>`	Use 'encrypt' (default) or 'decrypt' on your provided password.
`-p,--password <arg>`	The plaintext password that you want to encrypt. If you omit this parameter, the console will ask you to type the password.
`-s,--silent`	Log minimum info.

To encode the database password, follow the steps below.

1. Go to `<Bitbucket-installation-directory>/tools/atlassian-password`.
2. Run the following command to encode your password. Additionally, you can use optional arguments described above.

   ```
   java -cp "./*" com.atlassian.secrets.cli.db.DbCipherTool
   ```

   When this command is run you should see output similar to this:

```
2023-10-10 03:58:01,548 main INFO [com.atlassian.secrets.DefaultSecretStoreProvider] Initiating
secret store class: com.atlassian.secrets.store.base64.Base64SecretStore
2023-10-10 03:58:01,568 main DEBUG [secrets.store.base64.Base64SecretStore] Initiate Base64Cipher
2023-10-10 03:58:01,583 main DEBUG [secrets.store.base64.Base64SecretStore] Encrypting data...
2023-10-10 03:58:01,585 main DEBUG [secrets.store.base64.Base64SecretStore] Encryption done.
Success!
For Jira, set the following properties in dbconfig.xml:

<atlassian-password-cipher-provider>com.atlassian.secrets.store.base64.Base64SecretStore<
/atlassian-password-cipher-provider>
<password>c2VjcmV0</password>

For Bitbucket, set the following properties in bitbucket.properties:

jdbc.password.decrypter.classname=com.atlassian.secrets.store.base64.Base64SecretStore
jdbc.password=c2VjcmV0

For Bamboo, set the following properties in bamboo.cfg.xml:

<property name="jdbc.password.decrypter.classname">com.atlassian.secrets.store.base64.
Base64SecretStore</property>
<property name="hibernate.connection.password">c2VjcmV0</property>

For Confluence, set the following properties in confluence.cfg.xml:

<property name="jdbc.password.decrypter.classname">com.atlassian.secrets.store.base64.
Base64SecretStore</property>
<property name="hibernate.connection.password">c2VjcmV0</property>
```

Step 2. Add the encoded data to bitbucket.properties

1. Back up the `<home-directory>/shared/bitbucket.properties` file. Move the backup to a safe place outside of your instance.
2. In the `bitbucket.properties` file, add or modify the `encrypted-property.cipher.classname` property to contain:

```
com.atlassian.secrets.store.base64.Base64SecretStore
```

3. In the `bitbucket.properties` file, add or modify the `jdbc.password` property to contain the Base64 encoded value prefixed with `{ENC}`:

```
{ENC}c2VjcmV0
```

4. Once updated, check that `bitbucket.properties` contains:

```
encrypted-property.cipher.classname=com.atlassian.secrets.store.base64.Base64SecretStore
jdbc.password={ENC}c2VjcmV0
```

5. Restart Bitbucket.

Decode the sensitive data

To decode the sensitive data:

1. Extend the command with the `-m decrypt` parameter:

```
java -cp "./*" com.atlassian.secrets.cli.db.DbCipherTool -m decrypt
```

2. When asked for a password, provide the encoded one from your `bitbucket.properties` file.

```
2023-10-10 04:57:22,330 main INFO [com.atlassian.secrets.DefaultSecretStoreProvider] Initiating
secret store class: com.atlassian.secrets.store.base64.Base64SecretStore
2023-10-10 04:57:22,345 main DEBUG [secrets.store.base64.Base64SecretStore] Initiate Base64Cipher
2023-10-10 04:57:22,360 main DEBUG [secrets.store.base64.Base64SecretStore] Decrypting data...
2023-10-10 04:57:22,364 main DEBUG [secrets.store.base64.Base64SecretStore] Decryption done.
Success! Decrypted password using cipher provider: com.atlassian.secrets.store.base64.
Base64SecretStore decrypted password: secret
```

Troubleshooting

This means that Bitbucket couldn't connect to the database to access your configuration, most likely because of an error with decrypting your password.

To solve this problem, open `<Bitbucket_home_directory>/log/atlassian-bitbucket.log`, and check for `DataSourcePasswordDecryptionException`. For example:

```
com.atlassian.stash.internal.jdbc.DataSourcePasswordDecryptionException: java.lang.
IllegalArgumentException: Illegal base64 character 25
```

The exception contains details about the error. If the error is `java.lang.IllegalArgumentException`, you will need to encrypt the password again.
To investigate this problem, have a look at both the `<Bitbucket_home_directory>/log/launcher.log` and `<Bitbucket_home_directory>/log/atlassian-bitbucket.log` files, and check for `JdbcSQLExceptions`. The messages should be pretty clear as to what went wrong.

You'll probably see the following messages:

```
 Wrong user name or password [28000-176]
```

This means that Bitbucket decrypted the password successfully, but the password itself is incorrect. You can verify that by completing these steps:

1. Open the bitbucket.properties file, and copy the encrypted password.
2. Decrypt the password.
3. Check if the decrypted password is the same as the one in your backup bitbucket.properties file.

To disable database password encryption, remove the `jdbc.password.decrypter.classname` property from the `bitbucket.properties` file, and change the value of `jdbc.password` to the unencrypted in your backup.

Advanced encryption

This method provides more security as you don't have to store the encrypted password anywhere in the configuration file, which makes it difficult for unauthorised parties to find and decrypt it.

Encrypt the password

In this method, you'll use `AlgorithmCipher` that allows you to choose the algorithm used to encrypt the sensitive information in the `bitbucket.properties` file.

Before you begin: Prepare the JSON object

You'll need to provide all arguments required to encrypt the sensitive data in a JSON object. Prepare beforehand by using the information and examples below.

Field	Description
`plainTextPassword`	Password in plaintext.
`algorithm`	You can choose one of the following algorithms: • AES/CBC/PKCS5Padding • DES/CBC/PKCS5Padding • DESede/CBC/PKCS5Padding
`algorithmKey`	The algorithm key must correspond with the algorithm chosen above: • AES • DES • DESede

Using this information, prepare the appropriate JSON for the sensitive data to be encrypted, for example:

```
{"plainTextPassword":"secret","algorithm":"AES/CBC/PKCS5PADDING","algorithmKey":"AES"}
```

Keep this JSON available to use when you follow the steps below.

Step 1. Encrypt the sensitive data

When you encrypt the database password, you can supply some optional arguments, as shown in the table below.

Argument	Description
`-c,--class <arg>`	Canonical class name of the encoder provider. Leave empty to use the default: `com.atlassian.secrets.store.base64.Base64SecretStore`
`-h,--help`	Output the help message, which displays these optional arguments
`-m,--mode <arg>`	Use 'encrypt' to encode (default) or 'decrypt' to decode your provided password.
`-p,--password <arg>`	The plaintext password that you want to encrypt. If you omit this parameter, the console will ask you to type the password.
`-s,--silent`	Log minimum info.

To encrypt the database password, follow the steps below.

1. Go to `<Bitbucket-installation-directory>/tools/atlassian-password`.
2. Run the following command to encrypt your database password. You can also use the optional parameters described above.

   ```
   java -cp "./*" com.atlassian.secrets.cli.db.DbCipherTool -c com.atlassian.secrets.store.algorithm.
   AlgorithmSecretStore
   ```

   When prompted for a password enter the prepared JSON object based on the information from Before you begin.
   Note: the JSON object must be entered as a single line.
   When this command runs successfully, you will see output similar to the output below:

```
2023-10-13 00:30:49,016 main INFO [com.atlassian.secrets.DefaultSecretStoreProvider] Initiating
secret store class: com.atlassian.secrets.store.algorithm.AlgorithmSecretStore
2023-10-13 00:30:50,811 main DEBUG [secrets.store.algorithm.AlgorithmSecretStore] Initiate
AlgorithmCipher
2023-10-13 00:30:50,891 main DEBUG [secrets.store.algorithm.AlgorithmSecretStore] Encrypting
data...
2023-10-13 00:30:50,950 main DEBUG [store.algorithm.serialization.
EnvironmentVarBasedConfiguration] Will try to read file path from environment variable under:
com_atlassian_db_config_password_ciphers_algorithm_java_security_AlgorithmParameters
2023-10-13 00:30:50,951 main DEBUG [store.algorithm.serialization.
EnvironmentVarBasedConfiguration] Nothing found under environment variable.
2023-10-13 00:30:51,093 main DEBUG [store.algorithm.serialization.UniqueFilePathGenerator] Will
use generated name: java.security.AlgorithmParameters_1234567890
2023-10-13 00:30:51,108 main DEBUG [secrets.store.algorithm.AlgorithmSecretStore] Name of
generated file with algorithm params used for encryption: java.security.
AlgorithmParameters_1234567890
2023-10-13 00:30:51,111 main DEBUG [store.algorithm.serialization.
EnvironmentVarBasedConfiguration] Will try to read file path from environment variable under:
com_atlassian_db_config_password_ciphers_algorithm_javax_crypto_spec_SecretKeySpec
2023-10-13 00:30:51,111 main DEBUG [store.algorithm.serialization.
EnvironmentVarBasedConfiguration] Nothing found under environment variable.
2023-10-13 00:30:51,220 main DEBUG [store.algorithm.serialization.UniqueFilePathGenerator] Will
use generated name: javax.crypto.spec.SecretKeySpec_1234567890
2023-10-13 00:30:51,245 main DEBUG [store.algorithm.serialization.SerializationFile] Saved file:
javax.crypto.spec.SecretKeySpec_1234567890
2023-10-13 00:30:51,353 main DEBUG [store.algorithm.serialization.UniqueFilePathGenerator] Will
use generated name: javax.crypto.SealedObject_1234567890
2023-10-13 00:30:51,357 main DEBUG [store.algorithm.serialization.SerializationFile] Saved file:
javax.crypto.SealedObject_1234567890
2023-10-13 00:30:51,369 main DEBUG [secrets.store.algorithm.AlgorithmSecretStore] Encryption done.
Success!
For Jira, set the following properties in dbconfig.xml:

<atlassian-password-cipher-provider>com.atlassian.secrets.store.algorithm.AlgorithmSecretStore<
/atlassian-password-cipher-provider>
<password>{"sealedObjectFilePath":"javax.crypto.SealedObject_1234567890","keyFilePath":"javax.
crypto.spec.SecretKeySpec_1234567890"}</password>

For Bitbucket, set the following properties in bitbucket.properties:

jdbc.password.decrypter.classname=com.atlassian.secrets.store.algorithm.AlgorithmSecretStore
jdbc.password={"sealedObjectFilePath":"javax.crypto.SealedObject_1234567890","keyFilePath":"javax.
crypto.spec.SecretKeySpec_1234567890"}

For Bamboo, set the following properties in bamboo.cfg.xml:

<property name="jdbc.password.decrypter.classname">com.atlassian.secrets.store.algorithm.
AlgorithmSecretStore</property>
<property name="hibernate.connection.password">{"sealedObjectFilePath":"javax.crypto.
SealedObject_1234567890","keyFilePath":"javax.crypto.spec.SecretKeySpec_1234567890"}</property>

For Confluence, set the following properties in confluence.cfg.xml:

<property name="jdbc.password.decrypter.classname">com.atlassian.secrets.store.algorithm.
AlgorithmSecretStore</property>
<property name="hibernate.connection.password">{"sealedObjectFilePath":"javax.crypto.
SealedObject_1234567890","keyFilePath":"javax.crypto.spec.SecretKeySpec_1234567890"}</property>
```

When encrypting your data, the encryption tool generates three files and prints the output JSON object that you'll later add to the `bitbucket.properties` file. The next step discusses how to secure those files.

Step 2. Secure the generated files

Encrypting a password results in three generated files:

- `javax.crypto.SealedObject_[timestamp]`
  The file with the encrypted password.
- `javax.crypto.spec.SecretKeySpec_[timestamp]`
  The key used to encrypt your password. You will need this file to decrypt your password.

- `java.security.AlgorithmParameters_[timestamp]`
  The algorithm parameters used to encrypt your password. You will need this file only if you want to recreate an encrypted password.

If you're running Bitbucket in a cluster, the files should be available to all nodes via the same path. Bitbucket needs to be able to access and read those files to decrypt your password and connect to the database.

1. Move the files generated by the tool to a secure place.
2. Change them to read-only and accessible only to the user running Bitbucket.

Step 3. Add the encrypted data to bitbucket.properties

To add the encrypted data:

1. Back up the `<home-directory>/shared/bitbucket.properties` file. Move the backup to a safe place outside of your instance.
2. In the `bitbucket.properties` file, add or modify the `encrypted-property.cipher.classname` property to contain:

```
com.atlassian.secrets.store.algorithm.AlgorithmSecretStore
```

3. In the `bitbucket.properties` file, add or modify the `jdbc.password` property to contain the fully qualified path to the two files prefixed with `{ENC}`:

```
{ENC}{"sealedObjectFilePath":"/home/bitbucket/javax.crypto.SealedObject_1234567890","
keyFilePath":"/home/bitbucket/javax.crypto.spec.SecretKeySpec_1234567890"}
```

4. Once updated, check that the `bitbucket.properties` contains:

```
encrypted-property.cipher.classname=com.atlassian.secrets.store.algorithm.AlgorithmSecretStore
jdbc.password={ENC}{"sealedObjectFilePath":"/home/bitbucket/javax.crypto.
SealedObject_1234567890","keyFilePath":"/home/bitbucket/javax.crypto.spec.
SecretKeySpec_1234567890"}
```

5. Restart Bitbucket.

Decrypt the sensitive data

To decrypt the sensitive data:

1. Extend the command used earlier with the `-m decrypt` parameter:

```
java -cp "./*" com.atlass ian.secrets.cli.db.DbCipherTool -c com.atlassian.secrets.store.
algorithm.AlgorithmSecretStore -m decrypt
```

2. When asked for a password, provide the JSON object from your `bitbucket.properties` file without the `{ENC}` prefix.

```
{"sealedObjectFilePath":"/home/bitbucket/javax.crypto.SealedObject_1234567890","keyFilePath":"
/home/bitbucket/javax.crypto.spec.SecretKeySpec_1234567890"}
```

On running the command, the secret will be decrypted and printed:

```
2023-10-13 05:01:14,203 main INFO [com.atlassian.secrets.DefaultSecretStoreProvider] Initiating secret
store class: com.atlassian.secrets.store.algorithm.AlgorithmSecretStore
2023-10-13 05:01:15,991 main DEBUG [secrets.store.algorithm.AlgorithmSecretStore] Initiate
AlgorithmCipher
2023-10-13 05:01:16,068 main DEBUG [secrets.store.algorithm.AlgorithmSecretStore] Decrypting data...
2023-10-13 05:01:16,250 main DEBUG [secrets.store.algorithm.AlgorithmSecretStore] Decryption done.
Success! Decrypted password using cipher provider: com.atlassian.secrets.store.algorithm.
AlgorithmSecretStore decrypted password: secret
```

Recreate encrypted data

If you lose an encrypted password and try to encrypt the plaintext password once again, the new encrypted password will look different. This is not an issue, as it will still represent the same plaintext password. However, in some cases, you might want to keep it consistent, for example by having the same encrypted password when a Bitbucket instance is migrated to another server.

To encrypt the password in the exact same way as you did before, you will need the key used to encrypt the original password and the algorithm parameters. Both of these were generated by the encryption tool and saved in the following files:

- **Key:** `javax.crypto.spec.SecretKeySpec_[timestamp]`
- **Algorithm parameters:** `java.security.AlgorithmParameters_[timestamp]`

Once you've located these files, you can point the encryption tool to their location by using two extra fields in the JSON object.

Field	Description
`keyFilePath`	Path to a file that contains the key used to encrypt your original password, e.g. `javax.crypto.spec.SecretKeySpec_[timestamp]`. If you stored the file path as environment variable, you can omit this parameter.
`algorithmParametersFilePath`	Path to a file that contains the algorithm parameters used to encrypt your original password, e.g. `java.security.AlgorithmParameters_[timestamp]`.

```
{"plainTextPassword":"secret","algorithm":"AES/CBC/PKCS5PADDING","algorithmKey":"AES","
algorithmParametersFilePath":"/home/bitbucket/java.security.AlgorithmParameters_1234567890","
keyFilePath":"/home/bitbucket/javax.crypto.spec.SecretKeySpec_1234567890"}
```

To encrypt the password, follow the steps in the first step, Encrypt the password, and use the JSON object with the key and algorithm parameters.

Troubleshooting

This means that Bitbucket couldn't connect to the database to access your configuration, most probably because of an error with decrypting your password.

To solve this problem, examine the log files:

- `<Bitbucket_home_directory>/log/atlassian-bitbucket.log`
- `<Bitbucket_home_directory>/log/atlassian-launcher.log`

and look for the cause preventing startup, namely `DataSourcePasswordDecryptionException`.

For example:

```
com.atlassian.stash.internal.jdbc.DatasourcePasswordDecryptionException: java.lang.
IllegalArgumentException: <>
```

This exception contains details about the error. If the error is `java.lang.IllegalArgumentException`, you will need to encrypt the password again.

- If the error is related to missing files, there might be a problem with your environment variables. They could have been deleted, or have not been set correctly. To verify that, try adding file paths to the JSON object in the bitbucket.properties file.
- If you're seeing some Bouncy Castle errors, you will need to encrypt the password again.

To investigate this problem, open `<Bitbucket_home_directory>/log/atlassian-bitbucket.log`, and check for `JdbcSQLExceptions`. The messages should be pretty clear as to what went wrong.

You'll likely see the following message:

```
Wrong user name or password [28000-176]
```

This means that Bitbucket decrypted the password successfully, but the password itself is incorrect. You can verify that by completing these steps:

1. Open the `bitbucket.properties` file, and copy the encrypted password.
2. Decrypt the password.
3. Check if the decrypted password is the same as the one in your backup `bitbucket.properties` file.

To disable database password encryption, remove the `encrypted-property.cipher.classname` property from the `bitbucket.properties` file, and change the encrypted password to the plaintext one.

Custom implementation

In addition to the basic and advanced encryption methods that you can use in Bitbucket Data Center, you can also choose to create your own `SecretStore` implementation. This might be especially useful if:

- you're required to use a specific vault to store the password
- you want to use encryption algorithms beyond those we ship with Bitbucket

Step 1. Create a Maven project and get API dependencies

1. Navigate to the `<Bitbucket_installation_directory>/atlassian-bitbucket/WEB-INF/lib` directory.
2. Install the `atlassian-secrets-api.jar` file into local maven repository with the following command:

```
mvn install:install-file \
   -Dfile=./atlassian-secrets-api-<version>.jar \
   -DgroupId=com.atlassian.secrets \
   -DartifactId=atlassian-secrets-api \
   -Dversion=<version> \
   -Dpackaging=jar \
   -DgeneratePom=true
```

3. Install the `atlassian-secrets-store.jar` file into local maven repository with the following command:

```
mvn install:install-file \
   -Dfile=./atlassian-secrets-store-<version>.jar \
   -DgroupId=com.atlassian.secrets \
   -DartifactId=atlassian-secrets-store \
   -Dversion=<version> \
   -Dpackaging=jar \
   -DgeneratePom=true
```

4. Create a Maven project with the following pom:

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://maven.apache.org/POM/4.0.0http://maven.apache.org/xsd/maven-4.0.0.xsd">
<modelVersion>4.0.0</modelVersion>

  <groupId><your_group_ID></groupId>
  <artifactId><your_artifact_ID></artifactId>
  <version><your_version></version>

  <properties>
    <maven.compiler.source>1.8</maven.compiler.source>
    <maven.compiler.target>1.8</maven.compiler.target>
  </properties>

  <build>
    <resources>
      <resource>
        <directory>src/main/resources/libs</directory>
        <excludes>
          <exclude>*</exclude>
        </excludes>
        <filtering>false</filtering>
      </resource>
    </resources>
  </build>

  <dependencies>
    <dependency>
      <groupId>com.atlassian.secrets</groupId>
      <artifactId>atlassian-secrets-api</artifactId>
      <version><api_version></version>
      <scope>provided</scope>
    </dependency>
    <dependency>
      <groupId>com.atlassian.secrets</groupId>
      <artifactId>atlassian-secrets-store</artifactId>
      <version><api_version></version>
      <scope>provided</scope>
    </dependency>
  </dependencies>
</project>
```

Step 2. Implement the SecretStore interface

The SecretStore interface contains two methods that you need to implement according to your requirements; `store` and `get`. The `get` method is called during Bitbucket startup, which means that long-running tasks can affect the startup time. The `store` method is not called by Bitbucket, as it's only used in the encryption tool.

From Bitbucket 8.13, the `Cipher` interface should be considered deprecated. Instead, you should use the new interface, `SecretStore`, and its corresponding methods, `store` and `get`. These methods supersede the equivalent `Cipher` interface methods, `encrypt` and `decrypt`.

The `Cipher` interface and its methods can still be used, but will eventually be retired, and should not be used when setting up new encryption functionality.

You can use `Base64Cipher` and `AlgorithmSecretStore` as examples.

Step 3. Test your implementation

The encryption tool described in Basic encryption and Advanced encryption uses the same code as Bitbucket to decrypt the password. You can use it to test your implementation.

Assuming that the CLI and your jar is in the same folder:

```
java -cp "./*" com.atlassian.secrets.cli.db.DbCipherTool -c your.package.here.ClassName
```

Step 4. Make your library available

Bitbucket must be able to access your library. Your class will be instantiated using reflection. Put the library in the following directory:

```
<Bitbucket_home_directory>/lib
```

Configuring Bitbucket with AWS Secrets Manager

AWS Secrets Manager is a service to retrieve credentials through a runtime call, eliminating hard-coded credentials altogether. This type of encryption is especially useful if you want a secure storage option for your database credentials.

AWS Secrets Manager uses AWS Identity and Access Management (IAM) for authentication and access control so you don’t need to create tokens or maintain keys with other third parties.

We don’t currently support automated rotating credentials.

To configure Bitbucket to work with AWS Secrets Manager:

1. Create your secret in AWS Secrets Manager
2. Check your permissions to retrieve your secret
3. Authenticate to AWS
4. Confirm that you can retrieve your secret
5. Add the secret to the properties file

The following steps will guide you through the process. For additional help with AWS Secrets Manager, visit https://docs.aws.amazon.com/secretsmanager/index.html.

Step 1: Create your secret in AWS Secrets Manager

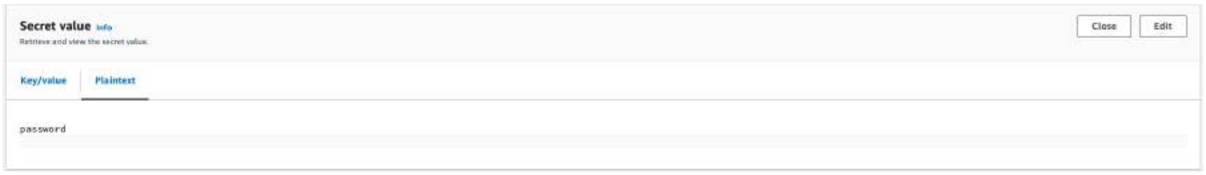
You can create a secret as plaintext or structured text. Creating a plaintext secret is faster and easier than creating a structured secret.

To see how they differ, check the following example, which shows how each option looks in the AWS console and your code.

Plaintext secret

AWS console showing a plaintext secret with the name `mySecretId`:

```
password
```



```
password
```

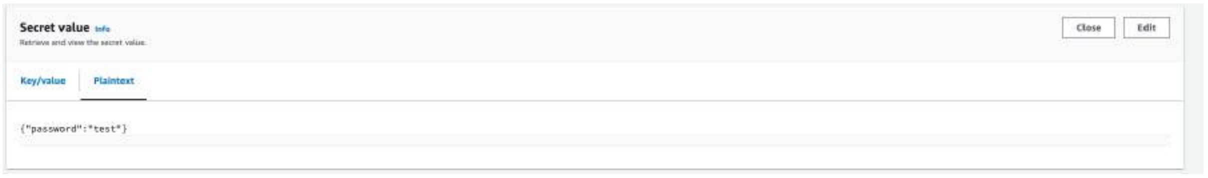
How this might appear in your code:

```
{"region":"ap-southeast-2","secretId":"mySecretId"}
```

Structured secret

AWS console showing a structured secret with the name `mySecretId`, which has a `secretPointer` value of `password`:

```
{"password": "mySecretPassword"}
```



```
{"password":"test"}
```

How this might appear in your code:

```
{"region":"ap-southeast-2","secretId":"mySecretId", "secretPointer": "/password"}
```

In the example above, the JSON keys include:

JSON key	Description
`region`	The AWS region ID of the secret source.
`secretID`	The ID of the secret.
`secretPointer`	A JSON pointer for the secret value (required if your secret value is in a key/value pair structure). Note that this value should be prefixed with a slash (`/`).

Detailed steps

1. Ensure you have decided whether to use a plaintext secret or a structured secret (see the content above these steps for further details).
2. Follow the instructions provided by AWS to create a secret: https://docs.aws.amazon.com/secretsmanager/latest/userguide/create_secret.html

Step 2: Check your permissions to retrieve your secret

To retrieve any secrets from AWS Secrets Manager, Bitbucket must have the appropriate AWS permissions, namely:

- `secretsmanager:GetSecretValue`

Here is a sample Identity and Access Management (IAM) policy providing appropriate permissions (based on a least privilege model):

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::123456789012:role/MyRole"
            },
            "Action": "secretsmanager:GetSecretValue",
            "Resource": "arn:aws:secretsmanager:us-west-2:123456789012:secret:1a2b3c"
        }
    ]
}
```

Additional info

- For more details on configuring permissions follow the AWS instructions (with linked examples).
- If you're using your own KMS key for secret retrieval permission, follow the AWS instructions (with examples).

Step 3: Authenticate to AWS

Bitbucket uses the AWS SDK for Java 2.x to communicate with AWS Secrets Manager. The SDK will search for credentials in your Bitbucket environment in the predefined sequence below until it can be authenticated.

Amazon EC2 instance profile credentials are recommended by Amazon. If using this option then it is also advisable to use v2 of the Instance Meta Data Service.

1. Environment variables
2. Java system properties

   > ⚠ If using Java system properties be aware that these values may be logged by the product on startup.

3. Web identity token from AWS Security Token Service
4. The shared credentials and `config` files (`~/.aws/credentials`)
5. Amazon ECS container credentials
6. **Amazon EC2 instance profile credentials** (recommended by Amazon)

For information on setting credentials in your environment, Amazon has developer guides on Working with AWS Credentials.

Step 4: Confirm that you can retrieve your secret

Now that a secret has been created, the correct permissions are in place and Bitbucket is appropriately authenticated to AWS, let's confirm the secret can be retrieved.

Run the following command from your host environment:

```
aws secretsmanager get-secret-value --secret-id=mySecretId --region=ap-southeast-2
```

Step 5: Add the secret to bitbucket.properties

1. Back up the `<home-directory>/shared/bitbucket.properties` file. Move the backup to a safe place outside of your instance.
2. In the `bitbucket.properties` file, add or modify the `encrypted-property.cipher.classname` property to contain:

   ```
   com.atlassian.secrets.store.aws.AwsSecretsManagerStore
   ```

3. In the `bitbucket.properties` file, add or modify the `jdbc.password` property to contain the coordinates to the secret in AWS Secrets Manager prefixed with `{ENC}`:

   ```
   {ENC}{"region":"ap-southeast-2","secretId":"mySecretId", "secretPointer": "/password"}
   ```

   The value is defined as a JSON object with the following values:

   - `region` (required) – the AWS region where the AWS secret is located
   - `secretId` (required) – the name of the secret
   - `secretPointer` (optional) – the key containing the password in a secret with the key-value structure. If omitted, the password is treated as plaintext.
4. Once updated, `bitbucket.properties` should contain:

   ```
   encrypted-property.cipher.classname=com.atlassian.secrets.store.aws.AwsSecretsManagerStore
   jdbc.password={ENC}{"region":"ap-southeast-2","secretId":"mySecretId", "secretPointer": "
   /password"}
   ```

5. Restart Bitbucket.

Configure Bitbucket with HashiCorp Vault

HashiCorp Vault is a secrets management platform that helps you store, access, and manage sensitive data. Bitbucket now supports Vault as a secure storage option for your product configuration file.

Supported engines

- V2 of the KV Secret Engine
  - We only support retrieving the most recent version of a secret.

Supported authentication

- Token
- Kubernetes

How to set up Vault

The steps below assume you already have a Hashicorp Vault instance running. For more details, see the Hashicorp Vault documentation.

To configure Bitbucket to work with HashiCorp Vault:

1. Create a secret in your HashiCorp Vault instance.
2. Create a policy with permission to read your secret.
3. Authenticate Bitbucket with Vault.
4. Add the Vault configuration data to the `<home-directory>/shared/bitbucket.properties` file.

Important
It's quite common for Vault deployments to have a **KV V2 Secret Engine** enabled under the `secret` mount. If you are using a different Vault deployment, please see the HashiCorp documentation for enabling a new KV V2 Secret Engine:
https://developer.hashicorp.com/vault/docs/secrets/kv/kv-v2

These steps are explained in more detail below.

Step 1: Create a secret in your HashiCorp Vault instance

If you haven't created a secret in the **KV V2 Secret Engine** of your Vault instance before, take a look at the Hashicorp Vault documentation for more information.

This secret must contain a single value for your product configuration file.

Step 2: Create a policy with permission to read your secret

If you need detailed instructions on creating a policy in Vault, see the Hashicorp Vault documentation. The details below provide additional information from the Bitbucket perspective.

To retrieve your secret from the Vault, Bitbucket must have a policy with the `read` permission.

Below is a sample Vault policy with permission to read a secret in the KV V2 Secret Engine.

```
path "secret/data/sample/secret" {
  capabilities = ["read"]
}
```

In the sample path above, there are three components:

Component	Description
`secret`	This is where the KV V2 Secret Engine is mounted.
`data`	This prefix indicates this is a KV V2 secret.
`sample/secret`	This is the path that contains this secret.

If the previous policy is located in `./sample_policy.hcl`, this command will create the policy on the server:

```
vault policy write sample_policy ./sample_policy.hcl
```

Step 3: Authenticate Bitbucket with Vault

You can choose to authenticate with a token, or, if you're using a Kubernetes environment, with the Kubernetes auth method. Both methods are described below.

Authenticate with a token

The information below assumes you're familiar with creating a Vault token. Refer to the HashiCorp Vault documentation for more information and token options.

1. Create a new token using the command:

   ```
   vault token create -policy=sample_policy
   ```

2. To confirm that your token and policy allow access to the secret, run the commands:

   ```
   export VAULT_TOKEN=<YOUR_TOKEN>
   vault kv get -mount=secret sample/secret
   ```

3. You should see the following output:

   ```
   ====== Secret Path ======
   secret/data/sample/secret

   ======= Metadata =======
   Key         Value
   ---         -----
   ~~~~        ~~~~~

   ====== Data ======
   Key         Value
   ---         -----
   ~~~~        ~~~~~
   ```

   If you don't see the output above, refer to the Hashicorp documentation to troubleshoot the issue.
   To complete the process, an environment variable associated with the token must be present on Bitbucket.

4. Define the environment variable `SECRET_STORE_VAULT_TOKEN` in the context of the Bitbucket instance. A simple way to do this is to add the following line to the `~/.bashrc` file for the user running Bitbucket:

   ```
   export SECRET_STORE_VAULT_TOKEN=<YOUR_TOKEN>
   ```

Authenticate using Kubernetes Service Account Token

If Bitbucket is operating within a Kubernetes environment, you can leverage the Kubernetes auth method. This method uses a Kubernetes Service Account Token to confirm the identity of the pod that runs Bitbucket and to grant the appropriate access.

Refer to the Hashicorp Vault documentation for more information on how to set up Kubernetes auth method in your Vault instance. Make sure you have enabled Kubernetes auth method on your Vault server before you start the steps below.

You will also need to set some environment variables in the following steps. The table below describes these.

Environment variable	Description
`SECRET_STORE_VAULT_KUBE_AUTH_ROLE`	The name of the role defined in Vault that's attached to Kubernetes auth method.
`SECRET_STORE_VAULT_KUBE_AUTH_PATH` (Optional)	The path defined in Kubernetes auth method. The default value is: `kubernetes`
`SECRET_STORE_VAULT_KUBE_AUTH_JWT_PATH` (Optional)	The location of the Service Account Token file in the pod for Bitbucket . The default value is: `/var/run/secrets/kubernetes.io/serviceaccount/token`

1. If you used custom path to create a Kubernetes auth method, replace `kubernetes` in the CLI command in the following step with your path name.
2. Define a role to link the auth method with the `sample_policy` you created with the following command:

```
vault write auth/kubernetes/role/<YOUR_NEW_ROLE_NAME> \
    bound_service_account_names=<YOUR_PRODUCT_SERVICE_ACCOUNT_NAME> \
    bound_service_account_namespaces=<YOUR_PRODUCT_SERVICE_NAMESPACE> \
    policies=sample_policy
```

3. Ensure that your Bitbucket pod has access to the secret.
   Currently, Vault CLI doesn't offer support for logging in with Kubernetes auth method, but you can log in to retrieve client token using HTTP API and then use this generated token to test for access.
4. If you can't retrieve the secret with the generated token, refer to Hashicorp's documentation to troubleshoot the issue.
5. Refer to the table at the start of these steps to set the following environment variables for Bitbucket:

- `SECRET_STORE_VAULT_KUBE_AUTH_ROLE`
- `SECRET_STORE_VAULT_KUBE_AUTH_PATH` (optional)
- `SECRET_STORE_VAULT_KUBE_AUTH_JWT_PATH` (optional)

ⓘ If there are any problems with your configurations, (for example, the secret is not accessible with the authentication token), Bitbucket won't start. Check the log file `launcher.log` for any related error messages.

Step 4: Add the Vault configuration data to bitbucket.properties

Vault is configured via a JSON object that is added to the `<home-directory>/shared/bitbucket.properties` file. The JSON configuration object has a number of fields. Make sure you refer to the following table for details on each of these properties.

We highly recommend that all your Vault instances use HTTPS to further improve security.

Field	Required?	Description
`mount`	Required	The KV V2 Secret Engine mount path.
`path`	Required	The secret path.
`key`	Required	The key name.
`endpoint`	Required	The base URL of your Vault instance. This accepts both HTTP and HTTPS. We highly recommend you always use HTTPS. Omit the trailing slash, if your URL has one.
`authenticationType`	Optional	The type of authentication you wish to use. Supported options are `TOKEN` and `KUBERNETES`. The default is `TOKEN`.

1. In the Bitbucket home directory, back up the `bitbucket.properties` file. Move the backup file to a safe place outside of your Bitbucket server.
2. In the `bitbucket.properties` file, add or modify the `encrypted-property.cipher.classname` property to contain:

```
com.atlassian.secrets.store.vault.VaultSecretStore
```

3. In the `bitbucket.properties` file, add or modify the `jdbc.password` property to contain your JSON configuration object. Use the table at the start of these steps for further information on these fields.
   Here is an example of how it might look:

```
{ENC}{"mount": "secret", "path": "sample/secret", "key": "password", "endpoint": "https://127.0.0.1:
8200"}
```

4. Restart Bitbucket

Data pipeline

This feature is available with a Bitbucket Data Center license.

On this page:

Data pipeline provides an easy way to export data from Jira, Confluence, or Bitbucket, and feed it into your existing data platform (like Tableau or Power BI). This allows you to:

- generate richer reports and visualizations of site activity
- better understand how your teams are using your application
- make better decisions on optimizing the use of Jira or Confluence in your organization

You can trigger a data export in your application’s admin console or through the REST API. Data will be exported in CSV format. You can only perform one data export at a time.

For a detailed reference of the exported data's schema, see Data pipeline export schema.

Data pipeline is available in Data Center editions of:

- Jira 8.14 and later
- Confluence 7.12 and later
- Bitbucket 7.13 and later

Requirements

To trigger data exports through the REST API, you’ll need:

- A valid Bitbucket Data Center license
- Bitbucket system admin global permissions

Considerations

There are a number of security and performance impacts you’ll need to consider before getting started.

Security

The export will include all data, including PII (Personally Identifiable Information) and restricted content. This is to provide you with as much data as possible, so you can filter and transform to generate the insights you’re after.

If you need to filter out data based on security and confidentiality, this must be done after the data is exported.

Exported files are saved in your shared home directory, so you’ll also want to check this is secured appropriately.

Export performance

Exporting data can take a long time in large instances. We intentionally export data at a limited rate to keep any performance impact to your site under a 5% threshold. It’s important to note that there is no impact to performance unless an export is in progress.

When scheduling your exports, we recommend that you:

- Limit the amount of data exported using the `fromDate` parameter, as a date further in the past will export more data, resulting in a longer data export.

- Schedule exports during hours of low activity, or on a node with no activity, if you do observe any performance degradation during the export.

Amount of data	Approximate export duration
Small data set • 27 million commits • 250,000 pull requests • 1.5 million pull request activity records • 6,500 repositories • 2,000 users	10 hours
Large data set • 207 million commits • 1 million pull requests • 6.8 million pull request activity records • 52,000 repositories • 25,000 users	35 hours

Test performance vs production

The data presented here is based on our own internal testing. The actual duration and impact of a data export on your own environment will likely differ depending on:

- your infrastructure, configuration, and load
- amount of pull request activity to be exported.

Our tests were conducted on Data Center instances in AWS:

- Small - EC2 instance type `m5d.4xlarge` and RDS instance type `db.m4.4xlarge`
- Large - EC2 instance type `c5.2xlarge` and RDS instance type `db.m5.large`

Access the data pipeline

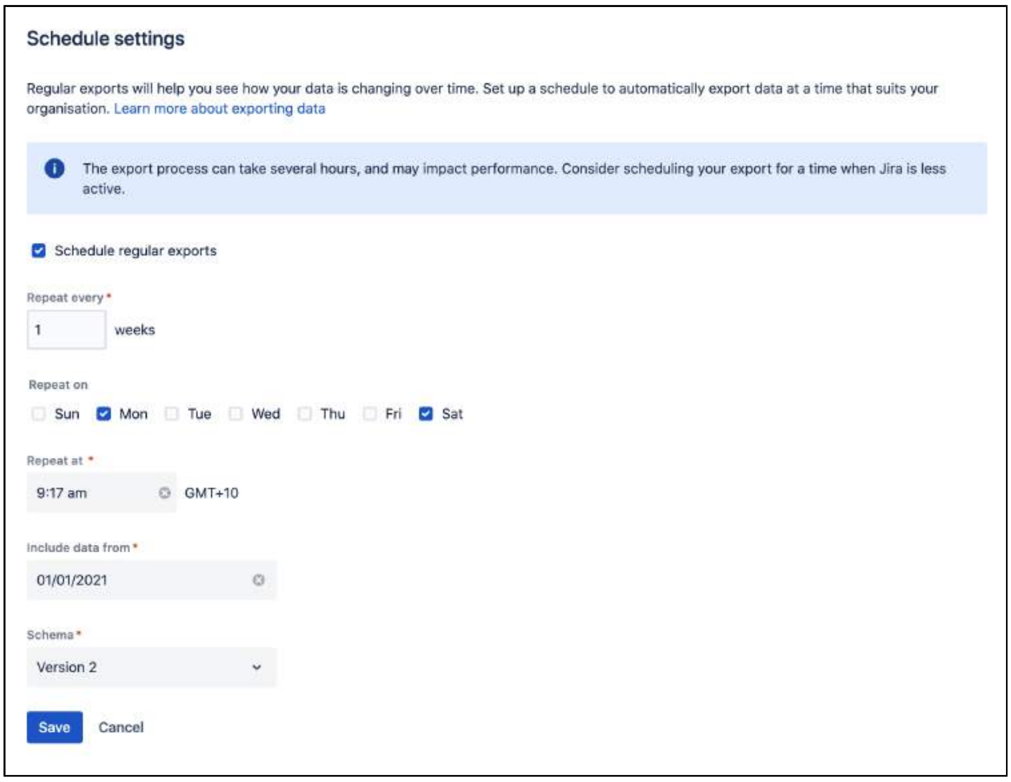
To access the data pipeline select ⚙ > **Data pipeline**.

Schedule regular exports

The way to get the most value out of the data pipeline is to schedule regular exports. The data pipeline performs a full export every time, so if you have a large site, you may want to only export once a week.

To set the export schedule:

1. From the Data pipeline screen, select **Schedule settings**.
2. Select the **Schedule regular exports** checkbox.
3. Select the date to include data from. Data from before this date won’t be included. This is usually set to 12 months or less.
4. Choose how often to repeat the export.
5. Select a time to start the export. You may want to schedule the export to happen outside working hours.
6. Select the **Schema version** to use (if more than one schema is available).
7. **Save** your schedule.



Schedule settings

Regular exports will help you see how your data is changing over time. Set up a schedule to automatically export data at a time that suits your organisation. Learn more about exporting data

The export process can take several hours, and may impact performance. Consider scheduling your export for a time when Jira is less active.

[✓] Schedule regular exports

Repeat every*: 1 weeks

Repeat on: [ ] Sun [✓] Mon [ ] Tue [ ] Wed [ ] Thu [ ] Fri [✓] Sat

Repeat at*: 9:17 am GMT+10

Include data from*: 01/01/2021

Schema*: Version 2

Save Cancel

Timezones and recurring exports

We use your server timezone to schedule exports (or system timezone if you've overridden the server time in the application). The export schedule isn't updated if you change your timezone. If you do need to change the timezone, you'll need to edit the schedule and re-enter the export time.

You can schedule exports to happen as often as you need. If you choose to export on multiple days, the first export will occur on the nearest day after you save the schedule. Using the example in the screenshot above, if you set up your schedule on Thursday, the first export would occur on Saturday, and the second export on Monday. We don't wait for the start of the week.

Export schema

The export schema defines the structure of the export. We version the schema so that you know your export will have the same structure as previous exports. This helps you avoid problems if you've built dashboards or reports based on this data.

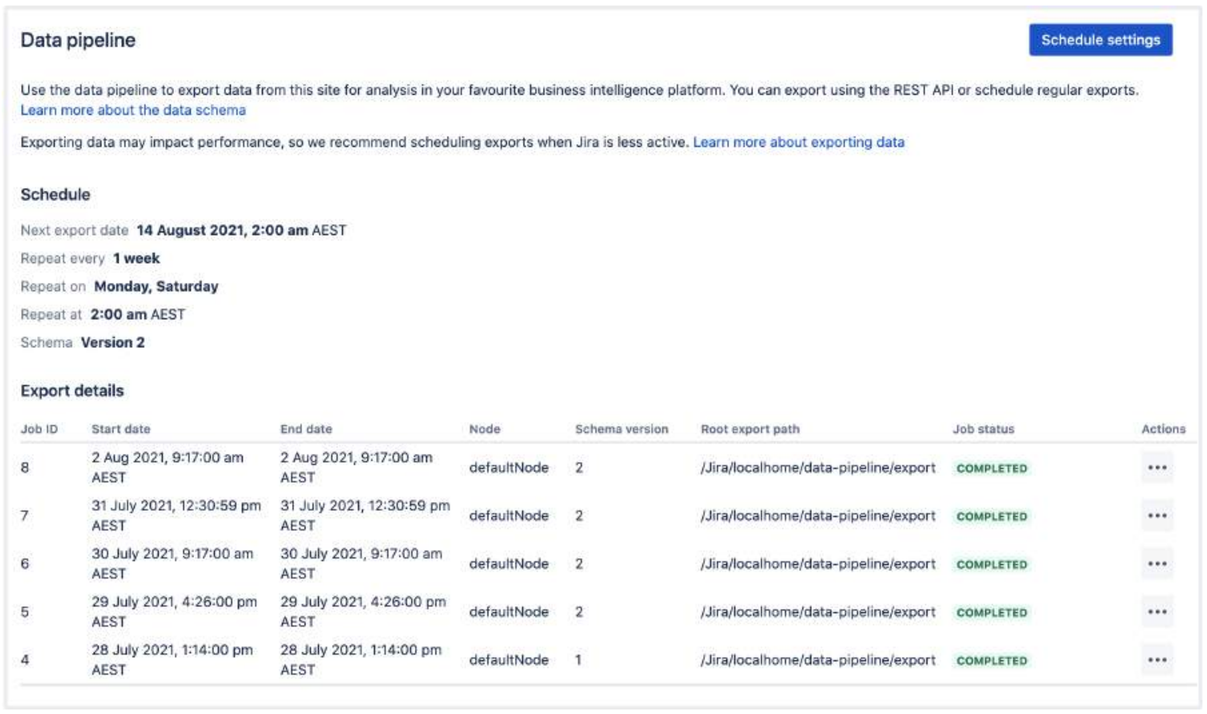
We only introduce new schema versions for breaking changes, such as removing a field, or if the way the data is structured changes. New fields are simply added to the latest schema version.

Older schema versions will be marked as 'deprecated', and may be removed in future versions. You can still export using these versions, just be aware we won't update them with any new fields.

Check the status of an export

You can check the status of an export and view when your last export ran from the data pipeline screen.

The **Export details** table will show the most recent exports, and the current status.



Data pipeline

Schedule settings

Use the data pipeline to export data from this site for analysis in your favourite business intelligence platform. You can export using the REST API or schedule regular exports.
Learn more about the data schema

Exporting data may impact performance, so we recommend scheduling exports when Jira is less active. Learn more about exporting data

Schedule

Next export date **14 August 2021, 2:00 am** AEST
Repeat every **1 week**
Repeat on **Monday, Saturday**
Repeat at **2:00 am** AEST
Schema **Version 2**

Export details

Job ID	Start date	End date	Node	Schema version	Root export path	Job status	Actions
8	2 Aug 2021, 9:17:00 am AEST	2 Aug 2021, 9:17:00 am AEST	defaultNode	2	/Jira/localhome/data-pipeline/export	COMPLETED	•••
7	31 July 2021, 12:30:59 pm AEST	31 July 2021, 12:30:59 pm AEST	defaultNode	2	/Jira/localhome/data-pipeline/export	COMPLETED	•••
6	30 July 2021, 9:17:00 am AEST	30 July 2021, 9:17:00 am AEST	defaultNode	2	/Jira/localhome/data-pipeline/export	COMPLETED	•••
5	29 July 2021, 4:26:00 pm AEST	29 July 2021, 4:26:00 pm AEST	defaultNode	2	/Jira/localhome/data-pipeline/export	COMPLETED	•••
4	28 July 2021, 1:14:00 pm AEST	28 July 2021, 1:14:00 pm AEST	defaultNode	1	/Jira/localhome/data-pipeline/export	COMPLETED	•••

Select ••• > **View details** to see the full details of the export in JSON format. Details include the export parameters, status, and any errors returned if the export failed.

For help resolving failed or cancelled exports, see Data pipeline troubleshooting.

Cancel an export

To cancel an export while it is in progress:

- Go to the **Data pipeline** screen.
- Select ••• next to the export, and choose **Cancel** export.
- Confirm you want to cancel the export.

It can take a few minutes for the processes to be terminated. Any files already written will remain in the export directory. You can delete these files if you don't need them.

Automatic data export cancellations

If you shut down a node running a data export, the export will be cancelled. However, if the JVM is not notified after a crash or hardware-level failure, the export process may get locked. This means you'll need to manually mark the export as cancelled (through the UI, or via the REST API by making a `DELETE` request). This releases the process lock, allowing you to perform another data export.

Exclude projects from the export

You can also exclude projects from the export by adding them to an opt-out list. This is useful if you don't need to report on that particular project, or if it contains sensitive content that you'd prefer not to export.

To add projects to the opt-out list, make a `POST` request to `<base-url>/rest/datapipeline/1.0/config/optout` and pass the project keys as follows.

```
{
 "type": "PROJECT",
 "keys": ["HR","TEST"]
}
```

These projects will be excluded from all future exports. Note that the opt-out feature was introduced in the Data Pipeline version 2.3.0+.

For full details, including how to remove projects from the opt-out list, refer to the Data pipeline REST API reference.

Configuring the data export

You can configure the format of the export data through the following configuration properties.

Default value	**Description**
plugin.data.pipeline.embedded.line.break.preserve	
`false`	Specifies whether embedded line breaks should be preserved in the output files. Line breaks can be problematic for some tools such as Hadoop. This property is set to `False` by default, which means that line breaks are escaped.
plugin.data.pipeline.embedded.line.break.escape.char	
`\\n`	Escaping character for embedded line breaks. By default, we'll print `\n` for every embedded line break.
plugin.data.pipeline.minimum.usable.disk.space.after.export	
5GB	To prevent you from running out of disk space, the data pipeline will check before and during an export that there is at least 5GB free disk space. Set this property, in gigabytes, to increase or decrease the limit. To disable this check, set this property to `-1` (not recommended).

The following additional properties only apply to Bitbucket.

Default value	**Description**
plugin.data.pipeline.bitbucket.export.personal.forked.repository.commits	
`false`	Specifies whether commits from forked repositories in personal projects should be exported. Set this property to `True` to include commits from forked repositories in personal projects.
plugin.data.pipeline.bitbucket.export.build.statuses	
`false`	Specifies whether build statuses should be included in the export. Exporting build statuses can take a significant amount of time if you have a lot of builds. Set this property to `true` to export build statuses.
plugin.data.pipeline.bitbucket.commit.queue.polling.timeout.seconds	
`20`	Time, in seconds, it takes to receive the first commit from git process. You should only need to change this if you see a `CommitStreamingException` (this error is usually caused by another underlying problem).
plugin.data.pipeline.bitbucket.commit.git.execution.timeout.seconds	
`3600`	Sets the idle and execution timeout for the git ref-list command. You should only need to change this if you see "an error occurred while executing an external process: process timed out" error.
plugin.data.pipeline.bitbucket.export.pull.request.activities	
`true`	

	Specifies whether historical data about pull request activity data should be included in the export. Exporting activity data will significantly increase your export duration. Set this property to `false` to exclude pull request activity from your export.

Use the data pipeline REST API

You can use the data pipeline REST API to export data.

To start a data pipeline export, make a POST request to `<base-url>/rest/datapipeline/latest/export`.

Here is an example request, using cURL and a personal access token for authentication:

```
curl -H "Authorization:Bearer ABCD1234" -H "X-Atlassian-Token: no-check"
-X POST https://myexamplesite.com/rest/datapipeline/latest/
export?fromDate=2020-10-22T01:30:11Z
```

You can also use the API to check the status, change the export location, and schedule or cancel an export.

For full details, refer to the Data pipeline REST API reference.

Output files

Each time you perform a data export, we assign a numerical job ID to the task (starting with 1 for your first ever data export). This job ID is used in the file name, and location of the files containing your exported data.

Location of exported files

Exported data is saved as separate CSV files. The files are saved to the following directory:

- `<shared-home>/data-pipeline/export/<job-id>` if you run Bitbucket in a cluster
- `<local-home>/shared/data-pipeline/export/<job-id>` you are using non-clustered Bitbucket.

Within the `<job-id>` directory you will see the following files:

- `build_statuses_<job_id>_<schema_version>_<timestamp>.csv`
- `commits_<job_id>_<schema_version>_<timestamp>.csv`
- `pull_request_activities_<job_id>_<schema_version>_<timestamp>.csv`
- `pull_requests_<job_id>_<schema_version>_<timestamp>.csv`
- `repositories_<job_id>_<schema_version>_<timestamp>.csv`
- `users_<job_id>_<schema_version>_<timestamp>.csv`

To load and transform the data in these files, you'll need to understand the schema. See Data pipeline export schema.

Set a custom export path

By default, the data pipeline exports the files to the home directory, but you can use the REST API to set a custom export path.

To change the root export path, make a PUT request to `<base-url>/rest/datapipeline/1.0/config/export-path`.

In the body of the request pass the absolute path to your preferred directory.

For full details, including how to revert back to the default path, refer to the Data pipeline REST API reference.

Sample Spark and Hadoop import configurations

If you have an existing Spark or Hadoop instance, use the following references to configure how to import your data for further transformation:

```
%python
# File location
file_location = "/FileStore/**/export_2020_09_24T03_32_18Z.csv"

# Automatically set data type for columns
infer_schema = "true"
# Skip first row as it's a header
first_row_is_header = "true"
# Ignore multiline within double quotes
multiline_support = "true"

# The applied options are for CSV files. For other file types, these will be ignored. Note escape &
quote options for RFC-4801 compliant files
df = spark.read.format("csv") \
  .option("inferSchema", infer_schema) \
  .option("header", first_row_is_header) \
  .option("multiLine", multiline_support) \
  .option("quote", "\"") \
  .option("escape", "\"") \
  .option("encoding", "UTF-8").load(file_location)

display(df)
```

```
CREATE EXTERNAL TABLE IF NOT EXISTS some_db.datapipeline_export (
  `repository_id` string,
  `instance_url` string,
  `url` string,
  `repository_name` string,
  `description` string,
  `hierarchy_id` string,
  `origin` string,
  `project_id` string,
  `project_key` string,
  `project_name` string,
  `project_type` string,
  `forkable` string,
  `fork` string,
  `public` string
)
ROW FORMAT SERDE 'org.apache.hadoop.hive.serde2.OpenCSVSerde'
WITH SERDEPROPERTIES (
  "escapeChar" = "\\",
  'quoteChar' = '"',
  'separatorChar' = ','
) LOCATION 's3://my-data-pipeline-bucket/test-exports/'
TBLPROPERTIES ('has_encrypted_data'='false');
```

Troubleshooting failed exports

Exports can fail for a number of reasons, for example if your search index isn’t up to date. For guidance on common failures, and how to resolve them, see Data pipeline troubleshooting in our knowledge base.

Data pipeline export schema

This page describes the structure and data schema of the Bitbucket data export files.

To learn more about how the set up and configure your data pipeline, see Data pipeline.

Output file format and structure

The output files are written in CSV format and are RFC4180 compliant. They have the following characteristics:

- Each file has a header. This includes files from exports that resulted in no data.
- New lines are separated by CRLF characters `\r\n`.
- Fields containing line breaks (CRLF), double quotes, and commas are enclosed in double quote.
- If double-quotes are present inside fields, then a double-quote appearing inside a field are escaped by preceding it with another double quote. For example: `"aaa"`, `"b""bb"`, `"ccc"`.
- Fields with no data (null values) are represented in the CSV export by two consecutive delimiters (as in, `,,`).
- Embedded break lines are escaped by default and printed as n.

Availability

The data exported depends on your Bitbucket version.

Table	Bitbucket version
Repositories	7.13
Commits	7.13
Pull requests	7.13
Pull request activities	7.15
Users	7.13

Individual fields are available in all schema versions, unless specifically noted in the tables below.

Users file

Field	Description
`user_id`	**Type**: String **Description**: ID of the user **Example**: `2853030`
`instance_url`	**Type**: URL **Description**: Base URL of the current instance. **Example:** `https://yoursitename.com`

`user_name`	**Type**: String **Description**: User name of the user. **Example**: `jsmith`
`user_fullname`	**Type**: String **Description**: Full name of the user. **Example**: `John Smith`
`user_email`	**Type**: Email **Description**: Email address of the user. **Example**: `jsmith@example.com`

Repositories file

Field	Description
`repository_id`	**Type:** Number **Description:** Unique identifier for the repository. **Example:** 23
`instance_url`	**Type:** URL **Description:** Base URL of the current instance. Example: `https://yoursitename.com`
`url`	**Type:** String **Description:** URL of the repository. **Example:** `http://yoursitename.com/projects/SAM/repos/sample-repo`
`repository_name`	**Type:** String **Description:** Name of the repository. **Example:** `Sample repo`
`description`	**Type:** String **Description:** Description of the repository.
`hierarchy_id`	**Type:** Number **Description:** The unique identifier for the hierarchy of forks to which this repository belongs. All repositories have a hierarchy ID, even if they have no forks. **Example:** `d536510043f3b4bb4f77`
`origin`	**Type:** String **Description:** Repository from which this repository was forked, if any. **Example:** `SAMPLE/my-fork`

`project_id`	**Type:** Number **Description:** Unique identifier for the project. **Example:** `19`
`project_key`	**Type:** String **Description:** Key of the project this repo is contained in. **Example:** `SAM`
`project_name`	**Type:** String **Description:** Name of the project this repo is contained in. **Example:** `Sample Project`
`project_type`	**Type:** String **Description:** Whether the project the repository is contained in is normal or personal. **Example:** `Personal`
`forkable`	**Type:** Boolean **Description:** ‘Allow forks’ is selected in the repository settings. **Example:** `True`
`fork`	**Type:** Boolean **Description:** Repository is forked from another repository. **Example:** `False`
`public`	**Type:** Boolean **Description:** Whether ‘Public access’ is enabled in the repository settings. **Example:** `False`

Commits file

Field	Description
`commit_hash`	**Type:** String **Description:** Unique identifier of the commit. **Example:** `fc57795ddd877f00e51ab9f51a929220b1a5337b`
`instance_url`	**Type:** URL **Description:** Base URL of the current instance. **Example:** `https://yoursitename.com`

`url`	**Type:** URL **Description:** URL of the commit. **Example:** `https://yoursitename.com/projects/SAM/repos/sample-repo/commits/fc57795ddd877f00e51ab9f51a929220b1a5337b`
`commit_message`	**Type:** String **Description:** Commit message included with the commit.
`repository_id`	**Type:** Number **Description:** Unique identifier for the repository. **Example:** `23`
`author_email`	**Type:** String **Description:** Email address of the author of the committed code. If the author is not a Bitbucket user, this email will not map to a user in the users table. **Example:** `jsmith@example.com`
`authored_date`	**Type:** Date **Description:** Date and time the commit was made. **Example:** `2021-02-04 00:43`
`committer_email`	**Type:** String **Description:** Email address of the user who committed the code. If the committer is not a Bitbucket user, this email will not map to a user in the users table. **Example:** `jsmith@example.com`
`committed_date`	**Type:** Date **Description:** Date and time the commit was last modified. **Example:** `2021-02-04 00:43`

Pull requests file

Field	Description
`pull_request_id`	**Type:** String **Description:** Unique identifier of the pull request. It is a combination to_repository_id & scoped_id. **Example:** `23-16`
`scoped_id`	**Type:** Number **Description:** Identifier for the pull request. This ID is only unique within each repository. **Example:** `16`

`instance_url`	**Type:** URL **Description:** Base URL of the current instance. **Example:** `https://yoursitename.com`
`url`	**Type:** String **Description:** URL of the pull request. **Example:** `http://yoursitename.com/projects/SAM/repos/sample-repo/pull-requests/132/`
`title`	**Type:** String **Description:** Title of the pull request. **Example:** TEST-123 fix broken tests
`description`	**Type:** String **Description:** Description included with the pull request, limited to XXX characters.
`author_id`	**Type:** Number **Description:** Unique identifier of the person who created the pull request. **Example:** `2853030`
`created_date`	**Type:** Date **Description:** Date the pull request was created. **Example:** `2021-01-03 20:57`
`updated_date`	**Type:** Date **Description:** Date the pull request was updated. **Example:** `2021-01-03 23:06`
`closed_date`	**Type:** Date **Description:** Date the pull request was closed. **Example:** `2021-01-03 23:06`
`from_branch_name`	**Type:** String **Description:** The name of the source branch. **Example:** Improve-tests
`from_commit_hash`	**Type:** String **Description:** The commit hash for the earliest commit in this pull request. **Example:** `c149b9a3a37fd211613aaf9390866d1778172a07`

`from_repository_id`	**Type:** Number **Description:** Unique identifier for the source repository. **Example:** `16`
`to_branch_name`	**Type:** String **Description:** The name of the destination branch. **Example:** `Master`
`to_commit_hash`	**Type:** String **Description:** The commit hash for the latest commit in this pull request. **Example:** `d149b9a3a37fd211613aaf9390866d1778172a56`
`to_repository_id`	**Type:** Number **Description:** Unique identifier for the destination repository. **Example:** `23`
`version`	**Type:** Number **Description:** Version number represents the number of times the pull request has been updated. **Example:** `3`
`state`	**Type:** String **Description:** Current status of the pull request. Can be MERGED, DECLINED, or OPEN. **Example:** `MERGED`
`participant_count`	**Type:** Number **Description:** Number of participants on the pull request.
`reviewer_count`	**Type:** Number **Description:** Number of reviewers on the pull request.
`approvals_count`	**Type:** Number **Description:** Number of approvals on the pull request.
`comments_count`	**Type:** Number **Description:** Number of comments on the pull request.
`tasks_count`	**Type:** Number **Description:** Total number of tasks on the pull request.
`resolved_tasks_count`	**Type:** Number **Description:** Number of tasks resolved on the pull request.

`time_to_merge`	**Type:** Number **Description:** Time between pull request creation and merge, in milliseconds. **Example:** `24800`

Pull request activity file

The historical activity for each pull request will be exported to `pull_request_activities` CSV file. Only activity after the export `fromDate` will be included.

Use the `pull_request_id` field to join this table to the pull requests table.

Field	Description
`pull_request_id`	**Type:** String **Description:** Unique identifier of the pull request. It is a combination `to_repository_id` & `scoped_id`. **Example:** `23-16`
`author_id`	**Type:** Number **Description:** Unique identifier of the person who created the pull request. **Example:** `2853030`
`created_date`	**Type:** Date **Description:** Date the action performed on the pull request. **Example:** `2021-01-03 20:57`
`action`	**Type:** String **Description:** The action performed on the pull request, for example created, updated, reviewed, commented, declined, approved, and merged. **Example:** `MERGED`

`additional_information`	**Type:** String
	
	Description: Any additional information associated with the change, in JSON format.
	
	Example:
	`{"comment_id":59,"`
	`"comment_action":"EDITED",`
	`"author_id":2,`
	`"severity":"BLOCKER",`
	`"state":"RESOLVED",`
	`"text":"sample comment",`
	`"thread":39,`
	`"resolved_date":"2021-06-14T13:08:10Z"}`

There are some situations where the created date and user ID may be incorrect in the pull request activities file. This is due to a historical issue, that was resolved in Bitbucket 7.14. For comments edited before the fix, the original created date and user ID was returned in the export, rather than the edited date and user ID.

Build status file (optional)

Exporting build statuses can take a significant amount of time depending on the number of build statuses that might be associated with a commit. For this reason, exporting this data is disabled by default. Set the `plugin.data.pipeline.bitbucket.export.build.statuses` system property to `true` to enable it.

Field	Description
`commit_hash`	**Type:** String **Description:** Commit hash for the commit. **Example:** `fc57795ddd877f00e51ab9f51a929220b1a5337b`
`repository_id`	**Type:** Number **Description:** Unique identifier of the repository. **Example:** 23
`build_key`	**Type:** String **Description:** Key set in your CI tool. Can be used as a unique identifier when combined with repository ID and commit ID. **Example:** `SAMPLE-PLAN123`
`build_url`	**Type:** String **Description:** URL of the build in your CI tool. **Example:** `https://bamboo.example.com/browse/SAMPLE-PLAN123-8`
`build_name`	**Type:** String **Description:** Name of the build. **Example:** `Pre-release build`
`build_number`	**Type:** Number **Description:** The identifier for the specific run that resulted in this build status. May be empty. **Example:** 8
`build_description`	**Type:** String **Description:** Description of the specific run that resulted in this build status. **Example:** `#8 successful\nin 7 minutes`
`build_duration`	**Type:** Number **Description:** Duration of the build, in milliseconds. **Example:** 230400

`build_created_date`	**Type:** Date **Description:** Date the build was created. **Example:** `2021-01-27 22:55`
`build_updated_date`	**Type:** Date **Description:** Date the build was updated. **Example:** `2021-01-27 22:55`
`build_state`	**Type:** String **Description:** State of the build. Can include SUCCESSFUL / FAILED / INPROGRESS **Example:** `SUCCESSFUL`
`build_parent`	**Type:** String **Description:** Key of the parent build for this plan. Can be empty. **Example:** `PLAN`
`build_ref`	**Type:** String **Description:** The branch or tag that this build is associated with. Can be empty.
`build_successful_tests`	**Type:** Number **Description:** The number of successful tests in this build.
`build_failed_tests`	**Type:** Number **Description:** The number of failed tests in this build.
`build_skipped_tests`	**Type:** Number **Description:** The number of skipped tests in this build.

Monitor application performance

App monitoring can give you a deeper insight into which apps are doing what in your instance. This can be useful when troubleshooting issues with a specific app, or to help you determine whether an app may have contributed to a drop in overall performance or stability.

Set up monitoring

Before you can connect your APM, you need to:

- configure a JMX exporter, and
- make sure that JMX metrics are enabled in your instance (which in turn enable App metrics).

The instructions on this page assume you'll be using Prometheus. You can use any Application Performance Monitoring (APM) solution, the steps will be very similar for each.

1. Configure the JMX Exporter

The exporter takes the JMX MBeans and transforms them into the right format for Prometheus. It also hosts a HTTP endpoint which Prometheus will connect to. Learn more about the Prometheus JMX exporter.

If you don't plan to use Prometheus, you'll need to check which exporter or agent is required for your APM solution. For example, this Java agent for NewRelic.

To install the exporter:

1. Download the Prometheus JMX exporter jar file from the GitHub repository.

   ```
   $ curl -L https://repo1.maven.org/maven2/io/prometheus/jmx/jmx_prometheus_javaagent/0.16.1
   /jmx_prometheus_javaagent-0.16.1.jar --output jmx-exporter.jar
   ```

2. Create a configuration file for the exporter. You can download an example file from our repository. For more information on the configuration options see the `README.md`.
3. Copy the jar file and configuration file to each application node (the local home directory is a good option).
4. Stop Bitbucket on one node.
5. Add the following agent properties to `$bitbucket_home/bin/_start-webapp.sh` of each cluster node to tell Bitbucket where to find the JMX exporter:

   ```
   JVM_SUPPORT_RECOMMENDED_ARGS="-javaagent:./jmx-exporter.jar=12345:config.yaml"
   ```

   The JMX exporter defaults to port 8080. You'll need to specify a different port for the exporter if this port is in use by Jira or another application.

6. Start Bitbucket.
7. To check that the exporter is working, go to `localhost:<jmx-exporter-port>`. You should see the metrics output.

Repeat these steps for all remaining nodes, if you run Bitbucket in a cluster. You can perform a rolling restart to avoid any downtime.

You'll need to make sure the JMX exporter endpoint is not exposed outside your network, or that you've taken appropriate steps to secure it.

2. Enable application monitoring in Bitbucket

Make sure that JMX monitoring is enables as application monitoring uses JMX (Java Management Extensions). Learn how to enable JMX monitoring

If you have previously set up JMX monitoring for Bitbucket, there's nothing else you need to do. The additional application monitoring metrics will be exposed in the same way as existing application metrics. For the full list of things, you might want to monitor see Application metrics reference.

If you don't have an existing Application Performance Monitoring (APM) solution, see our guide on getting started with Prometheus and Grafana.

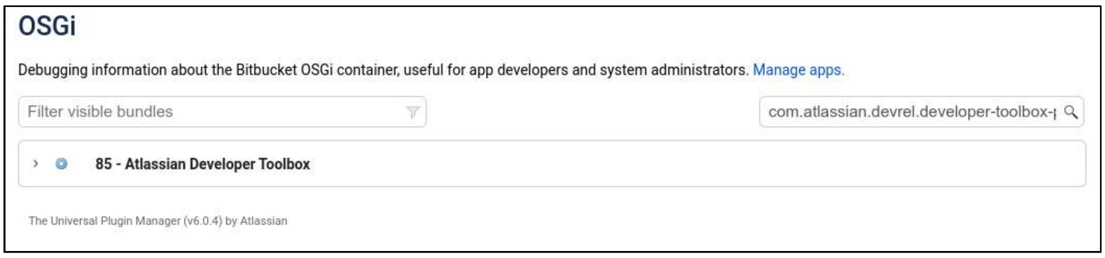
JMX monitoring can have a performance impact on your instance. In most cases it's not significant. However if you do experience any problems with your instance performance or stability, you can disable JMX monitoring.

Identify the app name

App metrics include the plugin key rather that the app's display name. For example, `com.atlassian.troubleshooting.plugin-bitbucket` is the plugin key for the Troubleshooting and Support Tools system app for Bitbucket.

To find the app name:

1. Go to `<base-url>/plugins/servlet/upm/osgi`
2. Enter the plugin key in the **Search bundled metadata** field
3. The plugin details will be returned, including the name and vendor.


OSGi

Debugging information about the Bitbucket OSGi container, useful for app developers and system administrators. Manage apps.

Filter visible bundles
com.atlassian.devrel.developer-toolbox-
85 - Atlassian Developer Toolbox
The Universal Plugin Manager (v6.0.4) by Atlassian

OSGi admin screen showing search results for a plugin key

You can also use the following REST endpoint `/rest/plugins/1.0/<plugin-key>/summary` which returns all the details about the app.

Enable optional tags

App vendors can choose to include additional metadata which can help when troubleshooting a performance issues. These tags are not included by default.

You can use the `atlassian.metrics.optional.tags` system property to show additional tags for a metric.

```
atlassian.metrics.optional.tags.<metric-name>=<tag-key1>,<tag-key2>
```

For example, if the full metric name is `sampleApp.asset.loadtime` and the app vendor included a tag to output additional information about the content type.

```
atlassian.metrics.optional.tags.sampleApp.asset.loadtime=sampleApp-type
```

The app vendor will be able to tell you the exact metric and tag names.

Troubleshooting

Out of memory errors

Because the monitoring is happening outside your application, we don’t expect there to be a significant impact on your instance performance or stability. If you do experience problems, you can disable JMX and app monitoring.

In the event of out of memory errors (OOME) caused by the monitoring agent, see Bitbucket is reaching resource limits

Monitor Bitbucket with Prometheus and Grafana

This section will guide you through how to install and connect Prometheus and Grafana. This is optional, but may be useful if you don't already have an APM solution, or would like to use our templates and sample queries.

Use Prometheus to monitor app performance metrics

To set up Prometheus to monitor app metrics:

1. Download and install Prometheus.
   For installation options and detailed instructions see the Prometheus documentation.
2. Edit the `prometheus.yaml` file and add the following scrape configuration to the bottom of the file.

   ```
   # A scrape configuration containing exactly one endpoint to scrape:
   scrape_configs:
     - job_name: 'Bitbucket app metrics'
       scheme: http
       metrics_path: '/metrics'
       static_configs:
        - targets: ["<jmx-exporter-host>:<port>"]
   ```

   - The target is the JMX exporter, not Bitbucket. For example `- targets: ["localhost:8060"]`
   - If you deploy Prometheus in Kubernetes, you'll need to use a pipe to indicate the multi-line YAML string, as in the example below.

     ```
     extraScrapeConfigs: |
       - job_name: 'Bitbucket app metrics'
         scheme: http
         metrics_path: '/metrics'
         static_configs:
          - targets: ["10.23.45.678:8060"]
     ```

   - See Configuration in the Prometheus documentation for more configuration options.
3. Start Prometheus. How you do this will depend on the way you run Prometheus.
4. Access the Prometheus UI at http://localhost:9090.
5. Go to **Status** > **Targets** to check that Prometheus is successfully connected to the JMX exporter.

Perform a simple query

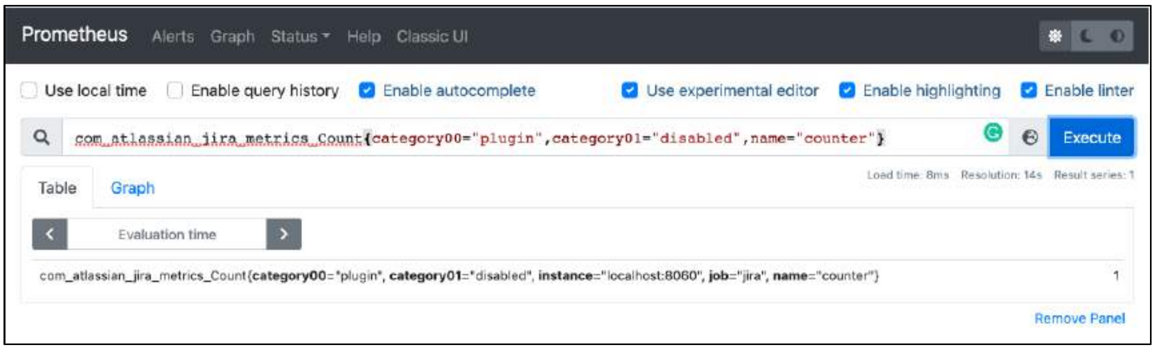
You can confirm that Prometheus is receiving app metrics with a simple test.

Go to **Manage apps** and temporarily disable an app (such as the Bitbucket Migration Assistant, don't disable anything that will interrupt your users).

In Prometheus, run the following query:

```
com_atlassian_bitbucket_metrics_Count
 {
  category00="plugin",
  category01="disabled"
 }
```

This will return the number of times an app has been disabled since monitoring was turned on.



```
com_atlassian_jira_metrics_Count{category00="plugin",category01="disabled",name="counter"}
```

Load time: 8ms Resolution: 14s Result series: 1

```
com_atlassian_jira_metrics_Count{category00="plugin", category01="disabled", instance="localhost:8060", job="jira", name="counter"}    1
```

Use Grafana to visualize metrics

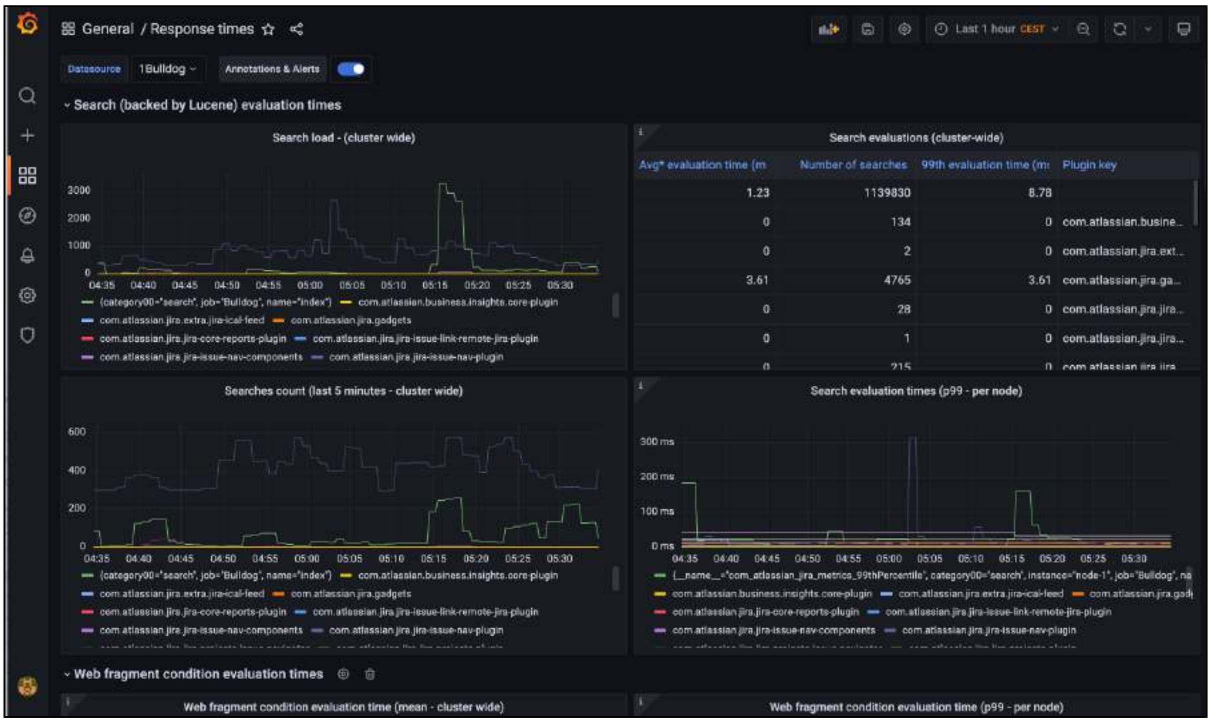
While you can use Prometheus to create graphs of your data, if you want to take it to the next level, you can use a tool like Grafana to create more detailed charts and dashboards.

To get you started, we’ve created some sample dashboards which track several important metrics. You can access the JSON for these dashboards in our App monitoring dashboards repo.

To set up Grafana and import the sample dashboard:

1. Download and install Grafana.
   For installation options and detailed instructions see the Grafana documentation.
2. Create a Prometheus data source in Grafana.
   For detailed instructions see the Prometheus documentation.
3. Select **Create** (+) > **Import**
4. Paste the JSON sample provided into the **Import via panel json** field. Remember to update the **Unique identifier**(only required if you already have a dashboard with the same ID).
5. Select **Load**.

Here's an example dashboard.


General / Response times
Last 1 hour CEST
Datasource
1Bulldog
Annotations & Alerts
Search (backed by Lucene) evaluation times
Search load - (cluster wide)
Searches count (last 5 minutes - cluster wide)
Search evaluation times (p99 - per node)
Web fragment condition evaluation times
Web fragment condition evaluation time (mean - cluster wide)
Web fragment condition evaluation time (p99 - per node)

Search evaluations (cluster-wide)

Avg* evaluation time (m	Number of searches	99th evaluation time (m	Plugin key
1.23	1139830	8.78	
0	134	0	com.atlassian.busine...
0	2	0	com.atlassian.jira.ext...
3.61	4765	3.61	com.atlassian.jira.ga...
0	28	0	com.atlassian.jira.jira...
0	1	0	com.atlassian.jira.jira...
0	215	0	com.atlassian.jira.jira

Application metrics reference

On this page:

App monitoring can give you a deeper insight into what apps are doing in your instance. This can be useful when troubleshooting issues with a specific app, or to help you determine whether an app may have contributed to a drop in overall performance or stability.

Learn how to set up app monitoring

Full list of app performance metrics

This is the full list of metrics that are exposed by the app monitoring agent. This is in addition to any JMX beans that are exposed by the application.

`db.ao.upgradetask`

Measures how long an app is taking to upgrade a part of the data it stores in the database.

Upgrade tasks can happen when an app is updated or enabled. During this time the app functionality will be unavailable, and may temporarily increase load on the database and the node the upgrade task is running on.

Action

To reduce the impact of upgrade tasks, consider upgrading apps during off-peak hours. This is especially important for apps that store lots of data.

Upgrade tasks should not take more than a few minutes. If it takes more than an hour, contact the vendor.

Sample query

```
com_atlassian_bitbucket_metrics_Value
  {
   category00="db",
   category01="ao",
   name="upgradetask"
  }
```

`db.ao.executeInTransaction`

Measures how long a database transaction takes.

Action

Transactions should not take more than a few seconds, if it takes longer than 10 minutes, consider contacting the vendor.

Sample query

```
com_atlassian_bitbucket_metrics_Value
  {
   category00="db",
   category01="ao",
   name="executeInTransaction"
  }
```

`db.ao.entityManager`
Measures the duration of various database operations on records (create, find, delete, deleteWithSQL, get, stream, count). **Action** If operations coming from an app are taking an abnormally long time (for example more than 10 minutes), this could mean the operation query might be long running, or the database is under load. Contact the vendor and investigate if long running queries are expected. **Sample query** `com_atlassian_bitbucket_metrics_95thPercentile { category00="db", category01="ao", category02="entityManager" }` Can be filtered further by adding a `name="<operation>"` attribute, for example `name="find"`.
`cluster.lock.held.duration`
Measures how long a database cluster lock was held. Used by Bitbucket in a clustered environment. **Action** Lock contention can lead to performance degradation. It may be normal for a thread to hold on to a lock for a long time, if there aren't any threads waiting for the lock. See `db.cluster.lock.waited.duration` to find out if there are any threads waiting for the lock. **Sample query** `com_atlassian_bitbucket_metrics_Value { category00="cluster", category01="lock", category02="held" }`
`cluster.lock.waited.duration`
Measures how long a database cluster lock was waited for. Used by Bitbucket in a clustered environment. **Action** If many threads are waiting for the same lock, it can lead to performance degradation. Contact the vendor responsible to flag and investigate the issue. **Sample query** `com_atlassian_bitbucket_metrics_Value { category00="cluster", category01="lock", category02="waited" }`

`db.sal.transactionalExecutor`

Measures how long a Shared Application Layer (SAL) transaction takes, when executed inside the `DefaultTransactionalExecutor`.

Action

The transaction can have many SAL operations, it may be there are too many operations, or the query is long running, or the database is under load.

Sample query

```
com_atlassian_bitbucket_metrics_Value
  {
   category00="db",
   category01="sal",
   name="transactionalExecutor",
   statistic="active"
  }
```

`web.resource.condition`

Measures how long a web resource condition will take to determine whether a resource should be displayed or not.

Action

Slow web resource conditions can lead to slow page load times especially if they are not cached. Reach out to the app vendor responsible to flag and investigate.

Sample query

```
com_atlassian_bitbucket_metrics_95thPercentile
  {
   category00="web",
   category01="resource",
   name="condition"
  }
```

`webTemplateRenderer`

Measures how long a Soy template or Velocity template web panel takes to render.

Action

The template renderer might be long running. Contact the vendor responsible and investigate if long running queries are expected.

Sample query

```
com_atlassian_bitbucket_metrics_95thPercentile
  {
   name="webTemplateRenderer",
   templateRenderer="velocity"
  }
```

`web.fragment.condition`

Measures how long a web fragment condition will take to determine whether a web fragment should be displayed or not.

Action

Web fragments conditions determine whether a link or a menu section or a panel on a page should be displayed. Slow web fragment conditions lead to slow page load times especially if they are not cached. Reach out to the app vendor responsible to flag and investigate

Sample query

```
com_atlassian_bitbucket_metrics_95thPercentile
  {
   category00="web",
   category01="fragment",
   name="condition"
  }
```

`cacheManager.flushAll`

Indicates that all caches are being flushed by an app. This operation should not be triggered by external apps and can lead to product slowdowns.

Action

Use the `invokerPluginKey` tag to determine which app invoked the flush. Reach out to the app vendor and flag this issue to them.

Additionally, the `className` tag refers to the implementation of `CacheManager` invoked and may be helpful.

Sample query

```
com_atlassian_bitbucket_metrics_Count
  {
    category00="cacheManager",
    name="flushAll"
  }
```

`cache.removeAll`

Indicates that a single cache has had all of its entries removed. This may or may not cause slowdowns in products or apps.

Action

Check how often these cache removals occur, and from which product. Use the `pluginKeyAtCreation` tag to determine which app created the cache.

Additionally, the `className` tag refers to the implementation of `Cache`, which may be helpful. If the frequency is excessive, consider reaching out to the app vendor and flag this issue to them.

Sample query

```
com_atlassian_bitbucket_metrics_Count
  {
   category00="cache",
   name="removeAll",
   invokerPluginKey!="undefined"
  }
```

`cachedReference.reset`

Indicates that a single entry in a cache has been reset. This may or may not cause slowdowns in products or apps.

Action

Check how often these cache resets occur, and from which product. Use the `pluginKeyAtCreation` tag to determine which app created the cache.

Additionally, the `className` tag refers to the implementation of `CachedReference`, which may be helpful. If the frequency is excessive, consider reaching out to the app vendor and flag this issue to them.

Sample query

```
com_atlassian_bitbucket_metrics_Count
  {
   category00="cachedReference",
   name="reset",
   invokerPluginKey!="undefined"
  }
```

`http.rest.request`

Measures HTTP requests of the REST APIs that use the `atlassian-rest` module.

Action

Check the frequency and duration of the rest requests.

Sample query

```
com_atlassian_bitbucket_metrics_95thPercentile
  {
   category00="http",
   category01="rest",
   name="request"
  }
```

`http.sal.request`

Measures HTTP requests of the given unique URL that uses the `atlassian-sal` module.

Action

Check the frequency and duration of the HTTP requests. If excessive or very slow, consider reaching out to the app vendor and flag this issue to them. You could also enable the optional `URL` tag to identify which URLs are causing the issue, you can do so by setting a system variable like so `atlassian.metrics.optional.tags.http.sal.request=url`

Sample query

```
com_atlassian_bitbucket_metrics_95thPercentile
  {
   category00="http",
   category01="sal",
   name="request"
  }
```

`longRunningTask`

Measures how long the long running tasks are taking.

Action

Check the duration of the task and if it’s taking too long, look for the `taskClass` and `pluginKey` to identify the source then contact the app vendor to flag this issue.

Sample query

```
com_atlassian_bitbucket_metrics_95thPercentile
  {
   name="longRunningTask",
   taskName=myLongRunningTask"
  }
```

`task`

Measures how long a task in queue is taking. Generally used for email queues or specific short running task.

Action

Check the duration of the task and if it’s taking too long look for the `queueName` and `pluginKey` to identify the source then contact the app vendor to flag this issue.

Sample query

```
com_atlassian_bitbucket_metrics_95thPercentile
  {
   name="task",
   taskName=myEmailQueue"
  }
```

`plugin.enabled.counter` / `plugin.disabled.counter`

Measures how many times apps have been enabled/disabled since uptime.

Action

Some caches are cleared when apps are disabled/enabled and may have a performance impact. If you see high counts, check the UPM or application logs to investigate which app is contributing to high counts.

Sample query

```
com_atlassian_bitbucket_metrics_Count
  {
   category00="plugin",
   category01="enabled",
   name="counter"
  }
```

Recommended alerts

Automated alerts help you identify issues early, without needing to wait for an end-user to bring problems to your attention. Most APM tools provide alerting capabilities.

The following alerts are based on our research into common issues with apps. We've used Prometheus and Grafana, but you may be able to adapt these rules for other APM tools.

To find out how to set up alerting in Prometheus, see Alerting overview in the Prometheus documentation.

Heap memory usage

Excessive Heap memory consumption often leads to out of memory errors (OOME). While fluctuations in Heap memory consumption are expected and normal, a consistent increase or failure to release this memory, can lead to issues. We suggest creating an alert which is triggered when there is less than 10% free Heap memory left on a node for an amount of time, such as 2 minutes.

```
  - alert: OutOfMemory
    expr: 100*(jvm_memory_bytes_used{area="heap"}/jvm_memory_bytes_max{area="heap"}) > 90
    for: 2m
    labels:
      severity: warning
    annotations:
      summary: Out of memory (instance {{ $labels.instance }})
      description: "Memory is filling up (< 10% left)"
```

CPU utilisation

Consistently high CPU usage can be caused by numerous issues such as process intensive jobs, inefficient code (loops), or too little memory.

We recommend creating an alert that is triggered when CPU load exceeds 80% for an amount of time, such as 2 minutes.

```
  - alert: HighCpuLoad
    expr: (java_lang_OperatingSystem_ProcessCpuLoad * 1000 > 80
    for: 2m
    labels:
      severity: warning
    annotations:
      summary: High CPU load (instance {{ $labels.instance }})
      description: "CPU load is > 80%"
```

Full GC

Full garbage collection (GC) occurs when both young and old Heap generations are collected. This is time consuming and pauses the application. Full GC can happen for a number of reasons, but a sudden spike may happen when too many large objects are loaded into memory.

We recommend monitoring any significant increase in the number of full GCs. How you do this will vary depending on the type of Collector being used. For the G1 Garbage Collector (G1GC), monitor the `java_lang_G1_Old_Generation_CollectionCount` metric.

Blocked threads

A high number of blocked or stuck threads means there are fewer threads available to process requests. An increase in blocked threads could indicate a problem.

We recommend creating an alert that is triggered when the number of blocked threads exceeds 10%.

```
  - alert: BlockedThreads
    expr: avg by(instance) (rate(jvm_threads_state{state="BLOCKED"}[5m])) * 100 > 10
    for: 0m
    labels:
      severity: warning
    annotations:
      summary: Blocked Threads (instance {{ $labels.instance }})
      description: "Blocked Threads are > 10%"
```

Database connection pool

The database connection pool should be tuned for the size of the instance (such as the number of users and plugins). It also needs to match what the database allows.

We recommend creating an alert that is triggered when the number of connections is consistently near the maximum for an amount of time.

Example alert:

```
- alert: DatabaseConnections
    expr: 100*(<domain>_BasicDataSource_NumActive{connectionpool="connections"}
/<domain>_BasicDataSource_MaxTotal{connectionpool="connections"}) > 90
    for: 5m
    labels:
      severity: warning
    annotations:
      summary: Database Connections (instance {{ $labels.instance }})
      description: "Database Connections are filling up (< 10% left)"
```

Replace <domain> with the Product metric domain, such as `com_atlassian_bitbucket` or `com_atlassian_confluence`.

Reacting to alerts

Some issues are transient or may resolve themselves, while others could be a warning sign of a major performance degradation.

When investigating the source of the problem, the app specific metrics below can help. If it's clear from the metrics that one particular app is spending more time or calling an API more frequently, you could try disabling that app to see whether performance improves. If it's a critical app, raise a support ticket, and include any relevant data extracts from your monitoring with the support zip.

Xcode for Bitbucket Data Center

Xcode is the IDE (Integrated Development Environment) for Apple platforms. This app adds a 'Clone in Xcode' button for relevant repositories in Bitbucket Data Center. It works with Xcode 10, the latest version of Xcode, announced at WWDC on 4th June 2018.

When you browse to a repository which has Xcode workspace files, the **Clone in Xcode** button appears in the clone dialog. This will open Xcode and set it up to clone that repository using whatever URL is active in the drop-down at the time. That means you can clone through HTTP or SSH, from a mirror or from the host, depending on what you select. After the clone completes, Xcode will open the project/workspace.

Clone in Xcode is only shown for users browsing from a Mac and only if it's been enabled. There are two ways to enable the feature:

- Access Bitbucket Data Center using Xcode 10, which offers the ability to integrate with Bitbucket Cloud and Data Center. This will automatically enable Xcode features for the user account used.
- Visit your account settings and toggle **Enable Clone in Xcode**. (Select your avatar in the upper right corner and go to **Manage account**.)

Once the feature is enabled, any repository containing an Xcode project or workspace that is identified by the `.xcodeproj` or `.xcworkspace` directories or files will display **Clone in Xcode** in the clone dialog.

Troubleshoot sidecar startup

If you're starting your Bitbucket Data Center application and see the “Sidecar failed to start” error message in your browser, you’ll need to investigate the logs of Bitbucket Mesh for further details.

Check your Mesh logs

Although you may not have any Bitbucket Mesh nodes set up, Bitbucket always starts a local Bitbucket Mesh node called the sidecar for Git operations.

To find the specific log file for further investigation:

1. Navigate to the Mesh log directory of your Bitbucket app node: `$BITBUCKET_HOME/mesh/log`
2. Open the `atlassian-mesh.log` log file

At the bottom of the `atlassian-mesh.log` file, you’ll find the root cause of why the sidecar failed to start and more details about what needs to be done to fix the problem.

Some of the most common causes for this error include:

- You have an unsupported version of Git installed on your server which is trying to be used for your Bitbucket application and your sidecar. For more information on the supported Git versions, see Supported platforms.
- The sidecar process has been killed by something before Bitbucket could be fully started. Restarting your Bitbucket instance will restart your sidecar process.

If you find that the information presented in the `atlassian-mesh.log` file does not provide you with enough information to help resolve your problem, contact the Atlassian support team for further assistance.

Integrated CI/CD

With Integrated CI/CD you can create a seamless idea to production workflow. It enables you to link Bitbucket Data Center with Bamboo or Jenkins, and to combine this with a link to Jira Software to get a centralized view of your CI/CD pipeline.

Configuring, maintaining, and monitoring your pipeline can then be done from Bitbucket, allowing you to see build statuses and deployment information all within the context of your code.

On this page:

Introduction

- Integrate your CI/CD pipeline
- Supported platforms

Get started

- Link your CI server
- Configure your CI server
- View builds information in Bitbucket
- Perform build actions
- View build logs
- Download build artifacts
- View deployment information in Bitbucket

Step-by-step guides

- Link Bitbucket with Bamboo
- Link Bitbucket with Jenkins

Integrate your CI/CD pipeline

Integrated CI/CD is a comprehensive CI/CD solution. With it, you can integrate Bitbucket Data Center with Bamboo or Jenkins, unlocking a range of benefits.

On this page:

Related pages:

- Integrated CI/CD
- Supported platforms

What is CI/CD?

CI/CD is a modern approach to software development that focuses on continuous integration (CI), and continuous development or delivery (CD). Learn more about CI/CD on the Atlassian CI/CD website.

Quick and easy set up

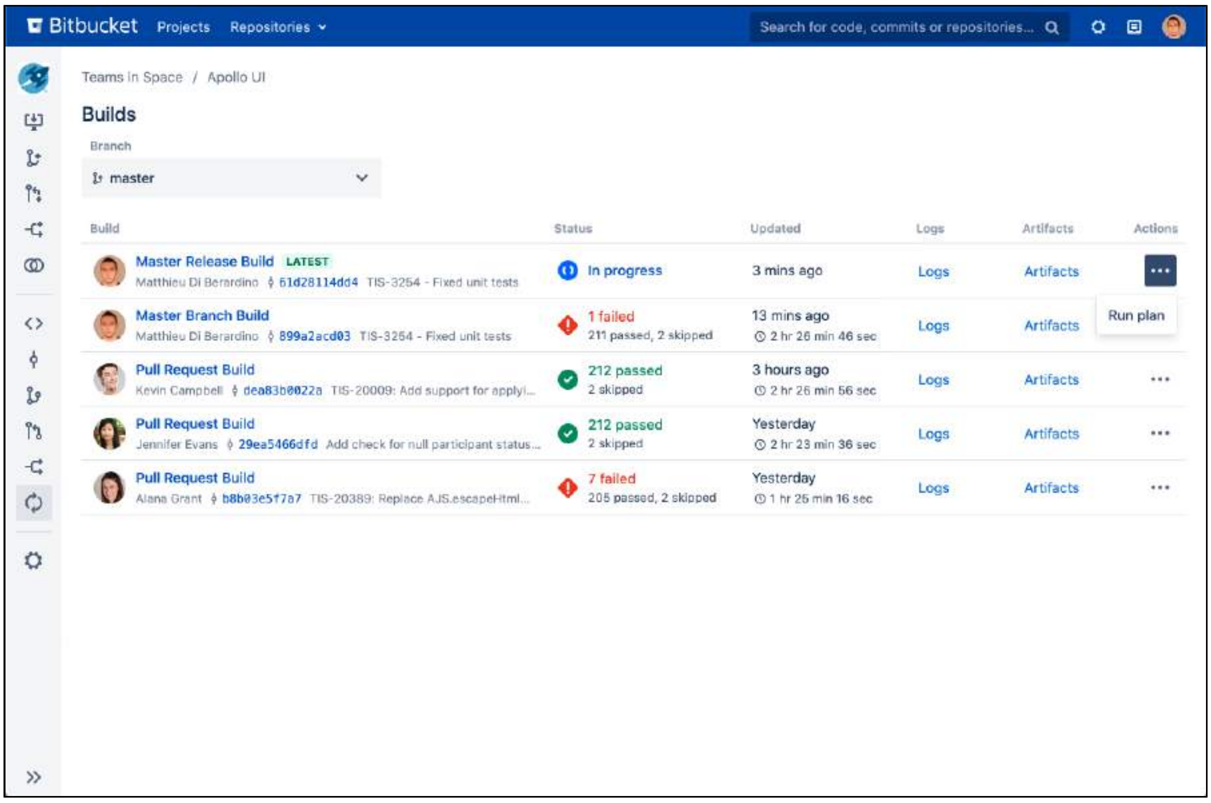
Integrated CI/CD removes the need to use complex third-party or custom integrations to link the applications in your CI/CD pipeline. It comes with the ability to create a seamless link to Bamboo or Jenkins, making it quick and easy to set up. Once this link has been created at a global level, the whole team can then create and maintain their own CI/CD pipelines.

Simplified pipeline creation and maintenance

With its support for configuration as code, Integrated CI/CD makes pipeline creation and maintenance simple. To create a pipeline, you simply create a configuration file, check it into the target repository, and configure Bamboo or Jenkins to detect it. It will then be a versioned artifact, making it easy to keep up-to-date, reducing unreliable builds and incidents.

Centralized contextual feedback

Once you've integrated the applications in your CI/CD pipeline, you'll be able to see feedback where it matters most. Build statuses and test results will all be pulled into Bitbucket, where you can see them in context. You'll also be able to act on builds from Bitbucket, reducing the need to switch tools.


Bitbucket
Projects
Repositories
Search for code, commits or repositories...
Teams in Space / Apollo UI
Builds
Branch
master
Run plan

Build	Status	Updated	Logs	Artifacts	Actions
Master Release Build LATEST Matthieu Di Berardino 61d28114dd4 TIS-3254 - Fixed unit tests	In progress	3 mins ago	Logs	Artifacts	•••
Master Branch Build Matthieu Di Berardino 899a2acd03 TIS-3254 - Fixed unit tests	1 failed 211 passed, 2 skipped	13 mins ago 2 hr 26 min 46 sec	Logs	Artifacts	Run plan
Pull Request Build Kevin Campbell dea83b0022a TIS-20009: Add support for applyi...	212 passed 2 skipped	3 hours ago 2 hr 26 min 56 sec	Logs	Artifacts	•••
Pull Request Build Jennifer Evans 29ea5466dfd Add check for null participant status...	212 passed 2 skipped	Yesterday 2 hr 23 min 36 sec	Logs	Artifacts	•••
Pull Request Build Alana Grant b8b03e5f7a7 TIS-20389: Replace AJS.escapeHtml...	7 failed 205 passed, 2 skipped	Yesterday 1 hr 25 min 16 sec	Logs	Artifacts	•••

See where your code is deployed on pull requests and commits without leaving Bitbucket.

Get started

Check out our Supported Platforms page to see what you need to get started. Then when you're ready, see how to Link your CI server.

Link your CI server

Bitbucket Data Center is designed to be integrated with Bamboo and Jenkins, and we’ve streamlined the integration process for both applications.

Integrating can only be done by an administrator of both instances. Once it’s completed, your team will be able to configure and maintain their own CI/CD pipelines.

On this page:

Related pages:

- Integrated CI/CD
- Link Bitbucket with Bamboo
- Link Bitbucket with Jenkins

Get maximum benefit from Integrated CI/CD

To access the full set of Integrated CI/CD features, you need to:

- Use Application Links when integrating Bitbucket with Bamboo or Jenkins.
- Be on a recommended version [anchor link to Integration guides table] of all applications and plugins.

In Bitbucket you’ll then be able to:

- See detailed builds information, like test summaries and durations.
- See links to logs and artifacts for each build.
- Perform actions, such as running builds.

Integrate using Application Links

An important part of integrating Bitbucket with your CI server is connecting them using Application Links, a bundled Atlassian app. Integrating without Application Links is possible, but it’s not recommended as you’ll only have access to a limited number of Integrated CI/CD features.

How to set up Application Links is explained in the integration guides linked to below.

Upgrade to a minimum recommended version

Before integrating Bitbucket with Bamboo or Jenkins, we recommend upgrading to a minimum recommended version of these applications, or even better, the latest version. Along with Application Links, this will give you have access to all the features of Integrated CI/CD, and ensure that the environment is as secure and stable as possible.

For more on upgrading, see the Bamboo upgrade guide or the Jenkins upgrade guide on Jenkins.io.

Integration guides

CI server	Minimum recommended version	Integration guides
Bamboo	Bamboo 7.1+	Bamboo integration
Jenkins	Bitbucket Server integration plugin for Jenkins 2.0.0+	Bitbucket integration plugin on Jenkins.io

If you use a different CI server, you can integrate with Bitbucket and send it detailed builds information using our REST API. For more on how to do this, see our REST resources.

Once you’ve finishing integrating, see how to Configure your CI server.

Configure your CI server

Integrated CI/CD allows you to use configuration as code to set up and manage builds and deployments. This approach of storing your configuration as source code has many advantages – it enables easier automation, change tracking, validation, and more. For details, check out the benefits of configuration as code .

Before you continue, make sure you've linked with your CI server. Then complete these steps, which we'll outline in more detail below:

1. Create a configuration file
2. Check the configuration file into the target repository
3. Configure Bamboo or Jenkins

On this page:

Related pages:

- Bamboo Specs
- Using a Jenkinsfile

1. Create a configuration file

Integrated CI/CD supports Bamboo and Jenkins, which use their own types of configuration as code files.

CI server	Configuration file type	Documentation
Bamboo	Bamboo Specs file	Bamboo Specs documentation Bamboo Specs reference
Jenkins	Jenkinsfile	Jenkinsfile documentation on jenkins.io

2. Check the configuration file into the target repository

Once you've created your configuration file, check it into the Bitbucket repository you want your CI Server to build from. Then you need to configure Bamboo or Jenkins to detect it.

3. Configure Bamboo or Jenkins

If you use Bamboo, you need to configure Bamboo to scan Bitbucket for Bamboo Specs .

If you use Jenkins, you need to configure a Jenkins pipeline and specify the Bitbucket repository to build from.

Then when your build starts, it will appear on the Builds page. Here you can:

- view builds information
- access logs and artifacts
- perform build actions

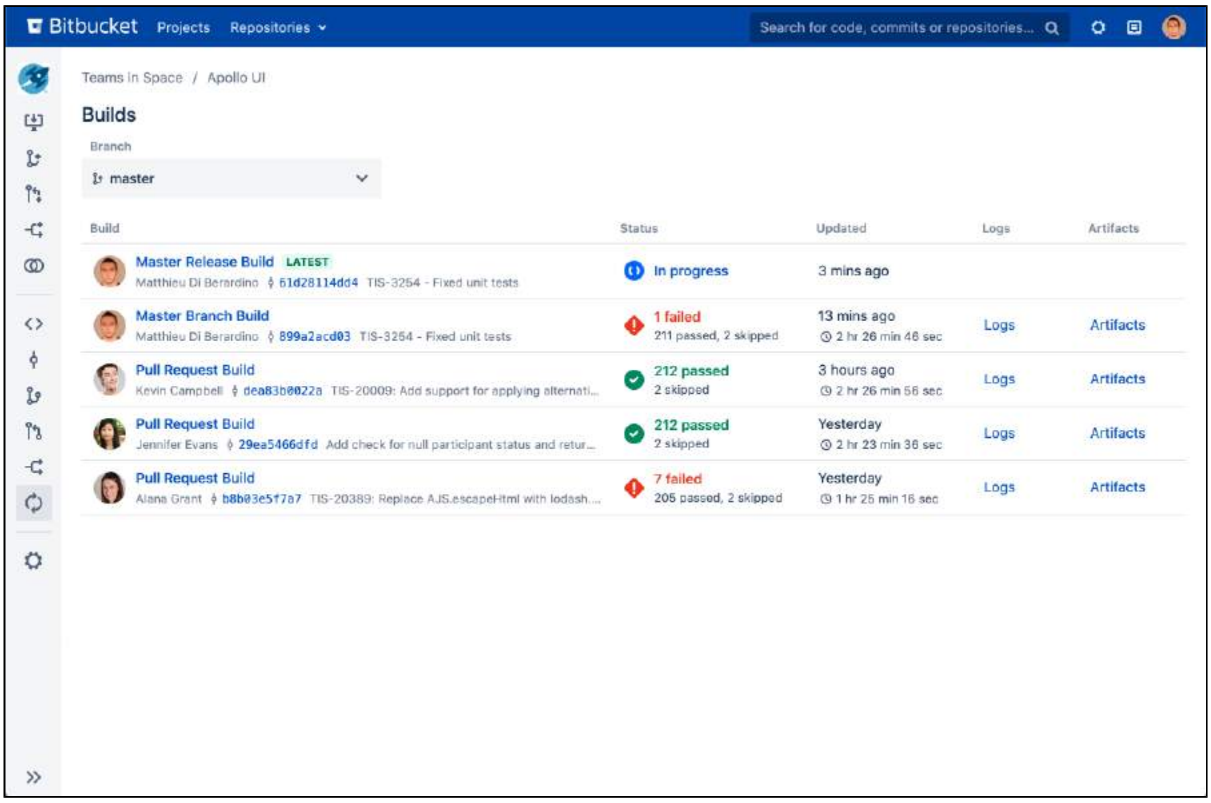
View builds information in Bitbucket

To view builds information in Bitbucket Data Center, you first need to link it with your CI (continuous integration) server. Once they're linked, you'll then be able to see build results and additional related information right next to your code where it's most valuable.

On this page:

Related pages:

- What is Continuous Integration?
- Bamboo integration
- Bitbucket Server integration plugin on Jenkins.io



Teams in Space / Apollo UI

Builds

Branch: master

Build	Status	Updated	Logs	Artifacts
Master Release Build LATEST Matthieu Di Berardino 61d28114dd4 TIS-3254 - Fixed unit tests	In progress	3 mins ago		
Master Branch Build Matthieu Di Berardino 899a2acd03 TIS-3254 - Fixed unit tests	1 failed 211 passed, 2 skipped	13 mins ago 2 hr 26 min 46 sec	Logs	Artifacts
Pull Request Build Kevin Campbell dea83b0022a TIS-20009: Add support for applying alternati...	212 passed 2 skipped	3 hours ago 2 hr 26 min 56 sec	Logs	Artifacts
Pull Request Build Jennifer Evans 29ea5466dfd Add check for null participant status and retur...	212 passed 2 skipped	Yesterday 2 hr 23 min 36 sec	Logs	Artifacts
Pull Request Build Alana Grant b8b03e5f7a7 TIS-20389: Replace AJS.escapeHtml with lodash....	7 failed 205 passed, 2 skipped	Yesterday 1 hr 25 min 16 sec	Logs	Artifacts

Builds information is shown in a number of contextually relevant places in Bitbucket:

- The **Builds** page gives you an overview of all builds across your instance. To find a specific build here you can filter by branch or commit. Once you've found it, you can then see its test results, access direct links to its logs and artifacts, and perform build actions.
- On the **Pull request** page you can see builds information in two locations – you can see the latest build status in the **Overview** tab, and you can see builds information for each commit in the **Builds** tab. Just like on the Builds page, here you can access log and artifact links, and act on builds.
- On the **Commits** and **Branches** pages you can see the latest build status for each item. For more information, you can also select any build status icon. This will take you to the builds page where the filter will be automatically set to that commit or branch.

Perform build actions

With Integrated CI/CD you can perform actions on Bamboo or Jenkins builds from Bitbucket Data Center, removing the need to switch tools.

You can act on builds from the Builds page and the pull request Builds tab. To do this, you first need to authorize Bitbucket to perform actions.

On this page:

Related pages:

- Link your CI server

Authorize Bitbucket

To act on Bamboo or Jenkins builds from Bitbucket you first need to authorize it. Each user only needs to do this once.

To authorize Bitbucket:

1. From the Actions column, select Bitbucket for a build.
2. Select **Authorize actions**.
3. Follow the instructions.

Perform an action

Once you’ve authorized Bitbucket, you can act on a build by selecting an action from the actions menu. The actions available to you will depend on how your CI server is configured and your level of access.

View build logs

Integrated CI/CD enables Bitbucket Data Center to display contextual information about a build, such as a link to the build's logs on your CI server. You'll see this link on the Builds page and the pull request builds tab, making it easy to investigate problems when you spot them.

To enable build log links, you need to Link your CI server.

On this page:

Related pages:

- Integrated CI/CD
- Link your CI server

Download build artifacts

Integrated CI/CD enables Bitbucket Data Center to display contextual information about a build, such as a link to the build's artifacts on your CI server. You'll see this link on the Builds page and the pull request Builds tab.

To enable build artifacts links, you need to Link your CI server.

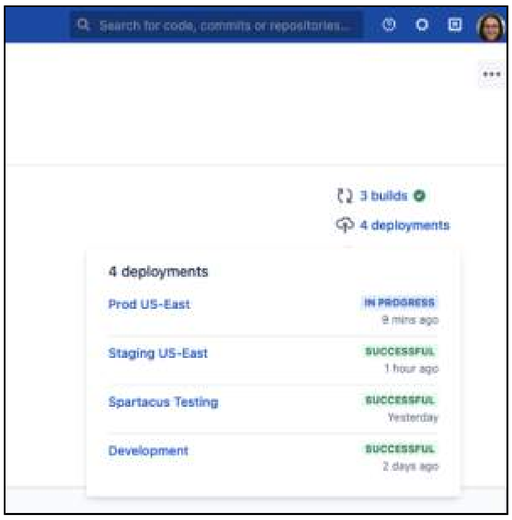
On this page:

Related pages:

- Integrated CI/CD
- Link your CI server

View deployment information in Bitbucket

See where your code is deployed on pull requests and commits in Bitbucket Data Center without having to go over to your deployment tool.



4 deployments

Prod US-East IN PROGRESS 9 mins ago

Staging US-East SUCCESSFUL 1 hour ago

Spartacus Testing SUCCESSFUL Yesterday

Development SUCCESSFUL 2 days ago

On this page:

Related pages:

- What is Continuous Integration?
- Bamboo integration
- Bitbucket integration plugin on Jenkins.io

For Bamboo 8.1 and higher, deployment projects will automatically send deployment information to Bitbucket Data Center. For more details on integrating Bitbucket and Bamboo, see our Bamboo integration documentation.

For Jenkins 2.319.3+ and higher, use the following implementations:

- For Freestyle jobs, this is implemented as a post-build action. The action will post an in-progress notification of the deployment during the Bitbucket SCM checkout, and a final notification during the post-build stage.

To create a post-deployment notifier to send deployment information to Bitbucket:

1. Select **Add post-build action** > **Notify Bitbucket Server of deployment**.
2. In the **Post-build actions** dialog, input the following:
    - **Environment name** (required) - the name of the environment being deployed to.
    - **Environment type** (optional) - the type of environment that was deployed to, for example, Production, Staging, etc. Choose **none** if a type does not apply.
    - **Environment URL** (optional)- if the environment has a URL, provide that here. Otherwise, leave blank.
    - **Environment Key** (optional) - unique identifier for the environment in Bitbucket. Leave it blank to have it automatically generated by the plugin.

- For Pipeline and Multibranch Pipeline jobs, this is implemented as a wrapper step. The `bbs_deploy` step will post an in-progress notification to Bitbucket Data Center at the start of the block, and a final status at the end of the block based on whether the steps within the block were successful or not.

To set up notifying Bitbucket of the deployment status for Pipeline and Multibranch Pipeline jobs:

1. From the **Pipeline Syntax** page, select **Sample step** > **bbs_deploy.**
2. Provide an **Environment name** (required).
3. Optionally, select an **Environment Type**, input an **Environment URL**, and **Key**.
4. Select **Generate Pipeline Script**.
5. Copy the generated code block, for example:

```
bbs_deploy(environmentKey: 'MY-ENV', environmentName: 'My Production Environment', environmentType:
'PRODUCTION', environmentUrl: 'http://url.to.prod') {
    // some block
}
```

6. Edit the Jenkins file and add the copied code to within the `steps` block of the file. Your steps to do the deployment must be within the `bbs_deploy` step.

7. Save or commit your changes.

For more details, see the documentation for the Bitbucket integration plugin for Jenkins.

If you’re using other integration tools, this can be done via the deployment status API.

Link Bitbucket with Bamboo

On this page:

Related pages:

- Integrated CI/CD
- Link your CI server
- Configure your CI server

Integrated CI/CD enables you to create a link between Bitbucket Data Center and Bamboo, unlocking a range of benefits. Bitbucket can receive build statuses, test results, and other feedback from Bamboo, and display it in context where it matters most. In Bamboo, you can pick a Bitbucket repository and checkout its sources without specifying additional credentials.

Once they're linked, users can then complete the authorization process to perform Bamboo actions in Bitbucket.

For more on the benefits of linking with Bamboo, see Bamboo integration.

Create an Application Link

Linking with Bamboo is done using Application Links, a bundled Atlassian app.

To create an application link:

1. Go to Bitbucket > **Application Links**.
2. Enter the Bamboo instance URL, then select **Create new link**.
3. Review the **Link applications** dialog and configure these options:
    - If you select **The servers have the same set of users and usernames**, the link will be configured using OAuth (with impersonation) authentication.
    - If you are not an admin on both servers you won't be able to set up a 2-way (reciprocal) application link. If you want to go ahead and create a 1-way link, clear the **I am an administrator on both instances** checkbox.
4. Select **Continue** to go to Bamboo.
5. In Bamboo, select **Continue** to return to Bitbucket. Your Bamboo instance will now be in the list of linked applications, and it will be able to submit build statuses and test results back to Bitbucket. In addition, Bitbucket will be able to display links to where you can see logs and download artifacts on Bamboo for each build.

Having trouble integrating your Atlassian products with Application Links?

We've developed a guide to troubleshooting application links, to help you out. Take a look at it if you need a hand getting around any errors or roadblocks with setting up application links.

Next steps

See how to configure your CI server.

Link Bitbucket with Jenkins

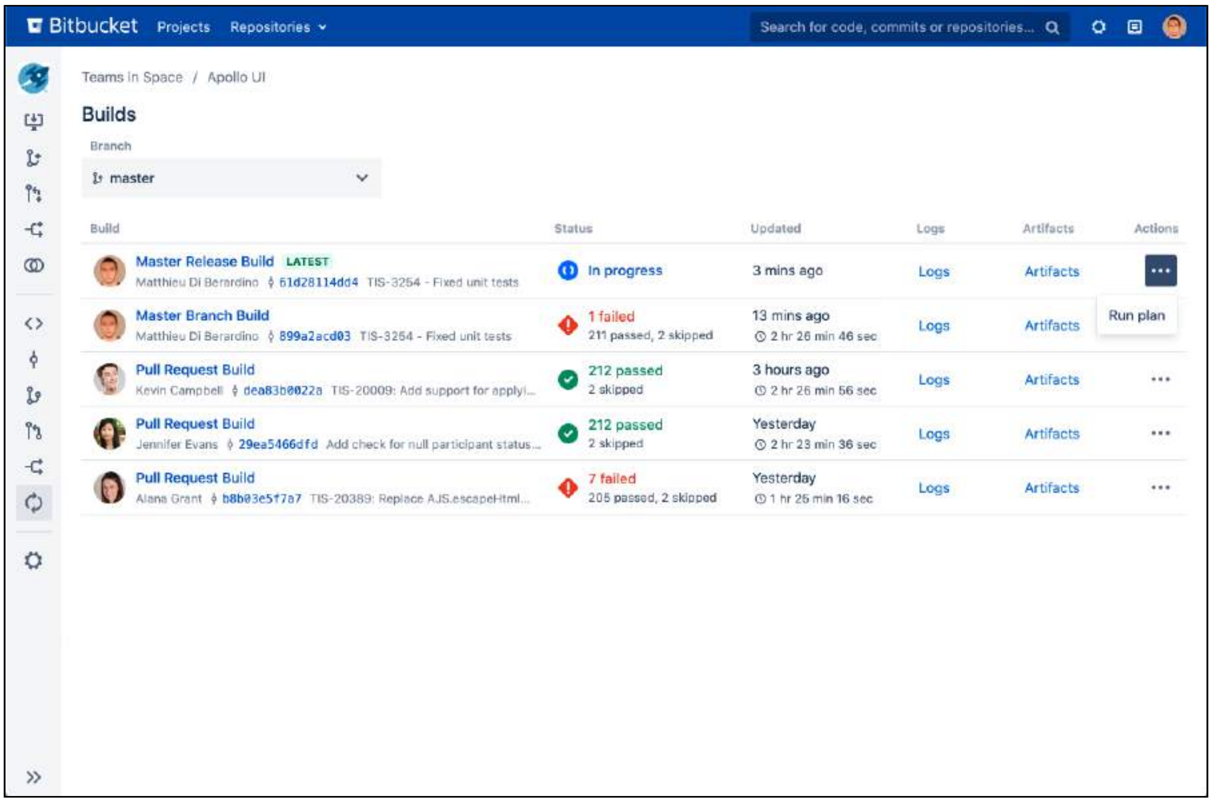
Integrated CI/CD enables you to create a link between Bitbucket Data Center and Jenkins, unlocking a range of benefits. Bitbucket can receive build statuses, test results, and other feedback from Jenkins, and display it in context where it matters most. In Jenkins, you can pick a Bitbucket repository and checkout its sources without specifying additional credentials.

Once they're linked, users can then complete the authorization process to perform Jenkins actions in Bitbucket.

On this page:

Related pages:

- Integrated CI/CD
- Link your CI server



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Builds

Branch: master

Build	Status	Updated	Logs	Artifacts	Actions
Master Release Build LATEST Matthieu Di Berardino 61d28114dd4 TIS-3254 - Fixed unit tests	In progress	3 mins ago	Logs	Artifacts	•••
Master Branch Build Matthieu Di Berardino 899a2acd03 TIS-3254 - Fixed unit tests	1 failed 211 passed, 2 skipped	13 mins ago 2 hr 26 min 46 sec	Logs	Artifacts	Run plan
Pull Request Build Kevin Campbell dea83b0022a TIS-20009: Add support for applyi...	212 passed 2 skipped	3 hours ago 2 hr 26 min 56 sec	Logs	Artifacts	•••
Pull Request Build Jennifer Evans 29ea5466dfd Add check for null participant status...	212 passed 2 skipped	Yesterday 2 hr 23 min 36 sec	Logs	Artifacts	•••
Pull Request Build Alana Grant b8b03e5f7a7 TIS-20389: Replace AJS.escapeHtml...	7 failed 205 passed, 2 skipped	Yesterday 1 hr 25 min 16 sec	Logs	Artifacts	•••

Create the link

For instructions on linking with Jenkins, see the documentation for the Bitbucket integration plugin for Jenkins on plugins.jenkins.io.

Next steps

See how to configure your CI server.

Install or upgrade Bitbucket

About the installation and upgrade guides

The install and upgrade guides have instructions for installing, setting up, or upgrading Bitbucket Data Center.

Information on the features and changes in specific Bitbucket releases can be found in the Release Notes.

For information about using and administering Bitbucket refer to the Bitbucket documentation.

Downloads

Download Bitbucket documentation in PDF format.

Other resources

Bitbucket release notes

Bitbucket Data Center and Server Knowledge Base

Atlassian Answers (topic: bitbucket-server)

Supported platforms

This page lists the supported platforms for Bitbucket Data Center 8.18.x.

See End of support announcements for upcoming changes to platforms supported by Bitbucket.

Please read the supplied information carefully and check if it applies to your instance.

✓ Supported – you can use **Bitbucket Data Center 8.18.x** with this platform.

ℹ Limited – you can evaluate Bitbucket on this platform, but you can't use it to run a production site.

⚠ Deprecated – support for this platform will end in an upcoming release.

On this page:

Hardware

Hardware	Good to know
Architecture x86-64 **CPU** 2+ cores **Memory:** 3+ GB	• You'll need at least 3GB available memory. We recommend 1GB for Bitbucket and an additional 2GB to support Git operations. • Your specific hardware requirements will depend on the number and frequency of Git operations and the number of active users. See Scaling Bitbucket Data Center for more information. • For setting up Bitbucket Mesh, see requirements for Mesh nodes.

Environments

Environments	Good to know
✓ Linux ℹ Apple macOS	• In production environments Bitbucket should be run from a dedicated user account. • Linux support requires a 2.6.17+ kernel and glibc 2.7+. This means that Red Hat Enterprise Linux 5, which uses glibc 2.5, is no longer supported for Bitbucket Server and Data Center 7.0+. • If you've migrated all Git repositories from the Bitbucket shared home directory to Bitbucket Mesh, you can use the following file system options for the shared home directory: NFSv3 and NFSv4 (dedicated Linux server). **Known issues** • You can't use NFS hosted on Windows for Bitbucket's shared home directory. • Apple macOS is evaluation only. MacOS cannot be used for production deployment.

Containerization

You can use official images to deploy Bitbucket in a Docker container or customize a Docker deployment on your own.

We support the Atlassian Docker templates and can help with Bitbucket related problems. We don't provide support for Docker itself or problems with any Docker environment.

Containerization manager

We recommend that you use official helm charts to deploy Bitbucket Data Center with Kubernetes or customize a Kubernetes deployment on your own with the reference to the official helm charts.

We support the Atlassian Kubernetes helm chart and can help with Bitbucket Data Center product-related problems. We don't provide support for Kubernetes itself or problems with any Kubernetes environment.

Read our Kubernetes support disclaimer and more about what we support and what we don’t.

Cloud platforms

Cloud platforms	Good to know
✓ Amazon Web Services (AWS) ✓ Microsoft Azure	See Recommendations for running Bitbucket in AWS for more information. If you've migrated all Git repositories from Bitbucket's shared home directory to Bitbucket Mesh, you can use the following file system options for the shared home directory: • NFSv3, NFSv4 (dedicated Linux server) • Amazon Elastic File System (EFS) • Amazon FSx for NetApp ONTAP NFS • Amazon FSx for OpenZFS • Amazon FSx for Lustre

Java

Java	Good to know
✓ Java 17 ⚠ Java 11 (Deprecated) ✗ Java 10 ✗ Java 9 ✗ Oracle Java 8u321 ✗ Oracle Java 8u311 ⚠ Java 8 (Deprecated)	• Java 11 is only supported from version 11.0.8+. • Bitbucket will install a supported version of OpenJDK Java JRE that is only available to Bitbucket if necessary. See Running the Bitbucket installer. • If you choose to pre-install a JRE, we recommend using an OpenJDK Java 17 JRE. You can download one from the Eclipse Temurin™ website. • For OpenJDK, download and install instructions for Linux flavors at http://openjdk.java.net/install/. • Pre-installed Java on some AWS EC2 Linux instances might be installed with a subset of features. For more information, see SSH server fails to start on AWS EC2 instance. • We support standard OpenJDK builds, including Oracle's official build, alternative builds such as Adoptium OpenJDK (formerly known as AdoptOpenJDK), and builds shipped with Linux distributions such as Red Hat Enterprise. • AdoptOpenJDK is now known as AdoptiumOpenJDK. • Oracle Java 8u311 and 8u321 are not supported due to JDK-8279618.

Databases

⚠ If you're using PostgreSQL and glibc version **lower than 2.28** and upgrading your operating system libraries, you'll need to rebuild the PostgreSQL indices before you start Bitbucket if the upgrade increases the glibc version to **2.28 or later**.

PostgreSQL	
✓ 13 - 16 ⚠ 10 - 12 (Deprecated)	**Known issues** Connect Bitbucket to PostgreSQL
MySQL/MariaDB	
From Bitbucket Data Center 8.15, MySQL and MariaDB are no longer supported.	
Microsoft SQL Server	
✓ 2022 ✓ 2019 ✓ 2017 ⚠ 2016 ⚠ 2014	**Good to know** Using Windows Authentication between a Linux Bitbucket installation and SQL sever is not supported. **Known issues** • Connect Bitbucket to SQL Server • **Named Instances**: If you have a named instance on your server, it is not possible to migrate from the internal database to a named instance of SQL Server using the UI procedure. You will need to manually edit the `bitbucket.properties` file as described on the Connecting to named instances in SQL Server from Bitbucket Server Knowledge Base article.
Oracle	
✓ 19c ⚠ 18c (Deprecated) ⚠ 12c R2 (Deprecated)	No additional information or known issues
Amazon Aurora	
✓ PostgreSQL 13 - 16 ⚠ PostgreSQL 10 - 12 (Deprecated)	**Good to know** • The only supported Amazon Aurora config is a PostgreSQL-compatible clustered database with one writer replicating to zero or more readers. Learn more
H2 (bundled)	

ℹ Bitbucket Data Center, evaluation only ✓ Bitbucket Mirror	**Good to know** • H2 is bundled with Bitbucket for evaluation use only. • H2 (bundled) is the only database that is supported with Bitbucket Data Center mirrors in production.
HSQLDB (bundled)	
Bitbucket Data Center only, evaluation only ⚠ Deprecated	**Good to know** • Please see Connect Bitbucket to an external database. • HSQLDB is not supported in Bitbucket Data Center. • HSQLDB support was deprecated as of Bitbucket 4.0+. New Bitbucket installs will bundle and use H2 as the default database for evaluation purposes.

Secret managers

We provide a few secrets management options, as well as to our basic and advanced encryption options and our custom SecretStore implementation.

AWS Secrets Manager	
✓ Plaintext ✓ Structured secret	**Good to know** • See our guide, Configuring Bitbucket with AWS Secrets Manager, for full details on how to integrate AWS Secrets Manager.
HashiCorp Vault	
✓ KV V2 Secrets Engine	**Good to know** • KV Secrets Engine V2 is the **only** version that can be used. • Authenticate with tokens and Kubernetes Service Account Tokens. • See our guide, Configure Bitbucket with HashiCorp Vault, for full details on how to integrate HashiCorp Vault.

Integrations

See Integrate with Atlassian applications for supported version combinations.

CI/CD

We recommend upgrading to the latest version of your CI server to ensure that the environment is as secure and stable as possible. See Integrated CI/CD for more information about linking Bitbucket and your CI application.

Jenkins

✓ 2.162+	**Good to know** • Integrating requires the Bitbucket Integration plugin for Jenkins. • To access the full set of Integrated CI/CD features you need to set up an Application Link. • Using an earlier version of Jenkins is possible, but its integration with Bitbucket will be minimal. • Before upgrading see the Jenkins upgrade guide on Jenkins.io.
Bamboo	
✓ 5.6 - 6.10 ✓ 7.0+	**Good to know** • Bamboo 7.0+ is required to enable Integrated CI/CD features. To access all Integrated CI/CD features you need to set up an Application Link. • Using Bamboo 5.6 to 6.10 is possible, but its integration with Bitbucket will be minimal. • Before upgrading, see the Bamboo upgrade guide.

Browsers

Browsers	Good to know
✓ Chrome ✓ Firefox ✓ Edge ✓ Safari	• Bitbucket has a minimum supported browser resolution of 1100px. • Bitbucket supports the latest stable version of Chromium-based Microsoft Edge and does not support legacy Microsoft Edge (versions 18 and lower). • Mobile browsers are not supported.

DVCS

Git – server	
✓ 2.31.x - 2.42.x	**Good to know** We recommend using the most recent supported version of Git on both the Bitbucket instance and clients where possible, subject to the following notes and exceptions: • The version of Git installed on machines that interact with Bitbucket must be compatible with the version of Git installed for use by the Bitbucket instance.
Git – client	
✓ 1.8.4.3+ ✓ 1.6.6+	**Good to know** • A bug was fixed in Git version 1.8.4.3 that prevented http push proxying from working.
Git LFS – client	
✓ 3.0.0+ ✓ 2.0.0+ ✓ 1.1.0+	**Good to know** • Git LFS 3.0 includes backwards incompatible changes with Bitbucket Data Center and Server 7.16.0 and below.

Internet protocols

Internet protocols	Good to know
✓ IPv4 ✓ IPv6	When using Bitbucket in IPv6 environments, we recommend that hostnames rather than IP addresses are used.

Search

Search servers	Good to know
OpenSearch ✓ 2.11 ⚠ 1.3 ⚠ 1.2 **Amazon OpenSearch Service** ✓ OpenSearch 2.11 ⚠ OpenSearch 1.3 ⚠ OpenSearch 1.2 ⚠ OpenSearch 1.1 ⚠ Elasticsearch 7.10 **Elasticsearch** ⚠ 7.17.6, 7.17.10 ⚠ 7.16.2, 7.16.3 ⚠ 7.10.2	• OpenSearch can be secured with OpenSearch's security plugin. Learn how to secure OpenSearch. • Amazon OpenSearch Service is the successor to Amazon Elasticsearch Service. • The Buckler plugin can be used to secure Elasticsearch 7.10.2, 7.16.2, 7.16.3, 7.17.6, and 7.17.10. Learn how to secure Elasticsearch with Buckler. Elasticsearch can also be secured with Elastic's Shield plugin.

Additional tools

Tools	Good to know
Perl ✓ 5.8.8+ **OpenSSH** ✓ 7.2+	• Perl is usually provided automatically with Git.

End of support announcements

End of support matrix

The table below summarizes the end of support announcements for recent Bitbucket Data Center (previously known as Stash) releases:

Platform/functionality	Announcement date	Bitbucket end of support
Deprecation of OpenSearch 1	6 February 2024	From Bitbucket 9.0
Deprecation of Microsoft SQL Server 2014 and 2016	6 February 2024	From Bitbucket 9.0
Deprecation of Aurora PostgreSQL 12	9 January 2024	From Bitbucket 9.0
Deprecation of Java 8 and Java 11	9 January 2024	From Bitbucket 9.0
Deprecation of Oracle 12c R2 and Oracle 18c	9 January 2024	From Bitbucket 9.0
Deprecation of PostgreSQL12	9 January 2024	From Bitbucket 9.0
Deprecation of Elasticsearch 7	24 October 2023	From Bitbucket 9.0
Server licenses end of support	12 September 2023	15 February 2024 for customers with a Server licence 19 March 2024 for customers with a Data Center license
Deprecation of Postgres 10 and 11	19 September 2023	From Bitbucket 9.0
Deprecation of Amazon Aurora Postgres 10 and 11	19 September 2023	From Bitbucket 9.0
Deprecation of MySQL 5.7.9+	19 September 2023	From Bitbucket 9.0
Deprecation of MariaDB 10.3.7+	19 September 2023	From Bitbucket 9.0
Deprecation of Microsoft Windows	14 December 2021	From Bitbucket 8.0
Deprecation of Elasticsearch 6, 7.5.2, and 7.9.3	14 December 2021	From Bitbucket 8.0
Deprecation of Postgres 9.4, 9.5, 9.6	2 February 2021	From Bitbucket 8.0
Deprecation of MySQL 5.6	2 February 2021	From Bitbucket 8.0
Deprecation of Oracle 11g	2 February 2021	From Bitbucket 8.0
Deprecation of MySQL 5.5	5 March 2020	From Bitbucket 8.0
Deprecation of Elasticsearch 5.5x	5 March 2020	From Bitbucket 8.0
Deprecation of MariaDB 5.5	5 March 2020	From Bitbucket 8.0

Deprecation of MariaDB 10.0	5 March 2020	From Bitbucket 8.0
Deprecation of Internet Explorer 11	24 September 2019	From Bitbucket 7.0
Deprecation of Git 2.10	7 August 2018	From Bitbucket 6.0
Deprecation of Elasticsearch 2.3	11 January 2018	From Bitbucket 6.0
Deprecation of PostgreSQL 9.2.x	11 January 2018	From Bitbucket 5.7
Deprecation of database support	4 October 2016	From Bitbucket 5.0
Deprecation of Internet Explorer 10	5 May 2015	From Bitbucket 4.0
Deprecation of Internet Explorer 9	13 January 2015	From Stash 3.10
Deprecation of Java 7	25 November 2014	From Bitbucket 4.0
Deprecation of Git versions earlier than v1.8	25 November 2014	From Bitbucket 4.0
Deprecation of Tomcat 7	10 September 2014	From Bitbucket 4.0

Why is Atlassian ending support for these platforms?

Atlassian is committed to delivering improvements and bug fixes as fast as possible. We are also committed to providing world-class support for all the platforms our customers run our software on. However, as new versions of databases, web browsers, etc. are released, the cost of supporting multiple platforms grows exponentially, making it harder to provide the level of support our customers have come to expect from us. Therefore, we no longer support platform versions marked as end of life by the vendor, or very old versions that are no longer widely used.

End of support announcements on this page (most recent announcements first):

- Bitbucket 8.14.x is the last release to support Server licenses
- Elasticsearch deprecation for Bitbucket (announced 24 October 2023)
- Deprecated environments for Bitbucket (announced 14 December 2021)
- Elasticsearch deprecations in Bitbucket 8.0 for Data Center customers (announced 14 December 2021)
- Deprecated browsers for Bitbucket (announced 24 September 2019)
- Deprecation of Git 2.10 and earlier (announced 7 August 2018)
- Deprecation of Elasticsearch 2.3 in Bitbucket 6.0 for Data Center customers (announced 11 January 2018)
- Deprecation of PostgreSQL 9.2.x and earlier (announced 11 January 2018)
- Deprecation of database support (announced 4 October 2016)
- Deprecation of Internet Explorer 10 (announced 5 May 2015)
- Deprecation of Internet Explorer 9 (announced 13 January 2015)
- Deprecation of Java 7 (announced 25 November 2014)
- Deprecation of Git versions earlier than v1.8 (announced 25 November 2014)
- Deprecation of Tomcat 7 (announced 10 September 2014)
- Deprecation of Internet Explorer 8 (announced 22 July 2013)
- Deprecation of Java 6 (announced 9 May 2013)

Bitbucket 8.14.x is the last release to support Server licenses

Bitbucket Server 8.14 is the last Bitbucket feature release available to download for Server, prior to the Server end of support date on Feb 15, 2024.

All Bitbucket releases after Bitbucket Server 8.14 will only support our Data Center offering. Bitbucket 8.14 will continue to receive security and bug fixes until the end of support date on February 15, 2024, for customers with a Server license and until March 19, 2024, for customers with a Data Center license.

If you would like to downgrade to Bitbucket 8.14 or any previous version, check the downgrade guide for the instructions.

Elasticsearch deprecation for Bitbucket (announced 24 October 2023)

Support for Elasticsearch 7 will be ended with Bitbucket Data Center version 9.0, as noted on the Bitbucket 8.15 release notes. See Supported platforms for the current list of supported search servers. From Bitbucket 9.0 onwards OpenSearch will be the only supported search server distribution.

Deprecated environments for Bitbucket (announced 14 December 2021)

Bitbucket 8.0 and higher won't support hosting on the Windows operating system. It will only support hosting on the Linux operating system. This is due to Bitbucket only ever supporting hosting on Windows for Server licenses, not the Enterprise-focused Data Center license.

We'll follow a similar process with the way we're ending sales of new licenses of our Server products. Atlassian end of support for Server licenses announcement.

See what this process looks like in End of support for Bitbucket Server hosting on Windows and read more about what this means for you.

Elasticsearch deprecations in Bitbucket 8.0 for Data Center customers (announced 14 December 2021)

Support for Elasticsearch 7.93, 7.5.2, and 6 will be ended with Bitbucket Data Center version 8.0, with details noted on the Bitbucket 7.19 release notes. See Supported platforms for a current list of supported search servers.

Deprecated browsers for Bitbucket (announced 24 September 2019)

In 2015 Microsoft released Edge as the browser to supersede Internet Explorer, and in recent times Microsoft has discouraged the use of Internet Explorer as a default browser. To allow us to continue to take advantage of modern web standards that allow us to deliver improved functionality and the best possible user experience across all of our products, we have decided to end support for Internet Explorer 11.

End of support means we will not fix bugs specific to Internet Explorer 11 and will begin to introduce features that aren't compatible with this browser.

When is this happening?

- The last Bitbucket version to support Internet Explorer will be confirmed soon.
- Subsequent versions will not support Internet Explorer 11.

What this means for you

We recommend switching to one of our supported browsers, such as Microsoft Edge, Google Chrome, or Mozilla Firefox.

If you have questions or concerns regarding this announcement, please email eol-announcement at atlassian dot com.

Deprecation of Git 2.10 and earlier (announced 7 August 2018)

In Bitbucket 6.0, we will end support for all versions before Git 2.11:

- Versions before Bitbucket 6.0 support Git 2.2.0 and higher, **excluding Git 2.12.2 on Windows** (see supp orted platforms for details).

- After 6.0 we will require Git 2.11.0 or newer, **excluding Git 2.12.2 on Windows.**

Deprecation of Elasticsearch 2.3 in Bitbucket 6.0 for Data Center customers (announced 11 January 2018)

Support for Elasticsearch 2.3 for Data Center customers will be ended with version 6.0, with full details noted on the Bitbucket 5.7 release notes. See Supported platforms for a current list of supported search servers.

Deprecation of PostgreSQL 9.2.x and earlier (announced 11 January 2018)

PostgreSQL 9.2.x has been deprecated from version 5.7 of Bitbucket. Support for this is due to end with 6.0. See Supported platforms for a current list of supported databases.

Deprecation of database support (announced 4 October 2016)

In version 5.0, Bitbucket will no longer support the following databases.

- MariaDB 5.0.x, 5.1.x
- MySQL 5.0.x, 5.1.x
- Oracle 11
- PostgreSQL 9.1.x and earlier
- SQL Server 2008 and 2008 R2

Bitbucket 5.0 is expected to be released around early-2017. See Supported platforms for a current list of supported databases.

Deprecation of Internet Explorer 10 (announced 5 May 2015)

During Q4 2015, Bitbucket will no longer support Internet Explorer 10, and will only support Internet Explorer 11 and above. See Supported platforms.

Deprecation of Internet Explorer 9 (announced 13 January 2015)

In version 3.10, Stash will no longer support Internet Explorer 9, and will only support Internet Explorer 10 and above. Stash 3.10 is expected to be released around mid-2015. See Supported platforms.

Deprecation of Java 7 (announced 25 November 2014)

In version 4.0, Bitbucket will no longer support Java 7, and will only support Java 8 and above. Bitbucket 4.0 is expected to be released around mid-2015. See Supported platforms.

Deprecation of Git versions earlier than v1.8 (announced 25 November 2014)

In version 4.0, Bitbucket will only support Git 1.8, and later versions (with the exceptions noted in Supported platforms), on the server. Bitbucket 4.0 is expected to be released around mid-2015.

Deprecation of Tomcat 7 (announced 10 September 2014)

In version 4.0, Bitbucket will no longer support Tomcat 7, and will only support Tomcat 8 and above. Bitbucket 4.0 is expected to be released around mid-2015. See Supported platforms.

Deprecation of Internet Explorer 8 (announced 22 July 2013)

In version 3.0, Stash will no longer support Internet Explorer 8, and will only support Internet Explorer 9 and above. Stash 3.0 is expected to be released in mid-2014. See Supported platforms.

Deprecation of Java 6 (announced 9 May 2013)

In version 3.0, Stash will no longer support Java 6.0, and will only support Java 7.0 and above. Stash 3.0 is expected to be released in mid-2013. See Supported platforms.

End of support for Bitbucket Server hosting on Windows

Previously, we announced that as of February 2021, we'll no longer sell new licenses for our Server products and will stop new feature development in our Server product line, with migration to Bitbucket Data Center (self-hosted) or Bitbucket Cloud being the alternatives.

Bitbucket only ever supported hosting on Windows for Server licenses, not the Enterprise-focused Data Center license. The end of support for Server licenses means the end of support for hosting Bitbucket on Windows following a similar process. Here we describe exactly what this process looks like for hosting Bitbucket on Windows.

What was previously announced?

Previously we announced the changes to our Server product line, and by extension, what's happening for Windows support. Specifically:

- End of sale for new licenses
  - As of February 2, 2021, we'll no longer sell new licenses for our Server products and will cease new feature development in our Server product line.
- No new feature development
  - As of February 15, 2022, we'll only provide security bug fixes for critical vulnerabilities until the end of support.
- End of support
  - As of February 15, 2024, your products will reach the end of support.

How is the Windows end of support being implemented?

Bitbucket Server 7.21 will be the final minor 7.x version to support hosting on Windows. Bugfix releases will be provided for critical vulnerabilities from the date of release through to the end of support date, February 15, 2024, in line with the Atlassian end of support for Server licenses announcement.

Bitbucket 8.0 and later will not support hosting on the Windows operating system. It will only support hosting on the Linux operating system.

What does this mean for you?

If you're currently running Bitbucket Server on Windows we recommend planning either to:

- Migrate from Windows to Linux. See the Migrate Bitbucket Server from Windows to Linux for details. Your users will see improved performance and in the future, you can seamlessly upgrade to a Data Center license unlocking many additional features that help you to scale and manage your instance, meet compliance goals and improve developer workflow.
- Migrate to Bitbucket Cloud. See the Bitbucket Server to Cloud migration guide for details.

You can also remain hosting on Windows, running Bitbucket Server 7.21 through to February 2024, and be assured that bugfix releases will be available for any critical security vulnerabilities.

Has Atlassian considered supporting hosting Bitbucket Data Center on Windows?

Microsoft Windows has always been an inferior platform for hosting Bitbucket Server when compared to Linux. As a result, there have always been a number of restrictions including no support for Data Center licenses or running licenses with user tiers greater than 500 users. Disk I/O and process forking performance is poor on Windows and this impacts Bitbucket's performance. For those instances running on Windows, a superior user experience is available by hosting on Linux or by migrating to Bitbucket Cloud. Furthermore, Linux has always provided superior tooling to help our support engineers help you whether you need help understanding the load on your system or diagnosing and solving problems.

Additionally, only a tiny fraction of our customer base is running Bitbucket on Windows, however, the development and maintenance effort required to support Windows is significant. We'd prefer to channel this effort towards increasing the velocity of improvements we are working on that benefit all customers, including new feature development, improved performance, and greater scalability.

Taking all of this into account, we've decided to progress the Windows end of support alongside the Server license end of support.

Does this impact users on Windows clients?

No, this only affects the choice of server operating system, not client operating system. Bitbucket Data Center and Cloud both support clients running on Windows.

Installing and upgrading Git

This page describes how to:

- Check your version of Git
- Install or upgrade Git on Linux
- Install or upgrade Git on macOS
- Install or upgrade Git on Windows

The information on this page applies to installing or upgrading Git on either your local machine, or on the Bitbucket Data Center instance.

Check your version of Git

The versions of Git supported by Bitbucket are listed on Supported platforms.

You can check your current version of Git by running the `git --version` command in a terminal (Linux, macOS) or command prompt (Windows).

For example:

```
git --version
git version 2.7.4
```

If you don't see a supported version of Git, you'll need to either upgrade Git or perform a fresh install, as described below.

Install or upgrade Git on Linux

Use your package manager to install Git. For example, on Ubuntu 13.10, use:

```
sudo apt-get install git
```

Alternative download options are:

- Download a version of Git that is compatible with your version of Bitbucket from the Git website.
- If you are using a different Linux distribution, you may need to use a different package repository to get the latest stable version of Git. See the Git website
- If you want to use a more recent version of Git than your package manager provides, you can install Git from source. Make sure you check the version is compatible with Bitbucket.

Now check the Git version – you should see the new version of Git.

If you still can't see the expected Git version, you may need to add the Git install location to your path. Open your `~/.profile` file in a text editor and add this line, where `<path/to/git>` is the install location for Git:

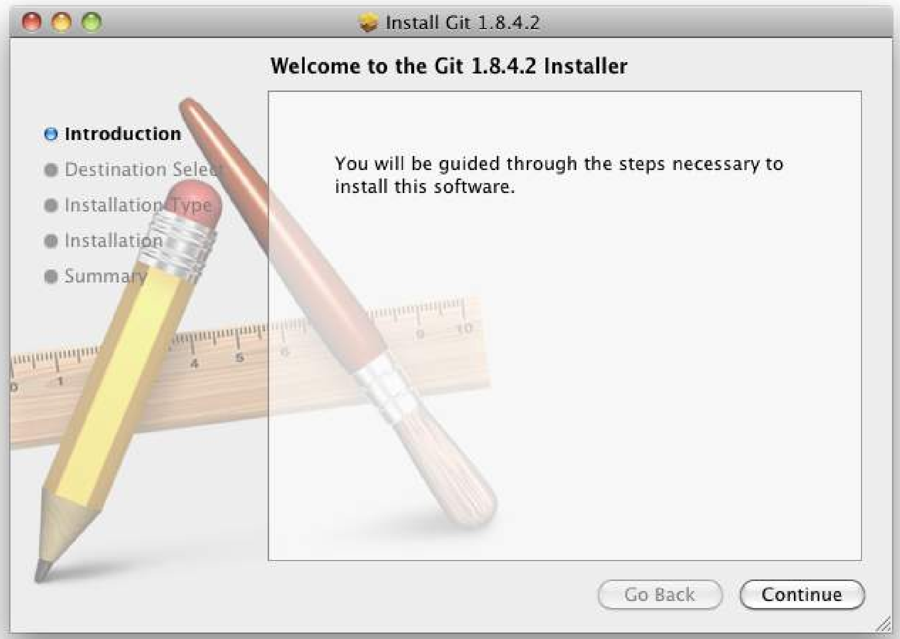
```
export PATH=$PATH:<path/to/git>
```

You can use the `which git` command to find the install location for Git.

Install or upgrade Git on macOS

Download a version of Git that is compatible with your version of Bitbucket from the Git website.

Click on the downloaded .dmg file, then double-click the .pkg icon to run the installer. This will install the new version of Git over the existing version:



You will be guided through the steps necessary to install this software.

Alternatively, you can:

- Use the native Git bundled with macOS.
- Use Homebrew to download and install Git.

Now check the Git version – you should see the new version of Git.

If you still can't see the Git version, you may need to add the Git install location to your path. Open your `~/.profile` file in a text editor and add this line, where `<path/to/git>` is the install location for Git:

```
export PATH=$PATH:<path/to/git>
```

You can use the `which git` command to find the install location for Git.

Install or upgrade Git on Windows

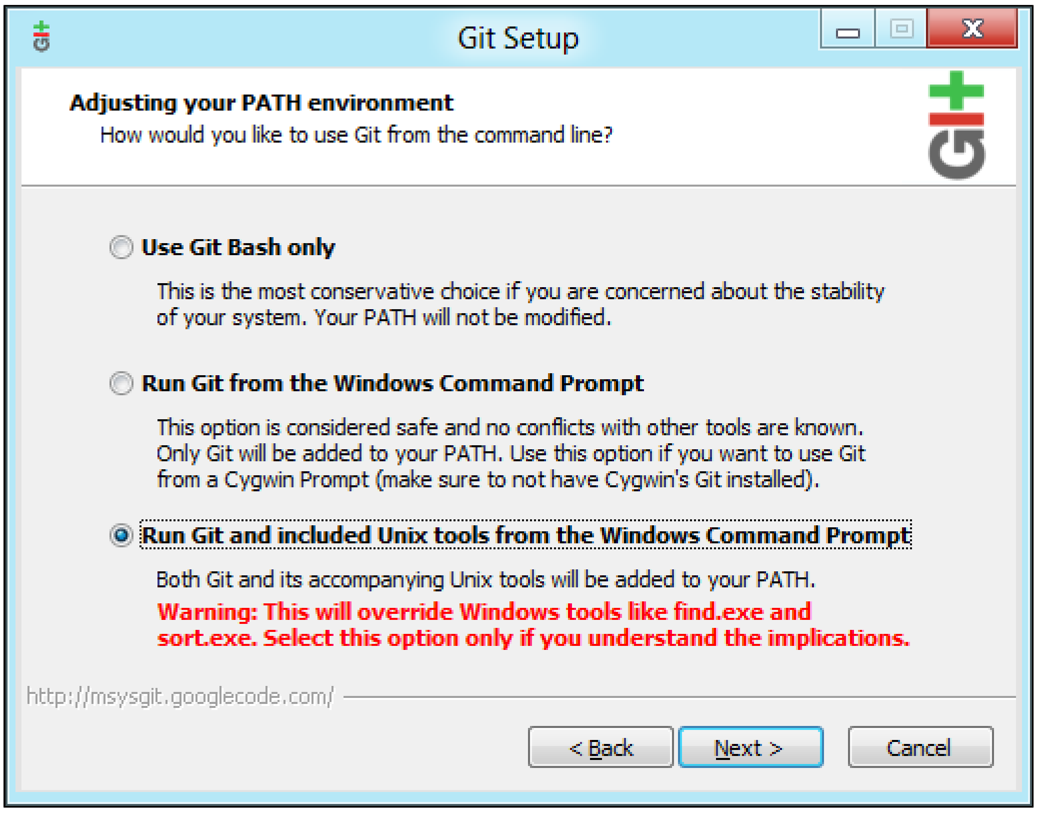
Download a version of Git that is compatible with your version of Bitbucket from the Git website.

Run the Git installer, ensuring that you install into the same location as any existing Git installation. You can use `where git` to locate existing installations. Installing Git for Windows (msysGit) also installs a supported version of Perl.

To ensure that git.exe is available in the path, choose either:

- **Run Git from the Windows Command Prompt**, or
- **Run Git and included Unix tools from the Windows Command Prompt**.

Do ***not*** select **Use Git Bash only** when installing or upgrading Git for the Bitbucket instance -- *this will not work.*



Adjusting your PATH environment
How would you like to use Git from the command line?

( ) **Use Git Bash only**

This is the most conservative choice if you are concerned about the stability of your system. Your PATH will not be modified.

( ) **Run Git from the Windows Command Prompt**

This option is considered safe and no conflicts with other tools are known. Only Git will be added to your PATH. Use this option if you want to use Git from a Cygwin Prompt (make sure to not have Cygwin's Git installed).

[✓ **Run Git and included Unix tools from the Windows Command Prompt**]

Both Git and its accompanying Unix tools will be added to your PATH.
Warning: This will override Windows tools like find.exe and sort.exe. Select this option only if you understand the implications.

http://msysgit.googlecode.com/

Now, check the Git version – you should see the new version of Git.

⚠ msysGit is the *only supported distribution* when running Bitbucket on Windows. Cygwin Git is *not supported* and has known issues.

If you have successfully installed msysGit but you receive the error "Unable to find git!" when installing Bitbucket, you should abort the installation, restart the Windows server, then restart the Bitbucket installation.

Restart Bitbucket if necessary

If you've been installing or upgrading Git for the Bitbucket instance, rather than for your local machine, you'll need to stop and restart Bitbucket so that it will pick up the upgraded version of Git. See Start and stop Bitbucket for details.

Bitbucket installation guide

Starting from 8.15.x, new releases of Bitbucket will be available only to Data Center customers. If you have a Server license, learn about your options.

Before you start

Before installing Bitbucket Data Center, check that you meet the minimum system requirements by reading the page Supported platforms.

As announced, Bitbucket 7.21 is the last release that supports Bitbucket hosting on Windows. Learn more about how to migrate from Windows to Linux

Choose your installation method

There are a number of ways to install Bitbucket. Choose the method that is best for your environment.

Install method	Is this right for you?
Install a Bitbucket trial • Linux or macOS	This is the fastest way to get Bitbucket up and running. If you're evaluating Bitbucket, use this option. You don't need an external database to install a Bitbucket trial.
Install Bitbucket Data Center using an installer • Linux	This option uses an installer and is the most straightforward way to get your production site up and running on a Linux server.
Install Bitbucket Data Center from a zip or archive file • Linux	This option requires you to manually install files and configure some system properties. It gives you the most control over the install process. Use this option if there isn't an installer for your operating system.
Run Bitbucket in a Docker container • Bitbucket and Docker	This option gets Bitbucket up and running in no time using a preconfigured Docker image. Atlassian supports running Bitbucket in a Docker container, but we cannot offer support for problems that are related to the environment itself.
Run Bitbucket in AWS • Bitbucket and AWS	Running Bitbucket on Amazon Web Services (AWS) gives you scalable computing capacity without the need to invest in hardware up front while retaining control over where and how your code is hosted within your organization.
Install Bitbucket Data Center on a single node • Linux	You don't need high availability or disaster recovery but could use features that are exclusive to Data Center. Learn more at Running Bitbucket Data Center on a single node.

Install Bitbucket in a cluster • Install Bitbucket Data Center	Bitbucket Data Center with a cluster of nodes is designed for enterprises with large or mission-critical deployments that require continuous uptime, instant scalability, and performance under high load. It can be hosted on your own infrastructure or deployed to AWS or Azure. Learn more at Clustering with Bitbucket

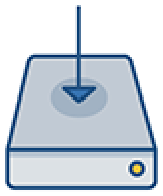
Note: We do not support installing Bitbucket as a production system on macOS. A macOS download is available for the purposes of evaluating Bitbucket only. There are no limitations to using Bitbucket on a Mac with any one of the supported browsers.

Install a Bitbucket Data Center trial

Want to quickly get up and running with Bitbucket Data Center? This page will guide you through a few simple steps to install and set up a trial instance of Bitbucket Data Center.

A trial license gives you access to a full instance of Bitbucket Data Center for 30 days. At the end of the trial period your Bitbucket Data Center will become read-only and you'll have the option to buy a full license to continue using it, so you won't lose any of your projects or data.

On this page



Before you begin

Our installers come with all the bits and pieces you need to run the application, but there's a few things you'll need to get up and running:

For the list of supported platforms, see Supported platforms.

- A computer with a supported operating system—you'll be running the Bitbucket installer so you'll need admin rights.

  You can install Bitbucket on a Linux operating system. See our Supported platforms page for information on the database, Java, and operating systems you'll be able to use. These requirements are the same for Server and Data Center deployments.
- A valid email address—you'll need this to generate your 30-day trial license and create an account.

Ready to get going? Let's start with grabbing the installer.

1. Download the installer

Head to www.atlassian.com/software/bitbucket/download and download the installer for your operating system.

2. Install Bitbucket

The installer allows you to choose the installation and home directories. For this guide we recommend using the default options.

1. Change to the directory where you downloaded Bitbucket then execute this command to make it executable:

   ```
   $ chmod a+x atlassian-Bitbucket-X.X.X-x64.bin
   ```

   Where `X.X.X` is is the Bitbucket version you downloaded.
2. Run the installer - we recommend using `sudo` to run the installer as this will create a dedicated account to run Bitbucket and allow you to run Bitbucket as a service.

```
$ sudo ./atlassian-Bitbucket-X.X.X-x64.bin
```

3. When prompted, choose to start and launch Bitbucket in a browser.
4. Once installation is complete head to `http://localhost:7990` in your browser to begin the setup process.

3. Set up Bitbucket

The Setup Wizard runs automatically when you visit Bitbucket in your browser the first time it's started.

Add your license key

Follow the prompts and head to my.atlassian.com where you can generate a trial Data Center license.

Create your administrator account

1. Enter details for the administrator account.
2. Select either **Go to Bitbucket** to go straight to the Bitbucket interface or **Integrate with Jira** to create your connection with an existing Jira application.

   You can also select to use a Jira application as your user database during this step. See the page Configuring Jira integration in the Setup Wizard for details. You can also do this later.

Start using Bitbucket

That's it! Your Bitbucket site is accessible from a URL like this: http://<computer_name_or_IP_address>:<port>

What's next?

When setting up Bitbucket in a production environment, we recommend that you configure these aspects next:

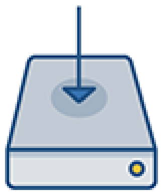
- Connect Bitbucket to a user directory - manage users/groups stored in an external directory.
- Run Bitbucket as a dedicated user - run Bitbucket from a user account with restricted privileges.
- Secure the Bitbucket home directory - secure the home directory against unauthorized access.
- Proxy and secure Bitbucket - run Bitbucket behind a reverse proxy and enable HTTPS access.
- Establish a data recovery plan - backup the home directory and database of your instance.

Read more about setting up Bitbucket for an enterprise here: Using Bitbucket in the enterprise.

Install Bitbucket Data Center on Linux

This page describes how to install Bitbucket Data Center in a production environment, with an external database, using the Linux installer.

This is the most straightforward way to get your production site up and running on a Linux server.



On this page

Other ways to install Bitbucket Data Center:

- Evaluation - get your free trial up and running in no time.
- TAR.GZ – install Bitbucket Data Center manually from an archive file.

Before you begin

Before you install Bitbucket Data Center, there are a few questions you need to answer.

Are you using a supported operating system?	Check the Supported Platforms page for the version of Bitbucket Data Center you are installing. This will give you info on supported operating systems, databases and browsers. **Good to know:** • We don't support installing Bitbucket Data Center on macOS for production sites. • The Bitbucket Data Center installer includes Java (JRE) and Tomcat, so you don't need to install these separately.

Do you want to run Bitbucket Data Center as a service?	Running Bitbucket Data Center as a service means that Bitbucket Data Center will automatically start up when your Linux server is started. You should use the Linux installer if you want to run Bitbucket Data Center as a service. **If you choose not to run Bitbucket Data Center as a service:** • You will start and stop Bitbucket Data Center by running the `start-bitbucket.sh` file in your Bitbucket Data Center installation directory. • Bitbucket Data Center will be run as the user account that was used to install Bitbucket Data Center, or you can choose to run as a dedicated user. • Bitbucket Data Center will need to be restarted manually if your server is restarted. **For more information about these options, see the pages:** • Run Bitbucket as a Linux service • Running Bitbucket Data Center with a dedicated user
Bitbucket uses ports 7990, 7992, and 7993 by default, are they available?	**Port 7990**: Bitbucket runs on port 7990 by default. If this port is already in use, see Change the port Bitbucket listens on for more guidance on changing this. **Ports 7992 and 7993**: Bitbucket Data Center bundled search server, which is required for search functionality, requires ports 7992 and 7993 be available. This is not configurable, so ensure these ports are available.
Is your database set up and ready to use?	To run Bitbucket in production you'll need an external database. Check the Supported platforms page for the version you're installing for the list of databases we currently support. **Good to know:** • Set up your database before you begin. Step-by-step guides are available for PostgreSQL, Oracle, and SQL Server.
Do you have a Bitbucket Data Center license?	You'll need a valid license to use Bitbucket Data Center. **Good to know:** • If you don't have a license you can create an evaluation license during setup, and be sure to use your business email address. • If you already have a license key you'll be prompted to log in to my.atlassian.com to retrieve it, or you can enter the key manually during setup. • If you're migrating from Bitbucket Cloud (bitbucket.org), you'll need a new license.

Do you have Git and Perl installed and on the right version?	Bitbucket Data Center requires Git on the machine that will run Bitbucket Data Center. If you need to check, install, or upgrade Git on the Bitbucket Data Center instance machine, see Installing and upgrading Git. **Do not upgrade Git to the latest version until you check the Supported Platforms page for which version of Git is currently supported.** Check that you have all the other system requirements, including Perl, to avoid any trouble.

Install Bitbucket Data Center

1. Download Bitbucket Data Center

Download the installer - www.atlassian.com/software/bitbucket/download.

2. Run the installer

1. Make the installer executable.

   Change to the directory where you downloaded Bitbucket Data Center then execute this command:

   ```
   chmod +x atlassian-bitbucket-x.x.x-x64.bin
   ```

   Where `X.X.X` is is the Bitbucket Data Center version you downloaded.
2. Run the installer – we recommend using `sudo` to run the installer as this will create a dedicated account to run Bitbucket Data Center and allow you to run Bitbucket Data Center as a service.

   To use `sudo` to run the installer execute this command:

   ```
   $ sudo ./atlassian-bitbucket-x.x.x-x64.bin
   ```

   Where `X.X.X` is is the Bitbucket Data Center version you downloaded.

   You can also run the installer with root user privileges.
3. Follow the prompts to install Bitbucket. You'll be asked for the following info:
   a. **Type of Bitbucket instance** - the type of installation, for these instructions select **Standard**.

      If you're installing Data Center on a single node, also choose **Standard**, because this type comes with a bundled search server and is suitable for a non-clustered Data Center deployment. In the **Data Center** type, you would need to install it separately.

   c. **Installation directory** - where Bitbucket will be installed.
   d. **Home directory** - where Bitbucket application data will be stored.
   e. **TCP ports** - the HTTP connector port and control port Bitbucket will run on.

4. Once the installer completes, head to `http://localhost:7990` in your browser to begin the setup process.

Set up Bitbucket

The Setup Wizard runs automatically when you visit Bitbucket Data Center in your browser the first time it's started. For details on how the Bitbucket Setup Wizard can be completed automatically, see Automated setup for Bitbucket.

3. Connect to your database

1. If you've not already done so, it's time to create your database. See the 'Before you begin' section of this page for details.

Select **External** as your database, then choose a **Database Type** from the dropdown menu and enter the details of your database.

4. Add your license key

Follow the prompts to log in to my.atlassian.com to retrieve your license, or enter a license key.

You can also set the base URL at this step, (you can elect to do this later).

5. Create your administrator account

1. Enter details for the administrator account.
2. Select either **Go to Bitbucket** to go straight to the Bitbucket interface or **Integrate with Jira** to create your connection with an existing Jira application.

   You can also select to use a Jira application as your user database during this step. See the page Configuring Jira integration in the Setup Wizard for details. You can also do this later.

6. Start using Bitbucket Data Center

That's it! Your Bitbucket site is accessible from a URL like this: http://<computer_name_or_IP_address>:<port>

What's next?

When setting up Bitbucket in a production environment, we recommend that you configure these aspects next:

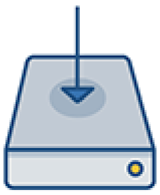
- Connect Bitbucket to a user directory - manage users/groups stored in an external directory.
- Run Bitbucket as a dedicated user - run Bitbucket from a user account with restricted privileges.
- Secure the Bitbucket home directory - secure the home directory against unauthorized access.
- Proxy and secure Bitbucket - run Bitbucket behind a reverse proxy and enable HTTPS access.
- Establish a data recovery plan - backup the home directory and database of your instance.

Read more about setting up Bitbucket for an enterprise here: Using Bitbucket in the enterprise.

Install Bitbucket Data Center on Linux from an archive file

This page describes how to install Bitbucket Data Center in a production environment, with an external database, manually using a tar.gz file.

This method gives you the most control of the installation process.



On this page

Other ways to install Bitbucket Data Center:

- Trial - get a free trial up and running in no time.
- Installer – install Bitbucket using the Linux installer.

Before you begin

Before you install Bitbucket Data Center, there are a few questions you need to answer.

Are you using a supported operating system and Java version?	Check the Supported Platforms page for the version of Bitbucket Data Center you are installing. This will give you info on supported operating systems, databases and browsers. **Good to know:** • We don't support installing Bitbucket Data Center on macOS for production sites. • The Bitbucket Data Center installer includes Java (JRE) and Tomcat, so you don't need to install these separately.

Do you want to run Bitbucket Data Center as a service?	Running Bitbucket Data Center as a service means that Bitbucket Data Center will automatically startup when your Linux server is started. You should use the Linux installer if you want to run Bitbucket Data Center as a service. **If you choose not to run Bitbucket Data Center as a service:** • You will start and stop Bitbucket Data Center by running the `start-bitbucket.sh` file in your Bitbucket Data Center installation directory. • Bitbucket Data Center will be run as the user account that was used to install Bitbucket Data Center, or you can choose to run as a dedicated user. • Bitbucket Data Center will need to be restarted manually if your server is restarted. **For more information about these options, see the pages:** • Run Bitbucket as a Linux service • Running Bitbucket Data Center with a dedicated user
Bitbucket uses ports 7990, 7992, and 7993 by default, are they available?	**Port 7990**: Bitbucket runs on port 7990 by default. If this port is already in use, see Change the port Bitbucket listens on for more guidance on changing this. **Ports 7992 and 7993**: Bitbucket Data Center bundled search server, which is required for search functionality, requires ports 7992 and 7993 be available. This is not configurable, so ensure these ports are available.
Is your database set up and ready to use?	To run Bitbucket in production you'll need an external database. Check the Supported platforms page for the version you're installing for the list of databases we currently support. **Good to know:** • Set up your database before you begin. Step-by-step guides are available for PostgreSQL, Oracle, and SQL Server.
Do you have a Bitbucket Data Center license?	You'll need a valid license to use Bitbucket Data Center. **Good to know:** • If you don't have a license you can create an evaluation license during setup, and be sure to use your business email address. • If you already have a license key you'll be prompted to log in to my.atlassian.com to retrieve it, or you can enter the key manually during setup. • If you're migrating from Bitbucket Cloud (bitbucket.org), you'll need a new license.
Do you have Git and Perl installed and on the right version?	Bitbucket Data Center requires Git on the machine that will run Bitbucket Data Center. If you need to check, install, or upgrade Git on the Bitbucket Data Center instance machine, see Installing and upgrading Git. **Do not upgrade Git to the latest version until you check the Supported Platforms page for which version of Git is currently supported.** Check that you have all the other system requirements, including Perl, to avoid any trouble.

Is your JAVA_HOME variable set correctly?	Before you install Bitbucket Data Center, check that you're running a supported Java version and that the `JAVA_HOME` environment variable is set correctly.
	
	To check the JAVA_HOME variable:
	
	`$ java -version`
	
	To check your JAVA_HOME variable is set correctly:
	
	`$ echo $JAVA_HOME`
	
	If you see a path to your Java installation directory, the `JAVA_Home` environment variable has been set correctly. If a path is not returned you'll need to set your `JAVA_HOME` environment variable manually before installing Bitbucket Data Center.

Do you need to use a remote search server?	Bitbucket Data Center comes with a bundled search server, which runs as a separate process from the Bitbucket Data Center application and doesn't require any extra configuration. You can also install a search server on a remote machine, which can provide some advantages allocating memory resources. In most cases, you're better off using our bundled search server that will be automatically configured out of the box. A clustered Bitbucket Data Center installation **requires** a search server on a remote machine. Check the instructions for using a search server on a remote machine: Install and configure a remote Elasticsearch server and Install and configure a remote OpenSearch server.

Install Bitbucket Data Center

1. Download Bitbucket Data Center

Download the `tar.gz` file - www.atlassian.com/software/bitbucket/download.

2. Create the installation directory

1. Create your installation directory (with full control permission) – this is where Bitbucket will be installed. Avoid using spaces or special characters in the path. We'll refer to this directory as your `<installation-directory>`.

2. Extract the `tar.gz` file to your `<installation-directory>`.

3. Create the home directory

1. Create your home directory (with full control permission) – this is where your Bitbucket Data Center data is stored. This should be separate to your installation directory. We'll refer to this directory as your `<home-directory>`.

2. Edit `<installation-directory>/bin/set-bitbucket-home.sh` file – uncomment the `BITBUCKET_HOME` line and add the absolute path to your home directory.

4. Start Bitbucket

1. Change directory to the `<installation-directory>` and run this command:

```
bin/start-bitbucket.sh
```

2. In your browser, go to `http://localhost:7990/` and run through the Setup Wizard.

Set up Bitbucket

The Setup Wizard runs automatically when you visit Bitbucket Data Center in your browser the first time it's started.

5. Connect to your database

1. If you've not already done so, it's time to create your database. See the 'Before you begin' section of this page for details.

Select **External** as your database, then choose a **Database Type** from the dropdown menu and enter the details of your database.

6. Add your license key

Follow the prompts to log in to my.atlassian.com to retrieve your license, or enter a license key.

You can also set the base URL at this step, (you can elect to do this later).

7. Create your administrator account

1. Enter details for the administrator account.
2. Select either **Go to Bitbucket** to go straight to the Bitbucket interface or **Integrate with Jira** to create your connection with an existing Jira application.

   You can also select to use a Jira application as your user database during this step. See the page Configuring Jira integration in the Setup Wizard for details. You can also do this later.

9. Start using Bitbucket Data Center

That's it! Your Bitbucket site is accessible from a URL like this: http://<computer_name_or_IP_address>:<port>

What's next?

When setting up Bitbucket in a production environment, we recommend that you configure these aspects next:

- Connect Bitbucket to a user directory - manage users/groups stored in an external directory.
- Run Bitbucket as a dedicated user - run Bitbucket from a user account with restricted privileges.
- Secure the Bitbucket home directory - secure the home directory against unauthorized access.
- Proxy and secure Bitbucket - run Bitbucket behind a reverse proxy and enable HTTPS access.
- Establish a data recovery plan - backup the home directory and database of your instance.

Read more about setting up Bitbucket for an enterprise here: Using Bitbucket in the enterprise.

Running Bitbucket Data Center with a dedicated user

For production installations, we recommend that you create a new dedicated user that will run Bitbucket Data Center on your system. This user:

- Should be local.
- Should *not* have admin privileges.
- Should be a non-privileged user with read, write, modify, and execute access (called "Full control" permission on Windows) on the Bitbucket Data Center install directory and home directory.

Learn more about how to run Bitbucket as a Linux service

Here is an example of how to create a dedicated user to run Bitbucket Data Center on **Linux**:

```
$ sudo /usr/sbin/useradd --create-home --home-dir /opt/atlassian/bitbucket --shell /bin/bash atlbitbucket
```

Run Bitbucket as a Linux service

This page describes how to run Bitbucket Data Center as a Linux service, and only applies if you are manually installing or upgrading Bitbucket from an archive file. See the page Install Bitbucket Data Center from an archive file for more details.

On this page:

Related pages:

- Use Bitbucket in the enterprise

Bitbucket assumes that the external database is available when it starts; these approaches do not support service dependencies, and the startup scripts will not wait for the external database to become available.

For production use on a Linux server, Bitbucket should be configured to run as a Linux service, that is, as a daemon process**.** This has the following advantages:

- Bitbucket can be automatically restarted when the operating system restarts.
- Bitbucket can be automatically restarted if it stops for some reason.
- Bitbucket is less likely to be accidentally shut down, as can happen if the terminal Bitbucket was manually started in is closed.
- Logs from the Bitbucket JVM can be properly managed by the service.

System administration tasks are not supported by Atlassian. These instructions are only provided as a guide and may not be up to date with the latest version of your operating system.

Using the Java Service Wrapper

Bitbucket can be run as a service on Linux using the Java Service Wrapper. The Service Wrapper is known to work with Debian, Ubuntu, and Red Hat.

The Service Wrapper provides the following benefits:

- Allows Bitbucket, which is a Java application, to be run as a service.
- No need for a user to be logged on to the system at all times, or for a command prompt to be open and running on the desktop to be able to run Bitbucket.
- The ability to run Bitbucket in the background as a service, for improved convenience, system performance and security.
- Bitbucket is launched automatically on system startup and does not require that a user be logged in.
- Users are not able to stop, start, or otherwise tamper with Bitbucket unless they are an administrator.
- Can provide advanced failover, error recovery, and analysis features to make sure that Bitbucket has the maximum possible uptime.

Please see http://wrapper.tanukisoftware.com/doc/english/launch-nix.html for wrapper installation and configuration instructions.

The service wrapper supports the standard commands for SysV init scripts, so it should work if you just create a symlink to it from `/etc/init.d`.

Using an init.d script

The usual way on Linux to ensure that a process restarts at system restart is to use an init.d script. This approach does not restart Bitbucket if it stops by itself.

1. Create the startup script in `/etc/init.d/atlbitbucket` with the following contents (Ensure the script is executable by running `chmod 755 atlbitbucket`):

```
#! /bin/sh

### BEGIN INIT INFO
# Provides:          atlbitbucket
# Required-Start:    $remote_fs $syslog
# Required-Stop:     $remote_fs $syslog
# Default-Start:     2 3 4 5
# Default-Stop:      0 1 6
# Short-Description: Initscript for Atlassian Bitbucket Server
# Description:  Automatically start Atlassian Bitbucket Server when the system starts up.
#               Provide commands for manually starting and stopping Bitbucket Server.
### END INIT INFO

# Adapt the following lines to your configuration
# RUNUSER: The user to run Bitbucket Server as.
RUNUSER=atlbitbucket

# BITBUCKET_INSTALLDIR: The path to the Bitbucket Server installation directory
BITBUCKET_INSTALLDIR="/opt/atlassian-bitbucket-X.Y.Z"

# BITBUCKET_HOME: Path to the Bitbucket home directory
BITBUCKET_HOME="/opt/bitbucket-home"

# ==================================================================================
# ==================================================================================
# ==================================================================================

# PATH should only include /usr/* if it runs after the mountnfs.sh script
PATH=/sbin:/usr/sbin:/bin:/usr/bin
DESC="Atlassian Bitbucket Server"
NAME=atlbitbucket
PIDFILE=$BITBUCKET_HOME/log/bitbucket.pid
SCRIPTNAME=/etc/init.d/$NAME

# Read configuration variable file if it is present
[ -r /etc/default/$NAME ] && . /etc/default/$NAME

# Define LSB log_* functions.
# Depend on lsb-base (>= 3.0-6) to ensure that this file is present.
. /lib/lsb/init-functions


run_with_home() {
    if [ "$RUNUSER" != "$USER" ]; then
        su - "$RUNUSER" -c "export BITBUCKET_HOME=${BITBUCKET_HOME};${BITBUCKET_INSTALLDIR}/bin
/$1"
    else
        export BITBUCKET_HOME=${BITBUCKET_HOME};${BITBUCKET_INSTALLDIR}/bin/$1
    fi
}

#
# Function that starts the daemon/service
#
do_start()
{
    run_with_home start-bitbucket.sh
}

#
# Function that stops the daemon/service
#
do_stop()
{
    if [ -e $PIDFILE ]; then
      run_with_home stop-bitbucket.sh
    else
      log_failure_msg "$NAME is not running."
    fi
}


case "$1" in
  start)
    [ "$VERBOSE" != no ] && log_daemon_msg "Starting $DESC" "$NAME"
    do_start
    case "$?" in
        0|1) [ "$VERBOSE" != no ] && log_end_msg 0 ;;
        2) [ "$VERBOSE" != no ] && log_end_msg 1 ;;
    esac
    ;;
  stop)
    [ "$VERBOSE" != no ] && log_daemon_msg "Stopping $DESC" "$NAME"
    do_stop
    case "$?" in
        0|1) [ "$VERBOSE" != no ] && log_end_msg 0 ;;
        2) [ "$VERBOSE" != no ] && log_end_msg 1 ;;
    esac
    ;;
  status)
       if [ ! -e $PIDFILE ]; then
         log_failure_msg "$NAME is not running."
         return 1
       fi
       status_of_proc -p $PIDFILE "" $NAME && exit 0 || exit $?
       ;;
  restart|force-reload)
    #
    # If the "reload" option is implemented then remove the
    # 'force-reload' alias
    #
    log_daemon_msg "Restarting $DESC" "$NAME"
    do_stop
    case "$?" in
      0|1)
        do_start
        case "$?" in
            0) log_end_msg 0 ;;
            1) log_end_msg 1 ;; # Old process is still running
            *) log_end_msg 1 ;; # Failed to start
        esac
        ;;
      *)
        # Failed to stop
        log_end_msg 1
        ;;
    esac
    ;;
  *)
    echo "Usage: $SCRIPTNAME {start|stop|status|restart|force-reload}" >&2
    exit 3
    ;;
esac
```

2. Enable the service to start at boot time:
    a. For Ubuntu and other Debian derivatives, use:

       `update-rc.d atlbitbucket defaults`
    b. For RHEL and derivatives, use:

       `chkconfig --add atlbitbucket --level 0356`

       ℹ You may have to install the `redhat-lsb` package on RHEL or derivatives to provide the LSB functions used in the script.
3. Gracefully shutdown Bitbucket.
4. Restart the machine to check that Bitbucket starts at boot time as expected.
5. Use the following commands to manage the service:
    a. Disable the service (not to start at boot time):

```
# Ubuntu and other Debian derivatives
update-rc.d atlbitbucket disable

# RHEL and derivatives
chkconfig atlbitbucket off --level 0356
```

b. Check that the service is set to start at boot time:

```
# Ubuntu and other Debian derivatives
ls /etc/rc*.d | grep atlbitbucket

# RHEL and derivatives
chkconfig --list | grep atlbitbucket
```

c. Manually start and stop the service:

```
service atlbitbucket start
service atlbitbucket stop
```

d. Check the status of Bitbucket:

```
service atlbitbucket status
```

Using a systemd unit file

Thanks to Patrick Nelson for calling out this approach, which he set up for a Fedora system. It also works on other distributions that use systemd as the init system. This approach does not restart Bitbucket if it stops by itself.

1. Create the `atlbitbucket.service` file in your `/etc/systemd/system/` directory with the following lines:

```
[Unit]
Description=Atlassian Bitbucket Server Service
After=syslog.target network.target

[Service]
Type=forking
User=atlbitbucket
ExecStart=/opt/atlassian-bitbucket-X.Y.Z/bin/start-bitbucket.sh
ExecStop=/opt/atlassian-bitbucket-X.Y.Z/bin/stop-bitbucket.sh

[Install]
WantedBy=multi-user.target
```

   The value for `User` should be adjusted to match the user that Bitbucket runs as. `ExecStart` and `ExecStop` should be adjusted to match the path to your `<Bitbucket installation directory>`.
2. Enable the service to start at boot time:

```
systemctl enable atlbitbucket
```

3. Gracefully shutdown Bitbucket.
4. Restart the machine to check that Bitbucket starts at boot time as expected.
5. Use the following commands to manage the service:
   a. Disable the service (not to start at boot time):

```
systemctl disable atlbitbucket
```

   b. Check that the service is set to start at boot time:

```
systemctl is-enabled atlbitbucket
```

   c. Manually start and stop the service:

```
systemctl start atlbitbucket
systemctl stop atlbitbucket
```

d. Check the status of Bitbucket:

```
systemctl status atlbitbucket
```

Automated setup for Bitbucket

This page describes how the Bitbucket Setup Wizard can be completed automatically, that is without the need for manual interaction in the browser. See Getting started for an outline of the tasks that the Setup Wizard assists with when setting up Bitbucket manually.

You might want to configure this when automating the provisioning of Bitbucket Data Center, for example. Of course, you'll need to configure provisioning tools such as Puppet or Vagrant yourself.

Note that you can also automate the 'install and launch' phase of provisioning Bitbucket – see Running the Bitbucket installer for information about how to run the installer in the console and unattended modes.

1. Get a license for Bitbucket

You can get a new Bitbucket license by:

- Logging in to your my.Atlassian.com account.
- Contacting Atlassian.

If you already have a licensed instance of Bitbucket, you can find the license in the Bitbucket admin area.

2. Set the configuration properties

After installing Bitbucket, but before you start Bitbucket for the first time, edit the `bitbucket.properties` file to add the properties in the table below. Use the standard format for Java properties files.

Note that the `bitbucket.properties` file is created automatically in the `shared` folder of your Bitbucket home directory when you perform a database migration. Create the file yourself if it does not yet exist. See Configuration properties for information about the properties file.

Add these properties to the `bitbucket.properties` file:

Property	Description
`setup.displayName=displayName`	The display name for the Bitbucket application.
`setup.baseUrl= https://bitbucket.yourcompany.com`	The base URL.
`setup.license=AAAB...`	The Bitbucket license. Use the \ character at the end of each line if you wish to break the license string over multiple lines.
`setup.sysadmin.username=username`	Credentials for the system admin account.
`setup.sysadmin.password=password`	
`setup.sysadmin.displayName=John Doe`	The display name for the system admin account. An empty property is ignored.
`setup.sysadmin.emailAddress=sysadmin@yourcompany.com`	The email address for the system admin account.
`jdbc.driver=org.postgresql.Driver`	JDBC connection parameters. Use the appropriate values for your own JDBC connection.

`jdbc.url=jdbc:postgresql://localhost:5432/bitbucket`	For Postgres, If no parameter is manually specified in the `jdbc.url`, Bitbucket will automatically append?`targetServerType=master` in the JDBC URL.
`jdbc.user=bitbucket`	
`jdbc.password=bitbucket`	
`plugin.mirroring.upstream.url=https://bitbucket.company.com`	(Smart Mirroring only) On the mirror, specifies the base URL of the primary Bitbucket Data Center instance that the new mirror will be mirroring from. See Set up a mirror for more information.

You should specify the JDBC properties so that Bitbucket can connect to the external database.

If any of the following required properties are not provided in the properties file, when you start Bitbucket the Setup Wizard will launch at the appropriate screen so that you can enter values for those properties.

3. Start Bitbucket

Start Bitbucket as usual. See Start and stop Bitbucket.

Bitbucket reads the `bitbucket.properties` file and applies the setup properties automatically.

When you now visit Bitbucket in the browser, you see the welcome page.

Troubleshooting

The Setup Wizard launches in the browser

The Setup Wizard will run if there are missing configuration properties, such as the license string, in the `bitbucket.properties` file. Check the properties file and compare it with the table in Step 2 above. Alternatively, the setup can be completed using the web UI.

Write access for the `config.properties` file

Once the automated setup process completes, the relevant properties in the `bitbucket.properties` file are commented out. This requires that the system user has write permission on the properties file.

Bitbucket fails to start with a 'Could not acquire change log lock.' error

If Bitbucket is forced to quit while modifying the config.properties file, you may not be able to restart Bitbucket, and `atlassian-bitbucket.log` contains the above error.

See this KB article for information about how to resolve this: Bitbucket Server Does Not Start - Could not acquire change log lock

Start and stop Bitbucket

This page describes the various ways you can start or stop Bitbucket Data Center, depending on which method suits your needs.

On this page

Start Bitbucket during installation

The Bitbucket installer can automatically start Bitbucket. If you're not using the installer, use the instructions below that are appropriate for your needs to start Bitbucket.

Start and stop Bitbucket

To start and stop Bitbucket

For Linux

Change to your `<Bitbucket installation directory>`, then use the command that meets your needs:

```
bin/start-bitbucket.sh
bin/stop-bitbucket.sh
```

For Windows

For automated starting and stopping of Bitbucket on Windows, **it should be installed as a service**.

You can use `start-bitbucket.bat` for short term debugging, using Ctrl+C will safely shutdown the instance when it is no longer needed.

To start and stop Bitbucket manually when running as a service on Windows

Start and stop the Bitbucket service from the services console, on Windows. Ensure you start both the `AtlassianBitbucket` and `AtlassianBitbucketSearch` services.

For macOS

Use the app icons in the `<Bitbucket installation directory>`. These link to the `start-bitbucket.sh` and `stop-bitbucket.sh` scripts in `<Bitbucket installation directory>/bin`.

Start and stop app icons:

Start Bitbucket Data Center

For Bitbucket Data Center, the *remote search server* must be started separately. It is a requirement of the Bitbucket Data Center setup that you have *only one* remote search server for your entire cluster, as described on Installing Bitbucket Data Center. To start (or restart) a remote search server, see the search server documentation for specific instructions.

To start Bitbucket Data Center (*does not* start Bitbucket bundled search server)

1. Change to your `<Bitbucket installation directory>`
2. Run this command:

```
start-bitbucket.sh --no-search
```

Start and stop Bitbucket when running as a service

On Windows and Linux systems, you can choose to have Bitbucket installed as a service, and it will be started automatically when the system boots.

For Linux

Manage the Bitbucket service with these commands:

```
# service atlbitbucket status
# service atlbitbucket stop
# service atlbitbucket start
```

If you installed Bitbucket as a systemd service (as explained in Run Bitbucket as a Linux service), use these commands instead:

```
# systemctl status atlbitbucket
# systemctl stop atlbitbucket
# systemctl start atlbitbucket
```

Start Bitbucket without starting the bundled search server

You're running Bitbucket Data Center: It is a requirement of the Bitbucket Data Center setup that you have *only one* remote search server for your cluster, as described on Installing Bitbucket Data Center.

You have a remote search server (for whatever reason): When using a remote search server, you have to start Bitbucket without starting the bundled search server.

You can also refer to Install and configure a remote Elasticsearch server and Install and configure a remote OpenSearch server.

You have a Docker deployment: We strongly recommend that you run a search server on a separate container. Otherwise, you won't be able to properly trigger a graceful shutdown.

To start Bitbucket without starting the bundled search server

For Linux

```
start-bitbucket.sh --no-search
```

For Windows

```
start-bitbucket.bat /no-search
```

For Docker installations, use the `-e SEARCH_ENABLED=false` parameter. Learn more about deploying Bitbucket through Docker

Performing a graceful shutdown (Linux only)

You can send a SIGTERM signal to Bitbucket to trigger a graceful shutdown. This will give Bitbucket some time to complete any running tasks, in-flight GIT requests, and in-flight user requests before terminating. The `bin/stop-bitbucket.sh` script, `service atlbitbucket stop` command, and `systemctl stop atlbitbucket` command all use the `SIGTERM` signal to terminate Bitbucket.

During a graceful shutdown:

- Tomcat stops accepting new HTTP connections without interrupting active connections.
- The SSH server stops accepting new SSH connections without interrupting active connections.
- The job scheduler will not start any new jobs, but will not immediately cancel any running jobs.

The following configuration properties control how graceful shutdown works:

Default value	Description
`graceful.shutdown.timeout`	
`30`	The amount of time (in seconds) that Bitbucket should allocate before terminating all active HTTP requests, SSH requests, and running jobs.
`server.shutdown`	
`graceful`	Sets whether Bitbucket should initiate a graceful shutdown first upon termination. If you want Bitbucket to shut down immediately without waiting for any tasks to complete, set this to `immediate`.

In addition to these config properties, the `BITBUCKET_SHUTDOWN_TIMEOUT` environment variable controls when Bitbucket terminates altogether. This environmental variable will override `plugin.search.indexing.event.shutdown.timeout`.

By default, `BITBUCKET_SHUTDOWN_TIMEOUT` is set to 40. We recommend you keep this environmental variable at least 10 seconds longer than `plugin.search.indexing.event.shutdown.timeout`.

Gracefully shutting down Docker deployments

If Bitbucket and the search server are running in the same container, you won't be able to trigger a graceful shutdown properly. We strongly recommend that you run the search server on its own separate container.

If the search server is not running on the same container, you can trigger a graceful Bitbucket shutdown through `docker stop`. This command will send a `SIGTERM` signal to Bitbucket.

Install Bitbucket Data Center from an archive file

This page describes how to manually install Bitbucket Data Center from an archive file. However, we strongly recommend that you use the Bitbucket installer instead, for a quick and trouble-free install experience.

Related pages

- See Getting started, and consider using the installer
- Use Bitbucket in the enterprise
- Docker container image for Bitbucket Server

1. Check supported platforms

Check the Supported platforms page for details of the application servers, databases, operating systems, web browsers and Java and Git versions that we have tested Bitbucket Data Center with and recommend.

Atlassian only officially supports Bitbucket Data Center running on x86 hardware and 64-bit derivatives of x86 hardware.

Cygwin Git is *not supported*. No internal testing is done on that platform, and many aspects of Bitbucket Data Center functionality (pull requests and forks among them) have known issues.

2. Check your version of Java

In a terminal or command prompt, run this:

```
java -version
```

The version of Java should be **1.8.x** . You'll need a 64-bit version of Java if you have a 64-bit operating system.

Install Java

Download Java Server JRE from Oracle's website, and install it.

Now try running '`java -version`' again to check the installation. The version of Java should be **1.8.x.**

Check that the system can find Java
In a terminal, run this:

```
echo $JAVA_HOME
```

You should see a path like `/usr/jdk/jdk1.8.0`.

If you don't see a path, then set JAVA_HOME

Do one of the following:

- If `JAVA_HOME` is not set, log in with 'root' level permissions and run:

  ```
  echo JAVA_HOME="path/to/JAVA_HOME" >> /etc/environment
  ```

  where `path/to/JAVA_HOME` may be like: `/usr/jdk/jdk1.8.0`
- If `JAVA_HOME` needs to be changed, open the `/etc/environment` file in a text editor and modify the value for `JAVA_HOME` to:

  `JAVA_HOME="path/to/JAVA_HOME"`

  It should look like: `/usr/jdk/jdk1.8.0`

Install Java

Download Java Server JRE from Oracle's website, and install it.

Now try running '`java -version`' again to check the installation. The version of Java should be **1.8.x** .

Check that the system can find Java
In a terminal, run this:

```
echo $JAVA_HOME
```

You should see a path like `/System/Library/Frameworks/JavaVM.framework/Versions/CurrentJDK/Home/`.

If you don't see a path, then set JAVA_HOME

Open your `~/.profile` file in a text editor and insert:

```
JAVA_HOME="path/to/JAVA_HOME"
export JAVA_HOME
```

where `path/to/JAVA_HOME` may be like: `/System/Library/Frameworks/JavaVM.framework /Versions/CurrentJDK/Home/`

Refresh your ~/.profile in the terminal and confirm that `JAVA_HOME` is set:

```
source ~/.profile
$JAVA_HOME/bin/java -version
```

You should see a version of Java that is **1.8.x**, like this:

```
java version "1.8.0_1"
```

3. Check your versions of Git and Perl

In a terminal or command prompt, run:

```
git --version
perl --version
```

The version of Git should be **1.8.x** or higher. The version of Perl should be **5.8.8** or higher.

If you don't see supported versions of Git and Perl, either install or upgrade them – see Installing and upgrading Git.

4. Now it's time to get Bitbucket Data Center

Download latest version

Download Bitbucket Data Center from the Atlassian download site. Looking for the Bitbucket WAR file?

Extract the downloaded file to an install location (without spaces in the path).

The path to the extracted directory is referred to as the `<Bitbucket installation directory>` in these instructions.

Never unzip the Bitbucket Data Center archive file over the top of an existing Bitbucket Data Center installation – each version of Bitbucket Data Center includes versioned jar files, such as `bitbucket-model-4.0.0.jar`. If you copy these, you end up with multiple versions of Bitbucket Data Center jar files in the classpath, which leads to runtime corruption.

Note that you should use the same user account to both extract Bitbucket Data Center and to run Bitbucket Data Center (in Step 6.) to avoid possible permission issues at startup. For production installations, we recommend that you create a new dedicated user that will run Bitbucket Data Center on your system. See Running Bitbucket Data Center with a dedicated user.

5. Tell Bitbucket Data Center where to store your data

The Bitbucket Data Center home directory is where your data is stored.

If you are upgrading Bitbucket Data Center, simply update the value of `BITBUCKET_HOME` in the `<Bitbucket installation directory>/bin/set-bitbucket-home` file so the *new* Bitbucket Data Center installation points to your *existing* Bitbucket Data Center home directory (if you use a `BITBUCKET_HOME` environment variable to specify the home directory location, no change is required).

Otherwise, for a new install, create your Bitbucket home directory (without spaces in the name), and then tell Bitbucket Data Center where you created it by editing the `<Bitbucket installation directory>/bin/set-bitbucket-home.sh` (or `set-bitbucket-home.bat`) file – uncomment the `BITBUCKET_HOME` line and add the absolute path to your home directory. Here's an example of what that could look like when you're done:

```
#
if ["x${BITBUCKET_HOME}" = "x"]; then
    export BITBUCKET_HOME="/home/username/bitbucket_home"
fi
```

You *should not* locate your Bitbucket home directory inside the `<Bitbucket installation directory>` — they should be entirely separate locations. If you do put the home directory in the `<Bitbucket installation directory>` it may be overwritten, and lost, when Bitbucket Data Center gets upgraded. And by the way, you'll need separate Bitbucket Data Center home directories if you want to run multiple instances of Bitbucket Data Center.

6. Move server.xml to your Bitbucket Data Center home `shared` directory

If this is a new installation, or you are already running Stash 3.8 or later, you can skip to the next step.

If you are upgrading from Stash 3.7 or earlier and you made any changes to `<Bitbucket installation directory>/conf/server.xml` (for instance to secure your server with SSL):

1. In the `<BITBUCKET_HOME>` directory, make a new directory called `shared`.
2. Then, copy your modified server.xml file into `<BITBUCKET_HOME>/shared/`. Ensure the copied file is readable by the user account that runs Bitbucket Data Center.

7. Install and configure a remote search server

This step is mandatory if you're using a clustered Bitbucket Data Center instance.

If your instance is single-node, this step is optional. On a single-node instance, you can use bundled search.

Bitbucket 4.5+ comes with a bundled search server, which runs as a separate process from the Bitbucket application, and does not require any extra configuration.

If you plan to use the bundled search server, jump to the next step, Start Bitbucket Data Center!

However, you can also install a search server on a remote machine, which can provide some advantages allocating memory resources. Read the instructions for installing and configuring a remote search server at Install and configure a remote Elasticsearch server and Install and configure a remote OpenSearch server.

Bundled search server ports

Bitbucket Data Center bundled search server requires ports 7992 and 7993 be available to provide code search functionality. This is not configurable, so ensure these ports are available.

8. Start Bitbucket Data Center!

There are a couple of ways in which you can start Bitbucket Data Center – see Start and stop Bitbucket.

If you've setup a remote search server you do not want to start the bundled search server.

To start Bitbucket Data Center with a remote search server

When using a remote search server, instead of the bundled search server, start Bitbucket Data Center by running `start-bitbucket.sh --no-search`. This starts Bitbucket Data Center alone without running the bundled search server.

Finish configuring Bitbucket Data Center

Now, in your browser, go to http://localhost:7990/ and run through the Setup Wizard. In the Setup Wizard:

- If you're evaluating Bitbucket Data Center, select **Internal** at the 'Database' step. Bitbucket Data Center will use its internal database, and you can easily migrate to external database later. See Connect Bitbucket to an external database.
- Enter your Bitbucket Data Center license key.
- Set the base URL for Bitbucket .
- Set up an administrator account.
- You can set up Jira Software integration, but you can do this later if you wish. See Configuring Jira integration in the Setup Wizard .

9. Set up your mail server

Configure your email server so users can receive a link from Bitbucket Data Center that lets them generate their own passwords. See Setting up your mail server.

10. Add users and repositories

Now is the time to set up your users in Bitbucket Data Center, and to tell Bitbucket Data Center about any existing repositories you have. Please the following pages for the details:

- Get started with Git
- Importing code from an existing project

Additional steps for production environments

For production or enterprise environments we recommend that you configure the additional aspects described on Use Bitbucket in the enterprise. The aspects described there are not necessary when you are installing for evaluation purposes only.

If you wish to install Bitbucket Data Center as a service on Linux, see Run Bitbucket as a Linux service.

Stopping Bitbucket Data Center

See Start and stop Bitbucket.

Uninstalling Bitbucket Data Center

To uninstall Bitbucket Data Center, stop Bitbucket Data Center as described above and then delete the `<Bitbucket installation directory>` and Set the home directory.

Run the Bitbucket installer

This page provides information about running Bitbucket Data Center with search installed. For high-level information about installing and using Bitbucket see Getting started.

An installer is available for the Linux operating system.

The installer will:

- Install Bitbucket into a fresh directory, even if you have an earlier version installed.
- Install a supported version of the Java JRE, which is only available to Bitbucket.
- Install a bundled, local search server.
- Launch Bitbucket when it finishes.

Additional services provided by the installer, and described on this page, are:

- Installing Bitbucket Data Center as a service
- Running the installer in console and unattended modes

You can also automate the Bitbucket Setup Wizard so that a Bitbucket instance can be completely provisioned automatically – see Automated setup for Bitbucket.

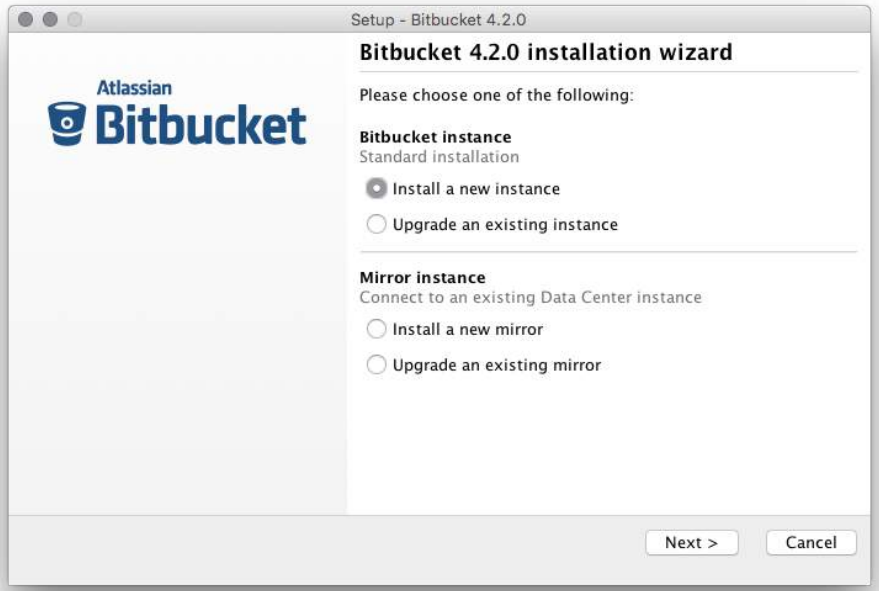
Running the installer

Download the Bitbucket installer from the Atlassian download site.

On Linux, you need to set the executable flag on the installer file before running it:

```
chmod +x atlassian-bitbucket-x.x.x-x64.bin
```

Run the installer, and follow the installation wizard.



Bitbucket 4.2.0 installation wizard

Please choose one of the following:

Bitbucket instance
Standard installation

[✓ Install a new instance]
Upgrade an existing instance

Mirror instance
Connect to an existing Data Center instance

Install a new mirror
Upgrade an existing mirror

Install Bitbucket as a service

The installer can install Bitbucket as a service (although not when upgrading an existing instance of Bitbucket).

A service account named 'atlbitbucket' will be created.

On Linux

- The 'atlbitbucket' account will be a locked account (it cannot be used to log in to the system).
- The `init.d` script will be linked to run levels 2, 3, 4 and 5. If you wish to change this, you will need to configure it manually.

Console and unattended mode

The Bitbucket installer has three modes:

- GUI mode: the default mode for the installer is to display a GUI installer.
- Console mode: if the installer is invoked with the `-c` argument, the interaction with the user is performed in the terminal from which the installer was invoked.
- Unattended mode: if the installer is invoked with the `-q` argument, there is no interaction with the user and the installation is performed automatically with the default values.

Unattended mode also allows you to supply a response file with a `-varfile` option, to supply answers for all questions that are used instead of the defaults. An example response file is:

Example response file

```
 // Should Bitbucket Data Center be installed as a Service? Must be ADMIN (default: true if the process is
running with administrator rights, false otherwise). If false, the home and installation directories must
be specified to point to directories owned by the user
app.install.service$Boolean=true

// The ports Bitbucket Data Center should bind to (defaults: portChoice=default, httpPort=7990)
portChoice=custom
httpPort=7990


// Path to the Bitbucket Data Center HOME directory (default: /var/atlassian/application-data/bitbucket if
the process is running with administrator rights, ~/atlassian/application-data/bitbucket otherwise)
app.bitbucketHome=/var/atlassian/application-data/bitbucket


// The target installation directory (default: /opt/atlassian/bitbucket/<VERSION> if the process is running
with administrator rights, ~/atlassian/bitbucket/<VERSION> otherwise)
app.defaultInstallDir=/opt/atlassian/bitbucket/<VERSION>
```

The following parameters can be included in the file.

Parameters	Accepted values	Description
app. bitbucketHome	N/A	This is the path to your target local home directory.
app. defaultInstallDir	N/A	This is the path to your target installation directory for a new install, or existing installation directory to be upgraded.

installation.type	• INSTALL • UPGRADE • DATA_CENTER_INSTALL • DATA_CENTER_UPGRADE • MIRROR_INSTALL • MIRROR_UPGRADE	Determines the type of installation: • INSTALL - Install a new single-node Bitbucket instance with a search server • UPGRADE - Upgrade an existing single-node Bitbucket instance with a search server • DATA_CENTER_INSTALL - Install one node in a multi-node Bitbucket Data Center instance • DATA_CENTER_UPGRADE - Upgrade one existing node in a multi-node Bitbucket Data Center instance • MIRROR_INSTALL - Install a Bitbucket mirror instance • MIRROR_UPGRADE - Upgrade an existing Bitbucket mirror instance
portChoice	• custom • default	Determines whether Bitbucket should be installed with default ports or custom values.
httpPort	<numeric port value>	HTTP port for Bitbucket, if `portChoice` is set to custom.
app.install.service$Boolean	• true • false	Determines whether Bitbucket should be installed as a service or not.
app.service.account	<service account name>	Account name for the Bitbucket service if Bitbucket is installed as a service.
launch.application$Boolean	• true • false	Determines whether the installer should start Bitbucket once installation is complete.
sys.adminRights$Boolean=true	• true • false	Indicates whether the user running the installer has admin rights privileges on the machine.
sys.languageId	N/A	Default application language

For more information see the install4j documentation.

Further reading

Use Bitbucket in the enterprise

Bitbucket Server upgrade guide

Starting from 8.15.x, new releases of Bitbucket will be available only to Data Center customers. If you have a Server license, learn about your options.

Use this document only if you're upgrading to **Bitbucket Server 8.14 or earlier**.

If you want to upgrade to Bitbucket 8.15 or later, go to Bitbucket Data Center upgrade guide.

If you try to upgrade to release 8.15 or later with your Server license, Bitbucket will fail to start, and you'll need to downgrade. To do this, follow our Bitbucket Server downgrade guide.

If you're using bundled search, you'll also need to delete search index data before downgrading Bitbucket.

On this page:

This guide describes how to upgrade your Bitbucket Server installation on Linux to the latest version using the installer.

Upgrading to any later version is free if you have current software maintenance. See our Licensing FAQ to find out more.

Other ways to upgrade Bitbucket:

- Manually – upgrade using an archive file.
- Data Center – upgrade your Data Center cluster
- Rolling upgrade - upgrade your Data Center cluster to the next bug fix update, without downtime
- Docker container image for Bitbucket Server.

Before you begin

Before you upgrade Bitbucket there are a few questions you need to answer.

Is using the installer the right upgrade method for you?	You can choose to upgrade using the installer, or, if the installer is not suitable for your situation you can use an archive file to update your Bitbucket Server instance. Only use an archive file to update Bitbucket Server if the installer is not suitable for your situation, as the installer is the the recommended approach to upgrade for most use cases. Read about how to upgrade Bitbucket Server from an archive file.
Are you eligible to upgrade?	To check if software maintenance is current for your license, go to ⚙ > **Licensing** and make sure the license support period has not expired. If your support period has expired, follow the prompts to renew your license and reapply it before upgrading.

Have our support platforms changed?	Check the Supported platforms page for the version of Bitbucket you are upgrading to. This will give you info on supported operating systems, databases and browsers.
Have you taken into consideration all the version-specific upgrade information?	Make sure you read the following pages for each version between your current version of the application and the version you're upgrading to: • Release notes • Supported platforms • End of support announcements • Upgrade matrix This will give you information about specific update notes for each version of Bitbucket Data Center.
Are you upgrading from Bitbucket 4.x or earlier and have you modified your `server.xml` file?	In Bitbucket 5 we changed where you configure properties such as port numbers, context paths, and access protocol (among other things) to centralize custom configuration to a single directory and file, and to make upgrading easier for future releases. Upgrading from any version earlier than or including Bitbucket Server 4.14 to Bitbucket Server 5.0 or later requires that you manually migrate any changes to the `server.xml` file to the `bitbucket.properties` file. See the page Migrate customizations from `server.xml` to `bitbucket.properties` for instructions on locating your `server.xml` file and how to migrate your customizations.

Plan your upgrade

1. Determine your upgrade path

Check the Supported platforms page to determine if your environment meets the minimum requirements to run the latest version of Bitbucket. Also read the End of support announcements.

You can update from any previous version of Bitbucket Server (or Stash) to the latest version, as there is no required upgrade path.

Bitbucket Data Center and Server 8.x is a major upgrade

Be sure to read the Bitbucket Server 8.0 release notes, take a full backup, and test your upgrade in a non-production environment before upgrading your production site.

Upgrading from a version older than Bitbucket 8.x disables all user-installed apps on startup

Be sure to update your own apps and check the Atlassian Marketplace to ensure 3rd-party apps are compatible with Bitbucket Data Center and Server 8.x before upgrading.

Upgrading to the next bug fix update

If you are upgrading a multi-node Bitbucket cluster to the next bug fix update (for example, from 8.0.0 to 8.0.1), you can upgrade with no downtime.

2. Complete pre-upgrade checks

1. Check the Version specific upgrade notes for the version you plan to upgrade to (and any in between).
2. Go to ⚙ > **Support Tools**, then review the Log analyzer for any issues that may need to be resolved.
3. Check the compatibility of your apps with the version you plan to upgrade to.

a. Go to ⚙ > **Manage apps** > **Bitbucket update check**.
b. Choose the version you plan to upgrade to then hit **Check**.

   If your users rely on particular apps, you may want to wait until they are compatible before upgrading Bitbucket. App vendors generally update their apps very soon after a major release.

   Good to know:

   - If you're performing a major version upgrade, user-installed apps will be disabled. You will need to enable your apps after successfully upgrading, regardless of compatibility with Bitbucket Server.
   - You can disable an app temporarily if it is not yet compatible.

3. Upgrade Bitbucket in a test environment

1. Create a staging copy of your current production environment.
2. Follow the steps below to upgrade your test environment.
3. Test any unsupported apps, customizations and proxy configuration (if possible) before upgrading your production environment.

Upgrade Bitbucket

This upgrade process does not perform an in-place upgrade, but instead installs the new version of Bitbucket Server into a new installation directory. The new instance uses your existing Bitbucket Server home directory and external database.

If necessary, rolling back an upgrade can only be performed by restoring a backup of *both* the Bitbucket Server home directory and the Bitbucket Server database – rolling back requires a consistent home directory and database. You can then reinstall the previous version of the application to the installation directory. Read the Rollback section for more details.

4. Download Bitbucket Server

⚠ Take this step only if you're upgrading to **Bitbucket Server 8.14 or earlier**.

Download the installer (the recommended approach) for your operating system - www.atlassian.com/software/bitbucket/download.

5. Back up your data

1. Determine which backup strategy to use.

   For **Bitbucket Data Center** (version 4.8 or later) instances, you can use Zero Downtime Backup, DIY Backup, or take snapshots of the shared home directory (on NFS) and database while all nodes are stopped.

   For **Bitbucket mirrors**, the home directory doesn't store any persistent state that can't be reconstructed from the primary Bitbucket instance, but you should still make sure you have a backup of at least the important configuration files such as SSL certificate, `server.xml`, `config/ssh-server-keys.pem`, `bitbucket.properties` file, and so on in a safe place. See How do I back up my mirrors? for more information.

   See the article Data recovery and backups for detailed information and guidance on creating an effective backup strategy.
2. Back up all the data in your Bitbucket home directory and external database.

6. Migrate customizations

If upgrading from Bitbucket 4.x or earlier, see migrate customizations.

7. Stop the application

To stop Bitbucket Server from your Linux terminal, change to the `<Bitbucket Server installation directory>` and run:

```
bin/stop-bitbucket.sh
```

Be sure to *stop all nodes* of Bitbucket Data Center, perform the steps to upgrade for a single node first, then repeat the process on each cluster node.

See the page Start and stop Bitbucket for more detailed instructions.

8. Run the installer

You can run the installer in GUI, console or unattended modes.

1. Run the installer.
   From your Linux terminal, change to the directory where you downloaded Bitbucket Server then execute this command to make the installer executable:

   ```
   chmod +x atlassian-bitbucket-x.x.x-x64.bin
   ```

   We recommend using `sudo` to run the installer as this will create a dedicated account to run Bitbucket Server and allow you to run Bitbucket Server as a service.

   To use `sudo` to run the installer, execute this command:

   ```
   $ sudo ./atlassian-bitbucket-x.x.x-x64.bin
   ```

   You can also run the installer with root user privileges.

2. Follow the prompts to upgrade Bitbucket Server.
   a. At the 'Welcome' step, choose the type of instance to upgrade

      For a single node (most users), choose the **Upgrade an existing Bitbucket instance** option.

      For Bitbucket Data Center instances, choose the **Upgrade an existing Bitbucket instance** o ption, and repeat the upgrade process for each application node.

      For a Bitbucket mirror, choose the **Upgrade an existing mirror** option.
   b. At the 'Select Bitbucket Server Home' step, select your existing home directory.
   c. Proceed with the remaining installer steps.

9. Start the application

If you're also upgrading your operating system libraries and using PostgresSQL and glibc version **lo wer than 2.28**, and the upgrade increases the glibc version to **2.28 or later**, you'll need to rebuild the PostgresSQL indices before starting Bitbucket.

When using the installer, there will be an option to start the application (and launch it in a browser) at the end of the installation wizard.

1. Choose **No** at this option
2. Change to your `<Bitbucket installation directory>`
3. Migrate your H2 database to MvStore format. For detailed instructions, see Migrate H2 database.
4. Start Bitbucket manually.

See the page Start and stop Bitbucket for more detailed instructions, including how to manually start Bitbucket.

Rollback

If necessary, rolling back an update can only be performed by restoring a backup of *both* the Bitbucket Server home directory and the Bitbucket Server database – rolling back requires a consistent home directory and database. You can then reinstall the previous version of the application to the installation directory. Never start an older binary against an upgraded home directory.

Check for known issues and troubleshooting

If something is not working correctly after you have completed the steps above to update your Bitbucket installation, please check for known issues and try troubleshooting your update as described below:

- **Check for known issues**. Known issues can be seen in the BSERV project on our issue tracker.
- **Bitbucket Knowledge Base.** Sometimes we find out about a problem with the latest Bitbucket version after we have released the software. In such cases we publish information in the Bitbucket Knowledge Base.
- If you encounter a problem during the update and cannot solve it, please create a support ticket and one of our support engineers will help you.

How to update your add-on

Starting from 8.15.x, new releases of Bitbucket will be available only to Data Center customers. If you have a Server license, learn about your options.

On this page

This document and referenced resources are here to help reduce the time and effort needed on your part to make your app compatible with Bitbucket 4.0.

Version numbering for Stash (3.x and earlier) has been left intact; for example, if you're running Stash 3.10.0, you can use app versions listed as compatible with Bitbucket Server 3.10.0.

About the changes

Bitbucket Server 4.0 is the biggest API release Stash has ever seen. The decision to break so many apps with this release was not taken lightly. As developers, we understand the friction such changes can cause. However, we strongly believe this short term pain will be for long term gain with a clearer, cleaner, more consistent and more robust API in 4.0 and beyond. We are making quite a few large changes in this release in the interest of consistency, and with the strong hope that we will not need to make such a drastic change again anytime soon.

Backend changes

One of the exciting changes with this release is the new **JDK minimum requirement of 1.8**, that allows you to use a wide new array of language features in your app code. *While Stash 3.x supports* running *on Java 8; Bitbucket Server supports* compiling *to Java 8.*

The largest change was we **renamed our package namespace** from `com.atlassian.stash` to `com.atlassian.bitbucket`, but this should also be a simple change when you update your plugins. The Bitbucket Server team updated over 100 apps internally and the process was quite straightforward using refactoring support in modern IDEs.

In addition to the repackage, we've also **removed *all* @deprecated APIs from the codebase**. Most of these had existing replacement methods in place, but some were removed without replacement. You can consult the latest Stash 3.x documentation for details on what replacement method to use if the new method is not obvious.

Finally, several of our bundled plugins were exporting API (our `com.atlassian.stash:stash-build-integration` plugin, for example), which meant plugin developers added dependencies on that jar. However, only a small portion of the code in that jar was exported. This was a frequent source of plugin issues because plugin developers attempted to use our internal classes. In 4.0, the **exported APIs from all of our plugins have been extracted into separate modules** (like with the `stash-build-integration` example, the build API is now in `com.atlassian.bitbucket.server:bitbucket-build-api`). These new API modules contain *all* of the code that is published for plugin developers to use.

Front-end changes

Our Javascript and Soy API modules have moved to the Bitbucket namespace. AMD Modules, previously found under `stash/api/*`, are now `bitbucket/*`. Non-API modules will be under `bitbucket/internal`. For example, `stash/api/util/navbuilder` is now `bitbucket/util/navbuilder`. For API Soy templates, these are now also under the `bitbucket` namespace - `Stash.template.branchSelector` is now `bitbucket.component.branchSelector`.

Another front-end change is that most keys – including Form Fragments, Web Panel & Section locations, and Web Resource apps – have been moved to Bitbucket namespaces. There is more detail on these changes below.

Any methods or modules that were deprecated for removal in 4.0 have been removed.

How to update your app

The app key of your plugin must not change

The value of your app key, as defined within the atlassian-plugin.xml file, must not change. This is often defined in terms of the maven groupId and artefactId of your plugin. This value is used by Atlassian Marketplace and other parts of Bitbucket Data Center as a unique identifier for your plugin. Changing this value could lead to data loss, and will cause you to lose review and download history on the Atlassian Marketplace.

For example, you would replace the variables below with the values for groupId and artifactId in your pom.xml.

```
<atlassian-plugin key="${project.groupId}.${project.artifactId}" ...
```

1. Update your pom.xml file to reference the latest version of the Bitbucket Server 4.0. You will need to update version properties for both Bitbucket Server and AMPS, which currently requires a pre-release version to build Bitbucket Server plugins, as well as dependencies on any API artifacts.

```
<dependency>
    <groupId>com.atlassian.bitbucket.server</groupId>
    <artifactId>bitbucket-api</artifactId>
    <version>${bitbucket.version}</version>
    <scope>provided</scope>
</dependency>
...
<properties>
   <bitbucket.version>4.0.0</bitbucket.version>
   <bitbucket.data.version>${bitbucket.version}</bitbucket.data.version>
   <amps.version>6.1.0</amps.version>
   ...
</properties>
```

2. In your pom.xml you will also need to change or add configuration for the `bitbucket-maven-plugin` (depending on whether you are supporting both Stash and Bitbucket Server, or just Bitbucket Server):

```
<build>
    <plugins>
        <plugin>
            <groupId>com.atlassian.maven.plugins</groupId>
            <artifactId>bitbucket-maven-plugin</artifactId>
            <version>${amps.version}</version>
            <extensions>true</extensions>
            <configuration>
                <products>
                    <product>
                        <id>bitbucket</id>
                        <instanceId>bitbucket</instanceId>
                        <version>${bitbucket.version}</version>
                        <dataVersion>${bitbucket.data.version}</dataVersion>
                    </product>
                </products>
            </configuration>
        </plugin>
    </plugins>
</build>
```

3. Update your app name and description in pom.xml to reference "Bitbucket" instead of "Stash". For example:

```
<name>Bitbucket Server - Realtime Editor</name>
<description>Provides support for real-time collaborative editing.</description>
```

4. Optional: If your plugin will only support Bitbucket Server, remove any Stash dependencies

```
<groupId>com.atlassian.stash</groupId>
<artifactId>stash-api</artifactId>
```

5. For a class with compilation errors, first remove any `com.atlassian.stash` import statements that are red.
6. Use the suggested imports your IDE provides, and/or consult the API Changelog and table below.
7. Open the `atlassian-plugin.xml` inside your IDE
   a. Rename any `com.atlassian.stash` imported components to `com.atlassian.bitbucket` (or equivalent as mentioned in the API changelog)
   b. If you are using any web-resources with a dependency on `com.atlassian.stash.stash-web-api`, change them to `com.atlassian.bitbucket.server.bitbucket-web-api`
   c. Check for any other changes in your resources required due to renamed frontend API
8. If your app has JavaScript which uses the Stash JavaScript API, change your AMD module imports from `stash/api/*` to `bitbucket/*`
9. Test the app starts in Bitbucket Server using:

```
mvn clean bitbucket:debug
```

Other helpful resources

- Bitbucket Server developer documentation.
- Ask a question on Atlassian Answers, using the "bitbucket-server" topic.
- Review the End of support announcements to ensure that you're aware of updates to this policy.

Outline of API changes

Java packages

Stash 3.x
com.atlassian.stash

Bitbucket 4.x
com.atlassian.bitbucket

App Key (in atlassian-plugin.xml)

Stash 3.x

`<atlassian-plugin key="${project.groupId}.${project.artifactId}" ...>`

or

`<atlassian-plugin key="com.myorg.stash.awesome-plugin" ...>`

Bitbucket 4.x

`<atlassian-plugin key="com.myorg.stash.awesome-plugin" ...>`

(must not change in either case)

`<atlassian-plugin key="com.myorg.stash.awesome-plugin" ...>`

Maven plugin

Stash 3.x

`<artifactId>maven-stash-plugin</artifactId>`

`e.g.`

```
<plugin>
 <groupId>com.atlassian.maven.plugins</groupId>
 <artifactId>maven-stash-plugin</artifactId>
 <version>${amps.version}</version>
 <extensions>true</extensions>
 <configuration>
   <products>
    <product>
     <id>stash</id>
     <instanceId>stash</instanceId>
     <version>${stash.version}</version>
     <dataVersion>${stash.data.version}</dataVersion>
    </product>
   </products>
  </configuration>
</plugin>
```

Bitbucket 4.x

`<artifactId>bitbucket-maven-plugin</artifactId>`

`e.g.`

```
<plugin>
 <groupId>com.atlassian.maven.plugins</groupId>
 <artifactId>bitbucket-maven-plugin</artifactId>
 <version>6.1.0</version>
 <extensions>true</extensions>
 <configuration>
  <products>
   <product>
    <id>bitbucket</id>
    <instanceId>bitbucket</instanceId>
    <version>${bitbucket.version}</version>
    <dataVersion>${bitbucket.version}</dataVersion>
   </product>
  </products>
 </configuration>
</plugin>
```

Exceptions

Stash 3.x

`com.atlassian.stash.exception.ServiceException`

Bitbucket 4.x

`com.atlassian.bitbucket.ServiceException`

The monolithic `com.atlassian.stash.exception` package has been removed. The exceptions it previously contained have been moved into the module they belong to. For example, `NoSuchRepositoryException` is now in the `com.atlassian.bitbucket.repository` package.

Java User model

Stash 3.x

`com.atlassian.stash.user.StashUser`

Bitbucket 4.x

`com.atlassian.bitbucket.user.ApplicationUser`

Java Authentication Context

Stash 3.x

`com.atlassian.stash.user.StashAuthenticationContext`

Bitbucket 4.x

`com.atlassian.bitbucket.auth.AuthenticationContext`

Java Event model

Stash 3.x

`com.atlassian.stash.event.StashEvent`

Bitbucket 4.x

`com.atlassian.bitbucket.event.ApplicationEvent`

The monolithic `com.atlassian.stash.event` package has been broken down and the events it formerly contained have been moved into subpackages. For example, `RepositoryCreatedEvent` is now in `com.atlassian.bitbucket.event.repository`

Java model

Stash 3.x

`Changeset, DetailedChangeset`

Bitbucket 4.x

`Commit, Changeset`

We've standardized our naming:

- A "commit" is an event where the contents of a repository are changed
- A "changeset" is the set of changes that exist *between two commits*
- The codebase no longer uses the words "changeset" and "commit" interchangeably; each word refers to a specific concept

All classes and interfaces with `Changeset` in the name have replaced with an equivalent class or interface with `Commit` in the name instead.

What was formerly a `DetailedChangeset`, because the object that should have been called a `Commit` had already stolen the `Changeset` name, is now called a `Changeset`

Java Pull Request Participant model

Stash 3.x

`PullRequestParticipantSearchRequest`

`PullRequestParticipantSearchCriteria`

Bitbucket 4.x

`PullRequestParticipantRequest`

`PullRequestParticipantCriteria`

Soy templates

Stash 3.x

changeset

Bitbucket 4.x

commit

Application constants

Stash 3.x

`com.atlassian.stash.Product`

- `#NAME="Stash"`
- `#DATA_CENTER_NAME="Stash Data Center"`
- `#FULL_NAME="Atlassian Stash"`

Bitbucket 4.x

`com.atlassian.bitbucket.Product`

- `#NAME="Bitbucket"`
- `#DATA_CENTER_NAME="Bitbucket Data Center"`
- `#FULL_NAME="Atlassian Bitbucket"`

License changes

Stash 3.x

`com.atlassian.extras.api.stash.StashLicense`

Bitbucket 4.x

`com.atlassian.extras.api.bitbucket.BitbucketServerLicense`

Add this dependency to your POM:

```
<dependency>
     <groupId>com.atlassian.extras</groupId>
     <artifactId>atlassian-extras-api</artifactId>
     <scope>provided</scope>
</dependency>
```

Javascript API modules

Stash 3.x

`stash/api/* (eg. stash/api/util/server)`

Bitbucket 4.x

`bitbucket/* (eg. bitbucket/util/server)`

Soy API namespaces

Stash 3.x

`stash.template.branchSelector`

Bitbucket 4.x

`bitbucket.component.branchSelector`

Web API plugin module

Stash 3.x

`com.atlassian.stash.stash-web-api`

Bitbucket 4.x

`com.atlassian.bitbucket.server.bitbucket-web-api`

Note there have been a number of new API resources added, which allow you to better express your web resources dependencies. Please see the updated Web UI API documentationfor more detail about these resources.

Core web plugin module

Stash 3.x

`com.atlassian.stash.stash-web-plugin`

Bitbucket 4.x

This core plugin contains internal modules only and should not be referenced by other plugins.

Web Panel & Section Locations

Stash 3.x

`stash.*`

e.g. `stash.branch.list.actions.dropdown`

Bitbucket 4.x

`bitbucket.*`

e.g. `bitbucket.branch.list.actions.dropdown`

Web Resource Contexts

Stash 3.x

`stash.*`

e.g. `stash.layout.pullRequest`

Bitbucket 4.x

`bitbucket.*`

`bitbucket.layout.pullRequest`

Plugin decorators

Stash 3.x

`stash.*`
e.g. `stash.repository.settings`

Bitbucket 4.x

`bitbucket.*`

`bitbucket.repository.settings`

See plugin decorators documentation

Web Resource Modules

Stash 3.x

`<stash-resource/>`

Bitbucket 4.x

`<client-resource/>`

Note that `client-resource` will expand `<directory/>` elements in-place, where `stash-resource` expanded them at the end.

Web Item icons (in atlassian-plugin.xml)

Stash 3.x

`<param name="stashIconClass">...</param>`

Bitbucket 4.x

`<param name="iconClass">...</param>`

Web I18n

Stash 3.x

`stash_i18n`

Bitbucket 4.x

`getText`, `getTextAsHtml`

`stash_i18n` should not be used; `getText` is a cross-product replacement that doesn't accept a default translation parameter. See Writing Soy Templates for usage details. Note that these templates for Confluence work for Bitbucket too.

Form Fragments

Stash 3.x

`stash.*`

Bitbucket 4.x

`bitbucket.*`

Javascript Events

Stash 3.x

`stash.*`

Bitbucket 4.x

`bitbucket.internal.*`

See below for additional information about JavaScript events.

I18n keys

Stash 3.x

`stash.*`

Bitbucket 4.x

`bitbucket.*`

Java API - Guava

Stash 3.x

`com.google.common.base.Function/Predicate`

Guava 11 was available to plugins

Bitbucket 4.x

Java 8 Lambdas

Guava types like Function or Predicate are no longer used in API type signatures, use the corresponding types from java.util.function instead

Guava 18 is available to plugins

Servlet Dependency

Stash 3.x

```
<groupId>javax.servlet</groupId>
    <artifactId>servlet-api</artifactId>
    <scope>provided</scope>
</dependency>
```

Bitbucket 4.x

```
<groupId>javax.servlet</groupId>
    <artifactId>javax.servlet-api</artifactId>
    <scope>provided</scope>
</dependency>
```

The artifactId has changed to javax.servlet-api from servlet-api.

Branch permissions

Stash 3.x

`canDelete, canWrite`

`search`

Bitbucket 4.x

`hasPermission`

Checking for access to a `Ref` is now done by calling the `RefRestrictionService's hasPermission` method.

The `search` method for `AccessGrants` has been removed. `AccessGrants` can now be accessed by calling `getAccessGrants` on a `RefRestriction`.

Exported 3rd party libraries

Stash 3.x

Apache HTTP Client 3.x is no longer exported by the host app.

Bitbucket 4.x

Use HTTP Client 4.x instead.

```
<dependency>
    <groupId>org.apache.httpcomponents</groupId>
    <artifactId>httpclient</artifactId>
    <scope>provided</scope>
</dependency>
```

SAL Scheduler deprecated

Stash 3.x

`SAL 2.0`

`com.atlassian.sal.api.scheduling.PluginScheduler`

(Since Bitbucket 4.0.0 will throw an IllegalArgumentException if any job data passed to

scheduleJob does not implement java.io.Serializable)

Bitbucket 4.x

`SAL 3.0` (see SAL 3.0 upgrade guide for further details)

Use `com.atlassian.scheduler.SchedulerService` provided by:

```
<groupId>com.atlassian.scheduler</groupId>
<artifactId>atlassian-scheduler</artifactId>
```

instead.

Outline of changes made to the REST API

The *payloads* for some of the REST resources have changed. All URLs are the same except that the default context path is now `/bitbucket` instead of `/stash`.

Self Links

Some REST model classes, like `RestStashUser`, had their "self" links defined two ways:

```
  "link": {
    "url": "/users/admin",
    "rel": "self"
  },
  "links": {
    "self": [
      {
        "href": "http://localhost:7990/stash/users/admin"
      }
    ]
  }
```

The `"link"` attribute is from 1.0 and was deprecated in 2.11. From 4.0, the `"link"` attribute has been removed. The `"self"` entry in the `"links"` map remains.

`Changeset` to `Commit`

Ref output, such as branches and tags, had a `"latestChangeset"` attribute. The following output is from the `/projects/KEY/repos/slug/branches` resource:

```
{
  "size": 1,
  "limit": 1,
  "isLastPage": false,
  "values": [
    {
      "id": "refs/heads/search/STASHDEV-8813-search",
      "displayId": "search/STASHDEV-8813-search",
      "latestChangeset": "de307ea7b6abfa1aad8de6771d79da0a9a7fd3cb",
      "latestCommit": "de307ea7b6abfa1aad8de6771d79da0a9a7fd3cb",
      "isDefault": false
    }
  ],
  "start": 0,
  "nextPageStart": 1
}
```

A `"latestCommit"` attribute was added in 3.7 and `"latestChangeset"` was deprecated. It has been removed in 4.0. *This also applies to pull request refs.*

`AttributeMap` to `PropertyMap`

Some REST objects, most notably `RestPullRequest`, had an `"attributes"` attribute which allowed plugin developers to attach arbitrary data. However, the model for this was very restrictive, being defined in `AttributeMap` as `Map<String, Set<String>>`. In 3.2, `PropertyMap`, defined as `Map<String, Object>`, was added to replace the attribute support. However, for performance and API consistency reasons, most existing attributes were not converted over. In 4.0, the changeover is now complete.

The following JSON snippets show the old and new layouts for pull request properties.

```
  "attributes": {
    "resolvedTaskCount": [
      "0"
    ],
    "openTaskCount": [
      "1"
    ],
    "commentCount": [
      "2"
    ]
  }
```

```
  "properties": {
    "commentCount": 2,
    "openTaskCount": 1,
    "resolvedTaskCount": 0
  }
```

As you can see, the new `"properties"` map allows its numeric entries to be numeric, resulting in much more readable, useful output.

`PullRequestOrder` default order

The `getDefaultOrderForState(PullRequestState state)` method in `PullRequestOrder` has been replaced with
`getDefaultOrder()`, which always returns `PullRequestOrder.NEWEST`.

XSRF Protection enabled by default

To prevent a malicious hacker submitting a form from a foreign site to a stash instance, XSRF protection has now been enabled by default on all REST resources which do **not** accept the "application/json" Content-Type.

Any client POSTing to these resources will need to add a special header to disable this check.

Header name: X-Atlassian-Token

Header value: no-check

For example, to set a Project Avatar via curl, the following command can be used:

```
$ curl -X POST -u username:password -H "X-Atlassian-Token: no-check" http://localhost:8080/rest/api/1.0
/projects/TEST/avatar.png -F avatar=@avatar.png
```

`The  -H "X-Atlassian-Token: no-check"`parameter was not needed in 3.x, however is now needed since 4.0

For your own REST resources which do not accept "application/json" (e.g. multipart/form-data, plain/text etc), you can opt-out of XSRF protection by using the @XsrfProtectionExcluded annotation.

If you use the excluded annotation, it should be because your endpoint has some other type of protection against XSRF/CSRF attacks.

Javascript Events

Since Stash 3.0 we have provided a Javascript API module for creating and consuming events (`stash/api/util/events`, now `bitbucket/util/events`), however we haven't documented what events Bitbucket (Stash) emits as part of our Developer Docs. Which events should be used and which should be considered internal implementation details were subject to change.

We are actively looking at which events we should consider part of the API. We will document usage and guarantee the stability for events that are part of the API for a major version. We would like to hear any feedback on which events you make use of in your apps, and why, to aid in our consideration of what to consider for the JS Events API.

App update strategies

There are two primary strategies we are suggesting to update your app, and here we explain how to implement each and how to provide support for your app going forward.

Hard break

The simplest way forward is to branch your app and only release Bitbucket Server 4.0 compatible versions in the future. **Replace** the old `com.atlassian.stash dependency` with the new `com.atlassian.bitbucket` one, fix the resulting compilation errors, and create a new listing on Marketplace.

Backwards/forwards compatibility

The best way to achieve this is to maintain a branch of the "Stash" version of your plugin, and merge changes onto a master branch which contains the "Bitbucket server" version.

Unfortunately, unless you have written a pure cross-product app, building two versions from the same branch of code is in general not worth the overhead.

Rename checklist

1. Beware of changing any Strings which are used as keys for accessing data your app may store. e.g. namespaces used with `PluginSettingsFactory.createSettingsForKey` or prefixes used with `ApplicationPropertyService.getPluginProperty`
2. We strongly recommend that you **do not change your app key**; if you do, customers won't be able to see the updated version of your app in their Universal Plugin Manager. The default `atlassian-plugin.xml` generated by AMPS uses `key="${project.groupId}.${project.artifactId}"`. Changing your Maven `groupId` or `artifactId` this will change your app key.

3. If you are using ActiveObjects, you are *strongly* encouraged to set the `namespace` attribute to ensure the unique hash in your table names does not change. Otherwise anyone who has installed your plugin will "lose" all of their data when your plugin starts using new tables!
   For example, here's how we defined the `<ao/>` module in our ref sync plugin:

   ```
   <ao key="ao" namespace="com.atlassian.stash.stash-repository-ref-sync">
   ```

Upgrade Bitbucket from an archive file

This page describes how to upgrade Bitbucket Data Center using a zip or tar.gz file.

Upgrading to any later version is free if you have current software maintenance. See our Licensing FAQ to find out more.

On this page:

Other ways to upgrade Bitbucket:

- Installer - the simplest way to upgrade Bitbucket.
- Docker container image for Bitbucket Data Center and Server.

Before you begin

Before you upgrade Bitbucket you should answer these questions about your instance.

Is manual the right upgrade method for you?	You can choose to upgrade using the installer, or, if the installer is not suitable for your situation you can use an archive file to update your Bitbucket instance. Only use an archive file to update Bitbucket if the installer is not suitable for your situation, as the installer is the the recommended approach to upgrade for most use cases. Read about how to upgrade using the installer.
Are you eligible to upgrade?	To check if software maintenance is current for your license, go to ⚙ > **Licensing** and make sure the license support period has not expired. If your support period has expired, follow the prompts to renew your license and reapply it before upgrading.
Have our support platforms changed?	Check the Supported platforms page for the version of Bitbucket you are upgrading to. This will give you info on supported operating systems, databases and browsers.
Have you modified your `server.xml` file?	In Bitbucket 5 we changed where you configure properties such as port numbers, context paths, and access protocol (among other things) to centralize custom configuration to a single directory and file, and to make upgrading easier for future releases. Upgrading from any version earlier than or including Bitbucket Server 4.14 to Bitbucket Server 5.0 or later requires that you manually migrate any changes to the `server.xml` file to the `bitbucket.properties` file. See the page Migrate customizations from `server.xml` to `bitbucket.properties` for instructions on locating your `server.xml` file and how to migrate your customizations.

Plan your upgrade

1. Determine your upgrade path

Check the Supported platforms page to determine if your environment meets the minimum requirements to run the latest version of Bitbucket. Also read the End of support announcements.

You can update from any previous version of Bitbucket Server (or Stash) to the latest version, as there is no required upgrade path.

Bitbucket Data Center and Server 8.x is a major upgrade

Be sure to read the Bitbucket Server 8.0 release notes, take a full backup, and test your upgrade in a non-production environment before upgrading your production site.

Upgrading from a version older than Bitbucket 8.x disables all user-installed apps on startup

Be sure to update your own apps and check the Atlassian Marketplace to ensure 3rd-party apps are compatible with Bitbucket Data Center and Server 8.x before upgrading.

Upgrading to the next bug fix update

If you are upgrading a multi-node Bitbucket cluster to the next bug fix update (for example, from 8.0.0 to 8.0.1), you can upgrade with no downtime.

2. Complete pre-upgrade checks

1. Check the Version specific upgrade notes for the version you plan to upgrade to (and any in between).
2. Go to ⚙ > **Support Tools**, then review the Log analyzer for any issues that may need to be resolved.
3. Check the compatibility of your apps with the version you plan to upgrade to.
    a. Go to ⚙ > **Manage apps** > **Bitbucket update check**.
    b. Choose the version you plan to upgrade to then hit **Check**.

    If your users rely on particular apps, you may want to wait until they are compatible before upgrading Bitbucket. App vendors generally update their apps very soon after a major release.

    Good to know:

    - If you're performing a major version upgrade, user-installed apps will be disabled. You will need to enable your apps after successfully upgrading, regardless of compatibility with Bitbucket Server.
    - You can disable an app temporarily if it is not yet compatible.

3. Upgrade Bitbucket in a test environment

1. Create a staging copy of your current production environment.
2. Follow the steps below to upgrade your test environment.
3. Test any unsupported apps, customizations and proxy configuration (if possible) before upgrading your production environment.

Upgrade Bitbucket

This upgrade process does not perform an in-place upgrade, but instead installs the new version of Bitbucket into a new installation directory. The new instance uses your existing Bitbucket home directory and external database.

If necessary, rolling back an upgrade can only be performed by restoring a backup of *both* the Bitbucket home directory and the Bitbucket database – rolling back requires a consistent home directory and database. You can then reinstall the previous version of the application to the installation directory. Read the Rollback section for more details.

4. Back up your data

1. Determine which backup strategy to use.

   For **Bitbucket Data Center** (version 4.8 or later) instances, you can use Zero Downtime Backup, DIY Backup, or take snapshots of the shared home directory (on NFS) and database while all nodes are stopped.

   For **Bitbucket mirrors**, the home directory doesn't store any persistent state that can't be reconstructed from the primary Bitbucket instance, but you should still make sure you have a backup of at least the important configuration files such as SSL certificate, `server.xml`, `config/ssh-server-keys.pem`, `bitbucket.properties` file, and so on in a safe place. See How do I back up my mirrors? for more information.

   See the article Data recovery and backups for detailed information and guidance on creating an effective backup strategy.
2. Back up all the data in your Bitbucket home directory and external database.

5. Stop the application

Stop Bitbucket Data Center from a terminal by changing to the `<Bitbucket installation directory>` and running:

```
bin/stop-bitbucket.sh
```

Be sure to *stop all nodes* of Bitbucket Data Center, perform the steps to upgrade for a single node first, then repeat the process on each cluster node.

See the page Start and stop Bitbucket for more detailed instructions.

6. Download Bitbucket

Download the appropriate file for your operating system - https://www.atlassian.com/software/bitbucket/download-archives.

7. Extract the file and upgrade Bitbucket

1. Extract (unzip) the files to a directory (this is your new installation directory, and **must** be different to your existing installation directory).

   Use the same user account to extract and to run Bitbucket to avoid permission issues at startup. For production installations, we recommend you use new dedicated user that will run Bitbucket on your system.

   See the page Running Bitbucket Data Center with a dedicated user for more details.
2. Update the value of `BITBUCKET_HOME` in the `<Bitbucket installation directory>/bin/set-bitbucket-home.sh` file so the new Bitbucket installation points to your existing Bitbucket home directory (if you use a BITBUCKET_HOME environment variable to specify the home directory location, no change is required).

8. Start Bitbucket

For Bitbucket Data Center, Bitbucket Server and the *remote* Elasticsearch instance must be started separately. It is a requirement of the Bitbucket Data Center setup that you have *only one* remote Elasticsearch instance for your entire cluster, as described in Installing Bitbucket Data Center. The `start-bitbucket.sh` command starts both Bitbucket and Elasticsearch and should not be used to start your Bitbucket Data Center application nodes.

When using a remote Elasticsearch instance, instead of the bundled Elasticsearch instance, start Bitbucket Server by running `start-webapp.sh` instead of `start-bitbucket.sh`.

To start Bitbucket Data Center

1. **Start each of your application nodes.** From `<Bitbucket installation directory>`, run this command for each node:

   For Windows

   ```
   bin\start-webapp.bat
   ```

   For Linux

   ```
   bin/start-webapp.sh
   ```

2. **Start your Elasticsearch node.** From `<Bitbucket installation directory>`, run this command:

   For Windows

   ```
   bin\start-search.bat
   ```

   For Linux

   ```
   bin/start-search.sh
   ```

Read the page Start and stop Bitbucket for more details.

Rollback

If necessary, rolling back an update can only be performed by restoring a backup of *both* the Bitbucket Server home directory and the Bitbucket Server database – rolling back requires a consistent home directory and database. You can then reinstall the previous version of the application to the installation directory. Never start an older binary against an upgraded home directory.

Version-specific update notes

This section provides specific update notes for each version of Bitbucket Data Center. These notes supplement the primary upgrade instructions above. You should read the relevant sections for each version between your current version of the application and the version you are upgrading to.

Bitbucket Data Center 8.18 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center 8.18 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center 8.17 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center 8.17 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center 8.16 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center 8.16 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center 8.15 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center 8.15 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.14 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.14 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.13 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.13 release notes
- the Bitbucket Server Supported platforms page

- the End of support announcements

Bitbucket Data Center and Server 8.12 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.12 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.11 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.11 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.10 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.10 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.9 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.9 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.8 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.8 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.7 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.7 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.6 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.6 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.5 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.5 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.4 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.4 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.3 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.3 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.2 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.2 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.1 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 8.1 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 8.0 update notes

You should also see:

- the general Upgrade steps section above

- the Bitbucket Data Center and Server 8.0 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 7.21 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 7.21 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 7.20 update notes

You should also see:

- the general Upgrade steps section above
- the Bitbucket Data Center and Server 7.20 release notes
- the Bitbucket Server Supported platforms page
- the End of support announcements

Bitbucket Data Center and Server 7.19 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Data Center and Server 7.19 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Data Center and Server 7.18 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Data Center and Server 7.18 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Data Center and Server 7.17 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Data Center and Server 7.17 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Data Center and Server 7.16 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Data Center and Server 7.16 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Data Center and Server 7.15 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Data Center and Server 7.15 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Data Center and Server 7.14 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Data Center and Server 7.14 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Data Center and Server 7.13 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Data Center and Server 7.13 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Data Center and Server 7.12 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Data Center and Server 7.12 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Data Center and Server 7.11 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Data Center and Server 7.11 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Data Center and Server 7.10 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Data Center and Server 7.10 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Server 7.9 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server and Data Center 7.9 release notes.

- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Server 7.8 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server and Data Center 7.8 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements

Bitbucket Server 7.7 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 7.7 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 7.6 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 7.6 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 7.5 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 7.5 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 7.4 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 7.4 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

New Data Center apps check as part of your license upgrade

Upgrading to a Bitbucket Data Center license now comes with a new apps check. Before we apply your new Bitbucket license, we'll show you if any of your installed apps will need to be upgraded to the Data Center approved version.

We've also introduced new status messages in the **Manage apps** section of your admin console, so you can clearly see if any apps will require a new license.

New status	Host product license	What it means
DATA CENTER LICENSE AVAILABLE	Evaluation license	The app vendor offers a Data Center version of this app. If you switch to a paid Data Center product license, you'll need to upgrade this app license to Data Center.
LICENSE INCOMPATIBLE	Full license	The app vendor offers a Data Center version of this app. Your Server app license is no longer compatible with the product. This means the app has either stopped working, or functionality has been lost or compromised. You need to add a Data Center license.

Learn more about upgrading your Server apps after you move to Data Center

Build status data migration

When upgrading to Bitbucket Server 7.4, you may notice an increased load on your database and application server. This is normal. It's due to an asynchronous upgrade task that needs to run to migrate your application's build status data.

While the upgrade task is running, your application will be available and able to serve requests, so your team can continue working as usual.

The upgrade task will run automatically around two minutes after your application starts up. In a multi-node cluster, it will run on a node picked by the system. How long it takes will depend on the size of the data that needs to be migrated. For example, for small instances it can take 10 minutes, and for large instances it can take over an hour.

Before upgrading to Bitbucket Server 7.4, you should test HTTP hosting in a staging environment that mirrors your production setup. This especially includes any installed apps, as app-provided servlet filters may be broken by async HTTP.

Bitbucket Server 7.3 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 7.3 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 7.2 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 7.2 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 7.1 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 7.1 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 7.0 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 7.0 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

If you are considering upgrading to bitbucket 7.0 or higher and are using version 2.8 or earlier of the `Bitbucket branch source` Jenkins plugin, there is a known issue that can cause builds to fail. This is because merges are performed lazily in order to manage scaling while changes to pull requests happen continuously.
See
~~BSERV-12284~~ - Eagerly update refs/pull-requests/*/from when a pull request's source branch changes CLOSED
.

Bitbucket Server 6.10 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.10 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 6.9 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.9 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 6.8 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.8 release notes.
- the Bitbucket Server Supported platforms page.

- the End of support announcements.

Bitbucket Server 6.7 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.7 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 6.6 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.6 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 6.5 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.5 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 6.4 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.4 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 6.3 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.3 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 6.2 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.2 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 6.1 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.1 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Bitbucket Server 6.0 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 6.0 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

To upgrade to Bitbucket Server 5+, you must migrate customizations to bitbucket.properties

Be sure to carefully read the Bitbucket Server upgrade guide to determine what impact this change may have on your instance. The page Migrate `server.xml` customizations to `bitbucket.properties` has specifics on which properties need to be migrated, how to migrate them, and includes some examples that demonstrate how to migrate some common customizations.

Start script changes

Starting from Bitbucket Server 5.0, some startup scripts had their name prefixed with an underscore. These scripts have been deprecated, and you should no longer call these scripts directly. This is to avoid confusion, because previously there were multiple start and stop scripts, making it easy to confuse which one to call. Now, there is only one script, that begins with "`start`" and one that begins with "`stop`".

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 5.16 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.16 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.15 update notes

You should also see:

- the general Upgrade steps section above.

- the Bitbucket Server 5.15 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.14 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.14 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.13 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.13 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.12 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.12 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.11 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.11 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.10 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.10 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.9 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.9 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.8 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.8 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.7 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.7 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.6 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.6 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.5 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.5 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.4 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.4 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.3 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.3 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.2 update notes

You should also see:

- the general Upgrade steps section above.

- the Bitbucket Server 5.2 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.1 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.1 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Bitbucket Server 5.0 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 5.0 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

To upgrade to Bitbucket Server 5+, you must migrate customizations to bitbucket.properties

Be sure to carefully read the Bitbucket Server upgrade guide to determine what impact this change may have on your instance. The page Migrate `server.xml` customizations to `bitbucket.properties` has specifics on which properties need to be migrated, how to migrate them, and includes some examples that demonstrate how to migrate some common customizations.

Start script changes

In Bitbucket Server 5.0, some startup scripts have had their name prefixed with an underscore. These scripts have been deprecated, and you should no longer call these scripts directly. This is to avoid confusion, because previously there were multiple start and stop scripts, making it easy to confuse which one to call. Now, there is only one script, that begins with "`start`" and one that begins with "`stop`".

BitbucketServer does not support reverse proxies using AJP connections

Starting from version 5.0, Bitbucket Server does not support reverse proxies using AJP connections. While never officially supported, previous versions of Bitbucket Server could use AJP connections. However, with changes to how Bitbucket Server uses Tomcat, using AJP connections with Bitbucket Server (or Data Center) 5.0+ will cause the application to fail on startup.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.14 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.14 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements for Bitbucket Server.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.13 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.13 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.12 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.12 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Do NOT upgrade to Git 2.11+

Any version after Git 2.11.0 (including future 2.12+ releases) cannot be used with Bitbucket Server. Bitbucket Server 4.12 will fail on startup if Git 2.11+ is detected. Only upgrade to versions of Git which are explicitly marked supported on our Supported Platforms page.

~~BSERV-9388~~ - Pre-receive hooks and branch permissions reject valid pushes on git 2.11 CLOSED

Known issues

P	Key	Summary	Status
⌄	BSERV-9592	Spotted Typo on Analytics page on Bitbucket Server Settings	GATHERING IMPACT

⌄	BSERV-9675	Duplicated branches and tags - Multiple entries for the same ref id	LONG TERM BACKLOG
⌄	BSERV-8201	Repository deletion times out	GATHERING IMPACT

3 issues

Bitbucket Server 4.11 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.11 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.10 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.10 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.9 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.9 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.8 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.8 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.7 update notes

You should also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.7 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.6 update notes

Also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.6 release notes.
- the Stash Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.5 update notes

Also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.5 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.4 update notes

Also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.4 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.3 update notes

Also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.3 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.2 update notes

Also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.2 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.1 update notes

Also see:

- the general Upgrade steps section above.
- the Bitbucket Server 4.1 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Bitbucket Server 4.0 update notes

Also see:

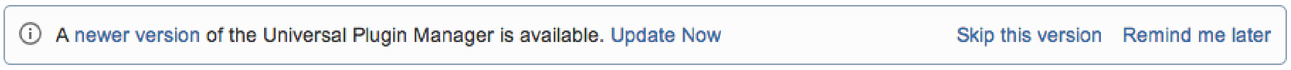
- the general Upgrade steps section above.
- the Bitbucket Server 4.0 release notes.
- the Bitbucket Server Supported platforms page.
- the End of support announcements. Note that Bitbucket Server 4.0 does not support Internet Explorer 9 or 10, Java 7, nor versions of Git earlier than 1.8 on the server.

Do you rely on user-installed add-ons?

Your plugins may not be compatible with Bitbucket Server 4.0 (yet)

Upgrading from Stash to Bitbucket Server will disable all user-installed add-ons, whether they are 3rd-party add-ons from Atlassian Marketplace, or your own custom add-ons. User-installed add-ons will need to be checked, upgraded and enabled again once you've finished the upgrade process. You should check the marketplace listing for 3rd-party add-ons to determine if there is a release that is compatible with Bitbucket Server 4.0. Unless they have been updated to work with Bitbucket Server 4.0, existing add-ons (or plugins) that use the API interfaces that have been removed in Bitbucket Server 4.0 *will not work*. Similarly, custom add-ons need to be upgraded for Bitbucket Server compatibility. See the documentation on how to update your add-on for details.

If you are upgrading from Stash 3.x to Bitbucket Server 4.x, you should be aware that most user-installed add-ons will be incompatible with Bitbucket Server 4.0. After upgrading, go to **Admin** > **Manage add-ons**, look for messages of this form, and follow the advice to update:


A newer version of the Universal Plugin Manager is available. Update Now Skip this version Remind me later

If no newer version is available the add-on will remain disabled.

New dedicated user account 'atlbitbucket'

A new dedicated user account will be created to run Bitbucket Server, called `atlbitbucket`. During the upgrade process, you will have an option to delete the dedicated user account for running Stash, named `atlstash`. For most users, deleting this dedicated user account won't have any negative consequences, however if you rely on this dedicated user accounts, for example in custom backup scripts, you will need to update the user account in those scripts.

Updates to logger names

If you have customized your logging configuration by manually editing the `logback.xml` file (using steps found in the Configure Stash Logging KB article), you should be aware of changes to several logger names that may require you to update some of your configuration files.

Stash logger name	Bitbucket Server logger name
`stash.application`	`bitbucket.application`

`stash.profiler`	`bitbucket.profiler`
`stash.access-log`	`bitbucket.access-log`
`stash.audit-log`	`bitbucket.audit-log`
`stash.mail-log`	`bitbucket.mail-log`

Important security improvement which may require configuration changes

Previous to Bitbucket Server 4.0, a security constraint for redirecting from HTTP to HTTPS was not enforced, meaning users could type "http://<bitbucketserver-url>" into their browser and still be shown a functioning version of Bitbucket Server (or Stash). Included with the release of Bitbucket Server 4.0 was a fix to enforce that security constraint. Using the previous security configuration with Bitbucket Server 4.0 means trying to access the application over an insecure connection, when users type "http" when trying to get to the application, they could encounter erroneous behavior.

As part of upgrading from Stash to Bitbucket Server, it is recommended you update your security configuration in order to avoid encountering this problem. See this Knowledge Base article for more information and specific instructions on addressing this: Redirect HTTP Requests to HTTPS.

Known issues

P	Key	Summary	Status

No issues found

Stash 3.11 update notes

Also see:

- the general Upgrade steps section above.
- the Stash 3.11 release notes.
- the Stash Supported platforms page. Note that Stash 3.11 does not support Git 2.0.2 or 2.0.3.
- the End of support announcements. Note that, in particular, Stash 4.0 will not support Internet Explorer 9 or 10, Java 7, nor versions of Git earlier than 1.8 on the server.
- If you have installed the **stash-stream-guard-plugin** (for example, if advised to do so by Atlassian Support), then you should uninstall it when upgrading to 3.11.2 as its functionality is now bundled in Stash.

Known issues

P	Key	Summary	Status

No issues found

Stash 3.10 update notes

Also see:

- the general Upgrade steps section above.
- the Stash 3.10 release notes.
- the Stash Supported platforms page. Note that Stash 3.10 does not support Git 2.0.2 or 2.0.3.
- the End of support announcements. Note that, in particular, Stash 4.0 will not support Internet Explorer 9 or 10, Java 7, nor versions of Git earlier than 1.8 on the server.

Are you using Git 2.2x - 2.4.0?

Git 2.2.x - 2.4.0 have reported performance issues when interacting with NFS. Hence, these versions are currently not supported for Stash Data Center or for Stash Server installations that use NFS mounts for the home directory.

Known issues

P	Key	Summary	Status

No issues found

Stash 3.9 update notes

Also see:

- the general Upgrade steps section above.
- the Stash 3.9 release notes.
- the Stash Supported platforms page. Note that Stash 3.9 does not support Git 2.0.2 or 2.0.3.
- the End of support announcements. Note that, in particular, Stash 4.0 will not support Internet Explorer 9, Java 7, nor versions of Git earlier than 1.8 on the server.

Are you using JIRA as a Crowd server?

Stash 3.9 cannot use JIRA 6.4 as a Crowd server due to a bug in JIRA 6.4. Please upgrade to JIRA 6.4.1 before upgrading Stash. (Note that Stash 3.7.2 and 3.8.0 contained a workaround for the bug but the workaround was removed in Stash 3.9)

Known issues

P	Key	Summary	Status

No issues found

Stash 3.8 update notes

Also see:

- the general Upgrade steps section above.
- the Stash 3.8 release notes.
- the Stash Supported platforms page. Note that Stash 3.8 does not support Git 2.0.2 or 2.0.3.
- the End of support announcements. Note that, in particular, Stash 4.0 will not support Internet Explorer 9, Java 7, nor versions of Git earlier than 1.8 on the server.

Have you made customizations to Tomcat's `server.xml` file?

For Stash 3.8 (and future versions) the `server.xml` file is now located in the `<stash home directory>/shared` directory. The benefit of this move is that your customizations to `server.xml` will not have to be redone for future upgrades.

⚠ You still need to update your custom configurations in `shared/server.xml` for the upgrade to Stash 3.8.

Deprecation of HighlightJS for syntax highlighting

The highlighting engine was changed in Stash 3.5 from HighlightJS to CodeMirror. The use of HighlightJS for syntax highlighting in Stash is *now deprecated*, and will be removed in Stash 4.0. See Syntax highlight changes for information about how to migrate any custom mappings for HighlightJS that you may have made.

Known issues

P	Key	Summary	Status

No issues found

Stash 3.7 update notes

Also see:

- the general Upgrade steps section above.
- the Stash 3.7 release notes.
- the Stash Supported platforms page. Note that Stash 3.7 does not support Git 2.0.2 or 2.0.3.
- the End of support announcements. Note that, in particular, Stash 4.0 will not support Internet Explorer 9, Java 7, nor versions of Git earlier than 1.8 on the server.

Do you use JIRA 6.4?

⚠ JIRA 6.4 has a known issue with Stash versions 3.4.3 to 3.7.1, which prevents the user synchronization from working. This will only affect you if you use JIRA to manage your users in Stash, and is fixed in Stash 3.7.2.

Deprecation of HighlightJS for syntax highlighting

The highlighting engine was changed in Stash 3.5 from HighlightJS to CodeMirror. The use of HighlightJS for syntax highlighting in Stash is *now deprecated*, and will be removed in Stash 4.0. See Syntax highlight changes for information about how to migrate any custom mappings for HighlightJS that you may have made.

Known issues

P	Key	Summary	Status

No issues found

Stash 3.6 update notes

Also see:

- the general update steps section above.
- the Stash 3.6 release notes.
- the Stash Supported platforms page. Note that Stash 3.6 does not support Git 2.0.2 or 2.0.3.
- the End of support announcements. Note that, in particular, Stash 4.0 will not support Internet Explorer 9, Java 7, nor versions of Git earlier than 1.8 on the server.

Secure email notifications

Stash 3.6 now:

- Allows you to require STARTTLS support on the mail server when using SMTP – if it is not supported, mail is not sent.
- Supports SMTPS (where the whole protocol conversation uses SSL/TLS).

See Setting up your mail server for more information.

Note that if you use either SMTP with STARTTLS or SMTPS and connect to a self-signed mail server you may need to import the server's certificate and set up a custom cacerts file for Stash (just as you do for any outbound SSL/TLS connection to a self-signed server). See this Stash knowledge base article for information about how to do that.

Deprecation of HighlightJS for syntax highlighting

The highlighting engine was changed in Stash 3.5 from HighlightJS to CodeMirror. The use of HighlightJS for syntax highlighting in Stash is *now deprecated*, and will be removed in Stash 4.0. See Syntax highlight changes for information about how to migrate any custom mappings for HighlightJS that you may have made.

Known issues

P	Key	Summary	Status

No issues found

Stash 3.5 update notes

Also see:

- the general update steps section above.
- the Stash 3.5 release notes.
- the Stash Supported platforms page. Note that Stash 3.5 does not support Git 2.0.2 or 2.0.3.
- the End of support announcements. Note that, in particular, Stash 4.0 will not support Java 7, nor versions of Git earlier than 1.8 on the server.

Stash home directory location

Stash 3.5 and later versions no longer allow the Set the home directory to be the same directory as, or a subdirectory of, the Stash installation directory. The Stash home directory, as defined by the `STASH_HOME` environment variable, must be in a separate location – Stash will fail on startup otherwise.

Deprecation of HighlightJS for syntax highlighting

The highlighting engine in Stash has been changed from HighlightJS to CodeMirror. The use of HighlightJS for syntax highlighting in Stash is *now deprecated*, and will be removed in Stash 4.0. See Syntax highlight changes for information about how to migrate any custom mappings for HighlightJS that you may have made.

Known issues

priority	key	summary	status

⚠ Jira project doesn't exist or you don't have permission to view it.

View these issues in Jira

Stash 3.4 update notes

Also see:

- the general update steps section above.
- the Stash 3.4 release notes.

- the Stash Supported platforms page. Note that Stash 3.4 does not support Git 2.0.2 or 2.0.3.
- the End of support announcements.

Changed group membership aggregation with multiple user directories

Stash 3.4 uses new schemes to determine the effective group memberships when Stash is connected to multiple user directories, and duplicate user names and group names are used across those directories. The new schemes are:

- 'aggregating membership'
- 'non-aggregating membership'.

These group membership schemes are only used to determine authorization. Authentication is determined on the basis of the group mappings in each directory.

See Effective memberships with multiple directories in the Crowd documentation for more information.

When you update to Stash 3.4, an update task will apply one of those schemes as follows:

Aggregating membership will be applied to your instance:

- If there is only one active directory.
- If there are multiple active directories but only a single directory applies group memberships to any particular user.
- For example, if directory-1 contains user-a in group-x, and directory-2 contains user-b in group-y, then Stash 3.4 will apply aggregating membership, and permissions will not be affected.

Non-aggregating membership will be applied to your instance:

- If there are multiple active directories and more than one directory applies group memberships to at least one user.
- For example, if directory-1 contains user-a in group-x, and directory-2 contains user-a in group-y, then Stash 3.4 will apply non-aggregating membership. If group-y has admin provileges then user-a would have their privileges escalated in this case if aggregating membership was applied instead when upgrading to Stash 3.4.

Any changes made by the update task will be logged.

A Stash admin can change the membership scheme used by Stash using the following commands:

- To change to *aggregating membership*, substitute your own values for `<username>`, `<password>` and `<base-url>` in this command:

```
curl -H 'Content-type: application/json' -X PUT -d '{"membershipAggregationEnabled":true}' -u
<username>:<password> <base-url>/rest/crowd/latest/application
```

- To change to non-*aggregating membership*, substitute your own values for `<username>`, `<password>` and `<base-url>` in this command:

```
curl -H 'Content-type: application/json' -X PUT -d '{"membershipAggregationEnabled":false}' -u
<username>:<password> <base-url>/rest/crowd/latest/application
```

Note that changing the aggregation scheme can affect the authorization permissions for your Stash users, and how update operations are performed. Read more about using Stash with multiple use directories.

Known issues

P	Key	Summary	Status

No issues found

Stash 3.3 update notes

Also see:

- the general update steps section above.
- the Stash 3.3 release notes.
- the Stash Supported platforms page. Note that Stash 3.3 does not support Git 2.0.2 or 2.0.3.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Stash 3.2 update notes

⚠ Upgrading to Stash 3.2 or later from Stash 3.1 or earlier is irreversible – please see the Home directory migration section below.

Also see:

- the general update steps section above.
- the Stash 3.2 release notes.
- the Stash Supported platforms page.
- the End of support announcements.

Note that:

- Stash 3.2 does not support Git 2.0.2 or 2.0.3.

Home directory migration

When you update to Stash 3.2 or later, an update task migrates directories in your Stash home directory to new locations. This is irreversible – once you update to Stash 3.2 or later you can not revert to Stash 3.1 or earlier, because of changes to the Stash home directory format.

For most installations, Stash 3.2 is able to perform these moves automatically and transparently. However, in the rare instance where Stash 3.2 can't perform the update automatically, please refer to Upgrading your Stash home directory for Stash 3.2 manually.

Undocumented home directory overrides are no longer supported

Before Stash 3.2 it was possible to override the location of the following subfolders in the Stash home directory, using undocumented environment variables or system properties:

- `export`
- `bin`
- `caches`
- `config`

- `data`
- `lib`
- `lib/native`
- `log`

- `plugins`
- `tmp`

In Stash 3.2 only the `tmp` subfolder can be overridden in this way. Attempting to override the others will fail on startup. For more information, please see Stash fails to start - UnsupportedDirectoryOverrideException .

Stash analytics

Stash 3.2, and later, collects user event data, unless this is disabled by an administrator. You will see outgoing network traffic to amazonaws.com. See Change data collection settings.

Known issues

P	Key	Summary	Status

No issues found

Stash 3.1 update notes

Also see:

- the general update steps section above.
- the Stash 3.1 release notes.
- the Stash Supported platforms page.

Note that:

- Stash does not support Git 2.0.2 or 2.0.3.

Known issues

P	Key	Summary	Status

No issues found

Stash 3.0 update notes

Stash no longer supports Java 6

Stash 3.0 requires at least Java 7, and supports Java 8.

Please see the End of support announcements.

Your plugins may not be compatible with Stash 3.0

The interfaces in the Stash API for plugin developers that *were deprecated* in Stash 2.11 and earlier *have been removed* in Stash 3.0. This means that, unless they have been updated to work with Stash 3.0, existing Stash add-ons (or plugins) that use these interfaces *will not work with Stash 3.0*.

Please see the section below about Stash add-on incompatibilities for more details.

Also see:

- the general update steps section above.
- the Stash 3.0 release notes.
- the Stash Supported platforms page.

Note that:

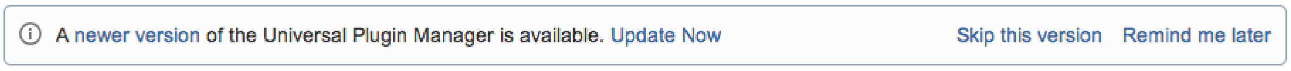
- Stash now has installers for the Linux, macOS and Windows platforms.
- Stash no longer supports Internet Explorer 8, as previoiusly announced.
- Stash does not support the Apache HTTP Server `mod_auth_basic` module.
- Stash does not support Git 2.0.2 or 2.0.3.

Stash add-on incompatibilities

Unless they have been updated to work with Stash 3.0, existing Stash add-ons (or plugins) that use the API interfaces that have been removed in Stash 3.0 *will not work*.

Fresh installs of Stash 3.0 shouldn't encounter any problems. The Stash 'Manage add-ons' page (in the admin area) should only display add-ons from the Marketplace that have been marked as compatible with Stash 3.0. Incompatible add-ons won't be available in the list.

However, if you are upgrading from Stash 2.x to Stash 3.0, you should be aware that some existing installed add-ons may be incompatible with Stash 3.0. After upgrading, you should go to **Admin** > **Manage add-ons**, look for messages of this form, and follow the advice to update:


A newer version of the Universal Plugin Manager is available. Update Now Skip this version Remind me later

If no newer version is available, the add-on must be disabled.

Custom add-ons

Please note that your custom locally-developed plugins may be affected by the API removals in Stash 3.0. You will need to update your custom plugins if you want those to work with Stash 3.0. See the Stash API changelog for details of the deprecated APIs.

Third-party add-ons

You'll need to check on Atlassian Marketplace for the compatibility status of any 3rd-party add-ons that you use.

Third-party add-on developers have been given an Early Access Program (EAP) build of Stash 3.0 in advance of release, and many have already updated their add-ons to be compatible. Add-ons must be explicitly marked by the publisher as compatible with Stash 3.0 for them to appear in 'Manage add-ons' page in Stash. ***This is NOT automatic as was the case with previous minor releases such as 2.10 and 2.11.*** Atlassian can not support issues involving third party Add-ons that are incompatible with Stash 3.0; such support cases must be directed to the third-party publisher of the add-on. See Managing apps.

Atlassian add-ons

All of the Atlassian add-ons for Stash that are available from the Atlassian Marketplace have been updated to be compatible with Stash 3.0. If you use any of these in your Stash installation you'll need to update them to the Stash 3.0 compatible version.

Add-on	JAR file name	Stash 3.0 compatible version
Custom Navigation Plugin	custom-navigation-plugin	2.0.3
Stash Archive Plugin	stash-archive	1.3.0
Repository git operations plugin	stash-git-ops-plugin	1.2.1
Stash Auto Unapprove Plugin	stash-auto-unapprove-plugin	1.1
Stash Protect Unmerged Branch Hook	stash-protect-unmerged-branch-hook	1.1

Stash Reviewer Suggester	stash-suggest-reviewers	1.2
Stash Web Post Hooks Plugin	stash-web-post-receive-hooks-plugin	1.1.0
Realtime Editor for Stash	stash-editor-plugin	1.0.6

Known issues

P	Key	Summary	Status

No issues found

Stash 2.12 update notes

Also see:

- the update steps section above.
- the End of support announcements. In particular, note that support for Java 6 is deprecated. Stash 3.0 + will require Java 7.
- the Stash 2.12 release notes.

Note that:

- Stash does not yet support Java 8.
- Stash 2.12 does not support Git 1.8.4.3
- Stash does not support the Apache HTTP Server `mod_auth_basic` module.

See Supported platforms.

Known issues

P	Key	Summary	Status

No issues found

Stash 2.11 update notes

Also see:

- the update steps section above.
- the End of support announcements.
- the Stash 2.11 release notes.

Note that Stash does not support Git 1.8.4.3, nor does Stash support Java 8 yet. See Supported platforms.

Known issues

P	Key	Summary	Status

No issues found

Stash 2.10 update notes

Also see:

- the update steps section above.
- the End of support announcements.
- the Stash 2.10 release notes.

Note that Stash does not support Git 1.8.4.3. See Supported platforms.

Known issues

P	Key	Summary	Status

No issues found

Stash 2.9 update notes

Also see:

- the update steps section above.
- the End of support announcements.
- the Stash 2.9 release notes.

Note that Stash does not support Git 1.8.4.3. See Supported platforms.

Pull Request Ref Optimization

When you first start Stash after upgrading to Stash 2.9 a repository update task runs that optimizes the pull request refs for all repositories managed by Stash. It's important that you do not interrupt this update process. You can track the progress of this in the Stash logs. See

~~BSERV-3469~~ - Pull request references in the Git repository are never removed after merge or decline CLOSED

.

Backup Client Update Required

Version 1.0.3 of the Stash Backup Client is required to back up Stash 2.9.

Known issues

P	Key	Summary	Status

No issues found

Stash 2.8 update notes

Also see:

- the update steps section above.
- the End of support announcements.
- the Stash 2.8 release notes.

Known issues

P	Key	Summary	Status

No issues found

Stash 2.7 update notes

Also see:

- the update steps section above.
- the End of support announcements.

Repository System Information Plugin is now deprecated

The functionality of the repository system information plugin has now been moved into core Stash. The plugin will still work for Stash 2.x versions but is redundant as of Stash 2.7.

MySQL default isolation level

Stash 2.7.x uses READ_COMMITTED instead of the MySQL default isolation level (REPEATABLE_READ). This can result in exceptions when installing or upgrading to 2.7.x, if binary logging is enabled in your MySQL server. More details and a fix can be found in this KB article.

Known issues

P	Key	Summary	Status

No issues found

Stash 2.6 update notes

Also see:

- the update steps section above.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Stash 2.5 update notes

Also see:

- the update steps section above.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Limited support for JIRA 4.4.x and earlier

JIRA 4.3+ allows for showing commits associated with issues in JIRA. However, viewing issues within Stash is not supported for JIRA 4.4.x and earlier.

Stash 2.4 update notes

Also see:

- the update steps section above.
- the End of support announcements.

Known issues

P	Key	Summary	Status

No issues found

Stash 2.3 update notes

Please also see the update steps section above.

When upgrading to Stash 2.3 you also need to update the SCM Cache plugin, due to recent Stash API changes.

Known issues

P	Key	Summary	Status

No issues found

Stash 2.2 update notes

Please see the update steps section above.

Known issues

P	Key	Summary	Status

No issues found

Stash 2.1 update notes

Please also see the update steps section above.

Known issues

P	Key	Summary	Status

No issues found

Install location for third-party libraries

As of Stash 2.1 you can install third-party libraries and jar files, such as the MySQL JDBC driver, into `<Stash home directory>/lib`. This has the advantage that files in this location are not overwritten, and lost, when you update Stash.

Microsoft SQL Server JDBC driver

Stash 2.1 now uses the Microsoft SQL Server JDBC driver to access Microsoft SQL Server, instead of using the jTDS driver. In most cases, Stash will automatically swap to using the Microsoft driver on update and **no configuration is required**.

If Stash was configured to use Microsoft SQL Server by manually entering a JDBC URL, please refer to this guide.

Stash 2.0 update notes

This section provides specific notes for upgrading to Stash 2.0. See also the update steps section above.

Tomcat

For Stash 2.0, Tomcat has been updated from version 6 to 7. As part of that update, the `server.xml` file has changed. If you have customized `server.xml` (for example, for `port`, `path` or `hostname`), you can not simply copy your own version across to the updated Stash; you must reapply your customizations to the `server.xml` file for the new version of Stash.

If you were running Stash as a Windows service and are upgrading from 1.x to 2.x you will need to reinstall the Stash service to make it use Tomcat 7.

To uninstall the Stash service you need to execute following commands from <STASH DISTRIBUTION DIR>\bin:

```
> net stop <service name>
> service.bat uninstall <service name>
```

You can call this command without the service name if you installed the Stash service with a default name.

After the service is uninstalled you can proceed with the update steps and refer to the **Running Bitbucket Server as a Windows service** page for instructions to configure Stash 2.x running as a service.

Perl

Stash 2.0 requires Perl for its branch permission functionality. If Perl is unavailable, Stash 2.0 will not start.

On Windows machines, Perl will only have been installed by the Git installer if the correct install option was chosen. See Installing and upgrading Git.

Existing Git hooks

In order to support Branch Permissions, Stash 2.0 moves existing hooks in the `pre-receive` and `post-receive` folders under `<Stash home directory>/data/repositories/NNNN/hooks` (where NNN is the internal repository id) to `.../hooks/pre-receive.d/10_custom` or `.../hooks/post-receive.d/10_custom`. Consequently, custom hooks that use relative path names (e.g. "./foo.sh" or "../dir/foo.sh") will be broken by the update to Stash 2.0.

Deprecation of Internet Explorer 8

Support for Internet Explorer 8 is deprecated from the release of Stash 2.0. The official end-of-support date is yet to be determined. See Supported platforms for details.

Known issues

P	Key	Summary	Status

No issues found

Migrate server.xml customizations to bitbucket.properties

Bitbucket Server 5.0 introduces some changes to how connector configuration customization is performed. In Bitbucket Server 4.x and earlier Bitbucket Server startup involved starting Apache Tomcat and deploying the web application into Tomcat. Customizing connector configuration (for example to secure connections with SSL) involved updating the Tomcat `server.xml` file.

In Bitbucket Server 5.0 and later, an embedded container (still Apache Tomcat) is started by the application. This allows you to make customizations to connector configuration directly in the `bitbucket.properties` file (the same file that hosts the vast majority of other settings).

Upgrading from any version earlier than Bitbucket Server 4.14 or earlier to Bitbucket Server 5.x or later requires that you manually migrate any changes to the `server.xml` file to the `bitbucket.properties` file.

This document explains in what cases this may be necessary, describes how to perform this migration, and provides some migration examples for common use cases.

How do I know if there were customizations to my `server.xml` file?

The `server.xml` file was where you would make customizations to do a number of things, but most users used it to:

- Secure Bitbucket using SSL.
- Run Bitbucket behind a reverse proxy.
- Changed the port Bitbucket runs on.
- Set up a custom keystore.

How to migrate your customizations to `bitbucket.properties`

To migrate customizations made in the `server.xml` file to the `bitbucket.properties` file

1. Locate your `server.xml` file.

Release	Directory
Stash 3.7 and earlier	`<Stash installation directory>/conf/server.xml`
Stash 3.8 and later	`<Stash home directory>/shared/server.xml`
Bitbucket Server 4.0 - 4.14	`<Bitbucket home directory>/shared/server.xml`
Bitbucket Server 5.0 and later	N/A, replaced by `<Bitbucket home directory>/shared /bitbucket.properties`

2. Identify and note any customizations made. Ideally you will know which customizations were made and can locate them in your `server.xml` file.

   This is not a comprehensive list. Review your `server.xml` file closely to ensure all your customizations are noted.

   a. Securing Bitbucket using SSL.
   b. Running Bitbucket behind a reverse a proxy.
   c. Bypassing the Bitbucket reverse proxy to solve Application Links issues.
   d. Bypassing the Bitbucket proxy to connect directly to a Data Center node (for troubleshooting, or to generate support zips).
   e. Configuring a custom keystore path and password.

3. Locate your `bitbucket.properties` file in the `<Bitbucket home directory> /shared` directory.
4. Look up the customization equivalent in the `bitbucket.properties` file by referring to one of the migration examples and/or by using the migration table below.
5. Add the equivalent values to the `bitbucket.properties` file. Save and close the file.

   The value for your load balancer to support session affinity ("sticky sessions") was previously set to `JSESSIONID`. The default value for Bitbucket 5.0+ has changed to `BITBUCKETSESSIONID`.

   You need to *either* change your load balancer cookie configuration to `BITBUCKETSESSIONID`, or, change the value in the `bitbucket.properties` file to `JSESSIONID`.

   To change the value in the bitbucket.properties file, add this line

   ```
   server.session.cookie.name=JSESSIONID
   ```

   To change this value in your load balancer configuration, locate your load balancer proxy configuration file, change the instances of `JSESSIONID` to `BITBUCKETSESSIONID`.

6. Remove or rename the `server.xml` file (don't delete this file until you confirm the customizations were successfully migrated to your upgraded instance).

Migration reference table

4.x and earlier (`server.xml`)	5.x and later (`bitbucket.properties`)
`compression="on"`	`server.compression.enabled=true`
`compressableMimeType= "text/html,text/xml,text/plain,text/css,application/json,application/javascript,application/x-javascript"`	`server.compression.mime-types= text/css,text/html,text/javascript,text/json,text/plain,text/xml,text/x-javascript, \application/javascript,application/json,application/x-javascript,application/vnd.git-lfs+json`
`connectionTimeout="20000"`	`server.connection-timeout=20000`
`path="/"`	`server.context-path=/`
N/A	`server.displayName=Atlassian Bitbucket`
`port="7990"`	`server.port=7990`
`useHttpOnly="true"`	`server.session.cookie.http-only=true`
`secure="true"`	`server.secure=true`
`SSLEnabled="true"`	`server.ssl.enabled=true`
`keyAlias="YourAlias"` `certificateKeyAlias="YourAlias"`	`server.ssl.key-alias=tomcat`

`keystoreFile= "/path/to/keystore/bitbucket.jks"`
 	
`certificateKeystoreFile=" /path/to/keystore/bitbucket.jks"`
	`server.ssl.key-store= ${bitbucket.shared.home} /config/ssl-keystore`

`keystorePass= "<password value>"`
 	
`certificateKeystorePassword= "<password value>"`
	`server.ssl.key-store-password=changeit`

`sslProtocol="TLSv1.2"`	`server.ssl.protocol=TLSv1.2`

`keystoreType="JKS"`
 	
`certificateKeystoreType="JKS"`
	`server.ssl.key-store-type= ${keystore.type:jks}`

`clientAuth="false"` or `clientAuth="true"`	`server.ssl.client-auth=want` or `server.ssl.client-auth=need`
`redirectPort="443"`	`server.redirect-port=443`
`proxyPort="443"`	`server.proxy-port=443`
`proxyName="mycompany.com"`	`server.proxy-name=mycompany.com`
`address="192.168.10.10"`	`server.address=192.168.10.10`

For Bitbucket Data Center

These properties are applicable to Bitbucket Data Center instances. In previous versions these were set within load balancer configuration files. Depending on which load balancer you're using, there are many configuration options, so it is not possible to precisely describe the properties or values for every configuration.

Setting these values within the `bitbucket.properties` in file in 5.0+ overrides what's in the load balancer configuration file.

- `server.session.cookie.name=BITBUCKETSESSIONID`
- `server.session.timeout=1800`
- `server.session.tracking-modes=cookie`

Migration examples

Here are some examples that demonstrate some common use cases for customizing the `server.xml` file, and how you would migrate those values to the `bitbucket.properties` file.

For these examples, if there are less properties in the `bitbucket.properties` syntax then in the initial `server.xml` syntax, that indicates the default value would be acceptable and you don't need to add that property to achieve the same result.

Read the Configuration properties - Server section for more details about all of the various properties that can be configured.

For Windows users

When adding values with file paths in them, for instance `server.context-path`, backslashes are escaped by default. Be sure to include two backslashes in any values with file paths in them.

Additional connectors

Bitbucket is preconfigured with a single connector and, as previously described, the default configuration for that connector can be configured using properties with a `server.` prefix. For example to change the port from the default `7990` to `7991`:

```
server.port=7991
```

Bitbucket also supports up to five additional connectors and these are configured using properties with prefix `server.additional-connector.#`, where `#` is a number between `1` and `5` inclusive. For example, if in addition to the default connector that is configured to listen on port `7990`, you wanted to add an SSL secured connector listening on port `8443`, you would add these lines to the `bitbucket.properties` file:

```
server.additional-connector.1.port=8443
server.additional-connector.1.ssl.enabled=true
server.additional-connector.1.ssl.key-store=/path/to/keystore/bitbucket.jks
server.additional-connector.1.ssl.key-store-password=<password value>
```

Running Bitbucket behind a reverse proxy secured with SSL

If Bitbucket is configured to run behind a reverse proxy that is secured with SSL, the existing server.xml file might contain the following connector configuration:

server.xml

```
<Connector port="7990"
     protocol="HTTP/1.1"
     connectionTimeout="20000"
     useBodyEncodingForURI="true"
     redirectPort="443"
     compression="on"
     compressableMimeType="text/html,text/xml,text/plain,text/css,application/json,application
/javascript,application/x-javascript"
     secure="true"
     scheme="https"
     proxyName="mycompany.com"
     proxyPort="443" />
```

To achieve the same configuration in Bitbucket 5.0 and later, add these entries to the `bitbucket.properties` file:

bitbucket.properties

```
server.secure=true
server.scheme=https
server.proxy-port=443
server.proxy-name=mycompany.com
```

For these examples, if there are less properties in the `bitbucket.properties` syntax then in the initial `server.xml` syntax, that indicates the default value would be acceptable and you don't need to add that property to achieve the same result. For example, the port for the default connector is `7990`, the default protocol is `HTTP/1.1`, and so on.

Bitbucket secured with SSL-terminating connector

If Bitbucket is secured with SSL, where the SSL connection is terminated at the application rather than a proxy, the existing `server.xml` file might contain the following connector configuration:

server.xml

```
<Connector port="8443"
     protocol="HTTP/1.1"
     connectionTimeout="20000"
     useBodyEncodingForURI="true"
     redirectPort="443"
     compression="on"
compressableMimeType="text/html,text/xml,text/plain,text/css,application/json,application/javascript,
application/x-javascript"
     secure="true"
     scheme="https"
     SSLEnabled="true"
     sslProtocol="TLSv1.2"
     keystoreType="JKS"
     keystoreFile="/path/to/keystore/bitbucket.jks"
     keystorePass="changeit"
     keyAlias="YourAlias"
     clientAuth="false"
/>
```

To achieve the same configuration in Bitbucket 5.0 and later, add these entries to the `bitbucket.properties` file:

bitbucket.properties

```
server.port=8443
server.secure=true
server.scheme=https
server.ssl.enabled=true
server.ssl.client-auth=want
server.ssl.protocol=TLSv1.2
server.ssl.key-store=/path/to/keystore/bitbucket.jks
server.ssl.key-store-password=<password value>
server.ssl.key-password=<password value>
```

Both `ssl.key-store-password` and `ssl.key-password` require explicit configuration. Even if you did not configure both values in the `server.xml` file, values for both entries need to be explicitly set in `bitbucket.properties` to secure Bitbucket with SSL.

Bitbucket secured with SSL and additional connector to redirect HTTP requests

For some with an SSL-terminating connector configured, you might also have an additional connector that redirects HTTP requests to the HTTPS connector. This would have required you to also specify an additional attribute in the `<Bitbucket installation directory>/atlassian-bitbucket/WEB-INF/web.xml` file.

Here's what that configuration might have looked like prior to Bitbucket 5.0:

server.xml

```
<Connector port="7990"
           protocol="HTTP/1.1"
           connectionTimeout="20000"
           useBodyEncodingForURI="true"
           redirectPort="8443"
           compression="on"
           compressableMimeType="text/html,text/xml,text/plain,text/css,application/json,application
/javascript,application/x-javascript"/>
```

web.xml

```
<security-constraint>
  <web-resource-collection>
```

```
    <web-resource-name>Restricted URLs</web-resource-name>
    <url-pattern>/*</url-pattern>
  </web-resource-collection>
  <user-data-constraint>
    <transport-guarantee>CONFIDENTIAL</transport-guarantee>
  </user-data-constraint>
</security-constraint>
```

To achieve the same configuration in Bitbucket 5.0 and later, add these entries to the `bitbucket.properties` file:

bitbucket.properties

```
server.require-ssl=true
server.additional-connector.1.port=7990
server.additional-connector.1.redirect-port=8443
```

For these examples, if there are less properties in the `bitbucket.properties` syntax then in the initial `server.xml` syntax, that indicates the default value would be acceptable and you don't need to add that property to achieve the same result.

Bitbucket Data Center upgrade guide

This page contains instructions for **upgrading an existing Bitbucket cluster** to the next major or minor version. Upgrading to either version type will incur downtime.

If you are not running Bitbucket in a cluster, follow the instructions in Bitbucket Server upgrade guide.

Upgrading to any later version is free if you have current software maintenance. See our Licensing FAQ to find out more.

If you deployed Bitbucket Data Center on AWS using our AWS Quick Starts, refer to the **Upgrading** section of Administer Bitbucket Data Center in AWS instead.

On this page:

Plan your upgrade

1. Determine your upgrade path

Check the Supported platforms page to determine if your environment meets the minimum requirements to run the latest version of Bitbucket. Also read the End of support announcements.

You can update from any previous version of Bitbucket Server (or Stash) to the latest version, as there is no required upgrade path.

Bitbucket Data Center and Server 8.x is a major upgrade

Be sure to read the Bitbucket Server 8.0 release notes, take a full backup, and test your upgrade in a non-production environment before upgrading your production site.

Upgrading from a version older than Bitbucket 8.x disables all user-installed apps on startup

Be sure to update your own apps and check the Atlassian Marketplace to ensure 3rd-party apps are compatible with Bitbucket Data Center and Server 8.x before upgrading.

Upgrading to the next bug fix update

If you are upgrading a multi-node Bitbucket cluster to the next bug fix update (for example, from 8.0.0 to 8.0.1), you can upgrade with no downtime.

2. Complete pre-upgrade checks

1. Check the Version specific upgrade notes for the version you plan to upgrade to (and any in between).
2. Go to ⚙ > **Support Tools**, then review the Log analyzer for any issues that may need to be resolved.
3. Check the compatibility of your apps with the version you plan to upgrade to.

   a. Go to ⚙ > **Manage apps** > **Bitbucket update check**.
   b. Choose the version you plan to upgrade to then hit **Check**.

      If your users rely on particular apps, you may want to wait until they are compatible before upgrading Bitbucket. App vendors generally update their apps very soon after a major release.

      Good to know:

      - If you're performing a major version upgrade, user-installed apps will be disabled. You will need to enable your apps after successfully upgrading, regardless of compatibility with Bitbucket Server.
      - You can disable an app temporarily if it is not yet compatible.

3. Upgrade Bitbucket in a test environment

1. Create a staging copy of your current production environment.
2. Follow the steps below to upgrade your test environment.
3. Test any unsupported apps, customizations and proxy configuration (if possible) before upgrading your production environment.

Upgrade Bitbucket Data Center

1. Back up your data

1. Determine which backup strategy to use.

   For **Bitbucket Data Center** (version 4.8 or later) instances, you can use Zero Downtime Backup, DIY Backup, or take snapshots of the shared home directory (on NFS) and database while all nodes are stopped.

   For **Bitbucket mirrors**, the home directory doesn't store any persistent state that can't be reconstructed from the primary Bitbucket instance, but you should still make sure you have a backup of at least the important configuration files such as SSL certificate, `server.xml`, `config/ssh-server-keys.pem`, `bitbucket.properties` file, and so on in a safe place. See How do I back up my mirrors? for more information.

   See the article Data recovery and backups for detailed information and guidance on creating an effective backup strategy.
2. Back up all the data in your Bitbucket home directory and external database.

2. Stop the cluster

You must stop all the nodes in the cluster before upgrading. For more info, see Starting and stopping Bitbucket.

We recommend configuring your load balancer to redirect traffic away from Bitbucket until the upgrade is complete on all nodes.

3. Download Bitbucket

Download the appropriate file for your operating system - https://www.atlassian.com/software/bitbucket/download-archives.

4. Upgrade the first node

To upgrade the first node:

1. Extract (unzip) the files to a directory (this will be your new installation directory, and must be different to your existing installation directory)
2. Update the value of BITBUCKET_HOME in the `<Installation-directory>/bin/set-bitbucket-home.sh` file so the new Bitbucket installation points to your existing Bitbucket home directory.

   > If you use a BITBUCKET_HOME environment variable to specify the home directory location, no change is required

3. Copy any other immediately required customizations from the old version to the new one (for example if you are not running Bitbucket on the default ports or if you manage users externally, you'll need to update / copy the relevant files)

   > If you configured Bitbucket to run as a Linux service, don't forget to update its service configuration as well. Learn more about running Bitbucket as a Linux service.

4. Start Bitbucket on the node. Learn more about starting Bitbucket

5. Copy Bitbucket to remaining nodes

The next step is to replicate your upgraded Bitbucket directories to other nodes in the cluster.

1. Stop Bitbucket on the first node.
2. Copy the installation directory and local home directory from the first node to the next node. If the path to the local home directory is different on this node, edit the /bin/set-bitbucket-home.sh (or set-bitbucket-home.bat on Windows) to point to the correct location.
3. Start Bitbucket, and confirm that everything works as expected.
4. Stop Bitbucket on this node before continuing with the next node.

Repeat this process for each remaining node.

6. Start Bitbucket and check cluster connectivity

Once all nodes have been upgraded you can start Bitbucket Data Center on each node, **one at a time** (starting up multiple nodes simultaneously can lead to serious failures).

The Cluster monitoring console (**Administration** > **Settings** > **Clustering**) includes information about the active cluster nodes. When the cluster is running properly, you should be able to see the details of each node.

Migrate H2 database

The H2 database can’t automatically migrate your data during the Bitbucket upgrade. That’s why a Bitbucket admin should migrate the data manually to the upgraded Bitbucket instance.

If you’re upgrading from:

- Bitbucket 8.8 to Bitbucket 8.8+, you don’t need to do anything.
- from versions below 8.0 to Bitbucket 8.0-8.7 (for example from 7.19 to 8.2), you’ll need to migrate your data to the MvStore format. Learn how to migrate H2 database from 1.3 to 1.4
- from versions below Bitbucket 8.8 to Bitbucket 8.8+ (for example from 8.0 to 8.8 or 7.21 to 8.9), you’ll need to migrate your data from version 1.x (for example 1.3.176 or 1.4.200) to version 2.1.214. Learn how to migrate H2 database from 1.x to 2.x and later

Migrate H2 database from 1.3 to 1.4

These instructions don't apply if you're already on a Bitbucket version 8.0 or later.

On this page

If you're upgrading from versions below 8.0 to Bitbucket 8.0-8.7 (for example from 7.19 to 8.2) and use the H2 database (for Bitbucket Mirror or Server), you'll need to migrate the on-disk database file from PageStore format to MVStore format.

The distribution package under the `/bin` directory contains a new script, `h2-migrate-db-file.sh`, that you can use to migrate the H2 database file.

If you start Bitbucket without migrating to the MVStore format, a fatal error will occur and you can't start Bitbucket.

To migrate your H2 database:

1. Make sure that the Bitbucket application is not running.
2. Change to your `<Bitbucket installation directory>/bin` and use the command `BITBUCKET_HOME=<Home directory> ./h2-migrate-db-file.sh`. You can customize the behavior of the script. Learn how to configure the migration script
3. When the script is successfully executed, it will generate output that looks similar to the following:

```
Creating script file...
Script file created successfully
Running script...
        - Table PUBLIC.DATABASECHANGELOGLOCK created with 1 row
        - Table PUBLIC.DATABASECHANGELOG created with 704 rows
        - Table PUBLIC.APP_PROPERTY created with 8 rows
        ....
        - Table PUBLIC.AO_4789DD_PROPERTIES created with 0 rows
Run script finished, DB file generated successfully at /var/opt/atlassian-bitbucket/home/shared
/data/db.mv.db
```

   A backup of the `db.h2.db` file gets stored at the same path as that of the original file with the suffix, `_old`. For example, `db_old.h2.db`

Configure the migration script

Set the below environment variables to customize the behavior of the script.

Variable	Description
`BITBUCKET_HOME`	Bitbucket home directory
`JAVA_HOME` or `JRE_HOME`	Set one of these variables so the script can run successfully.
`BITBUCKET_SHARED_HOME`	Set this variable only if the shared home is different from `<BITBUCKET_HOME>/shared`. Note that you don't need to set `BITBUCKET_HOME` if you set this variable.
`DB_FILE`	Set this variable only if you want to provide a custom location for the H2 database file. `<BITBUCKET_SHARED_HOME>/data/db.h2.db` is used by default if this variable is not set.

`H2_JAR_PATH`	This variable is optional and can be used to set the path of the H2 jar file. The H2 jar bundled in the installation directory is used by default.
`JDBC_USER`	This variable is optional and can be used to set the username to connect to the H2 database file. The default username is `sa`.
`JDBC_PASSWORD`	This variable is optional and can be used to set the password to connect to the H2 database file. The default password is blank (““).

Revert your migration

If the migration is unsuccessful or you want to reconsider your upgrade decision, you can revert the migration:

1. Navigate to the directory from where you executed the script `h2-migrate-db-file.sh` and remove the `h2_script.sql` file, if present.
2. Change the directory to `<BITBUCKET_HOME>/shared/data`.
3. If you see the file:
    - `db_old.h2.db`, rename it to `db.h2.db`.
    - `db.mv.db`, delete it.

Migrate H2 database from 1.x to 2.1

These instructions don’t apply if you’re already on a Bitbucket version 8.8 or above.

If you're upgrading to a Bitbucket version lower than 8.8, see Migrate H2 database from 1.3 to 1.4.

On this page

If you're upgrading from versions below 8.8 to Bitbucket 8.8+ (for example from 8.0 to 8.8 or 7.21 to 8.9) and use a H2 database (for a Bitbucket Mirror or Server), you'll need to migrate the on-disk database file so it's compatible with the new H2 driver version 2.1.214.

The distribution package under the `/bin` directory contains a script, `h2-migrate-db-file.sh`, that you can use to migrate the H2 database file.

If you start Bitbucket without migrating to the new disk format, a fatal error will occur and you can’t start Bitbucket.

Migrate H2 database for a Bitbucket Mirror or Server

To migrate your H2 database:

1. Make sure that the Bitbucket application is not running.
2. Change to your `<Bitbucket Server installation directory>/bin` and use the command `BITBUCKET_HOME=<Home directory> SOURCE_INST_DIR=<Old installation directory> ./h2-migrate-db-file.sh`. You can customize the behavior of the script. Learn how to configure the migration script
3. When the script is successfully executed, it will generate output that looks similar to the following:

```
Creating script file...
Script file created successfully
Running script...
Run script finished, DB file generated successfully at /var/opt/atlassian-bitbucket/home/shared
/data/db.mv.db
```

   A backup of the `db.h2.db` file gets stored at the same path as that of the original file with the prefix, `backup_`. For example, `backup_db.h2.db` or `backup_db.mv.db`

Configure the migration script

Set the below environment variables to customize the behavior of the script.

Variable	Description
`BITBUCKET_HOME`	Bitbucket home directory
`JAVA_HOME` or `JRE_HOME`	Set one of these variables so the script can run successfully.

`BITBUCKET_SHARED_HOME`	Set this variable only if the shared home is different from `<BITBUCKET_HOME>/shared`. Note that you don’t need to set `BITBUCKET_HOME` if you set this variable.
`DB_FILE`	Set this variable only if you want to provide a custom location for the H2 database file. `<BITBUCKET_SHARED_HOME>/data/db.h2.db` is used by default if present on the disk, otherwise `<BITBUCKET_SHARED_HOME>/data/db.mv.db`.
`H2_JAR_PATH`	This variable is optional and can be used to set the path of the H2 jar file. The H2 jar bundled in the installation directory is used by default.
`SOURCE_INST_DIR`	This is the path of the existing installation directory. For example, if you're upgrading from Bitbucket 7.21, then this is the path of the installation directory for 7.21
`JDBC_USER`	This variable is optional and can be used to set the username to connect to the H2 database file. The default username is `sa`.
`JDBC_PASSWORD`	This variable is optional and can be used to set the password to connect to the H2 database file. The default password is blank (““).

Revert your migration

If the migration is unsuccessful or you want to reconsider your upgrade decision, you can revert the migration:

1. Navigate to the directory from where you executed the script `h2-migrate-db-file.sh` and remove the `h2_script.sql` file, if present.
2. Change the directory to `<BITBUCKET_HOME>/shared/data`.
3. If you see the file:
    - `backup_db.h2.db`, rename it to `db.h2.db`.
    - `backup_db.mv.db`, rename it to `db.mv.db`.
    - `db.mv.db`, delete it.

Migrate H2 database for Bitbucket Mesh

ⓘ These instructions don't apply if you're upgrading from versions above Mesh 1.5.

If you're upgrading from versions below Mesh 1.5 to Mesh 1.5+, you'll need to migrate your database file so it's compatible with the new H2 driver version 2.1.214.

⚠ If you start Mesh migrating to the new disk format, a fatal error will occur and the Mesh application will not start.

To migrate your H2 database perform the following steps as the same user that runs the Mesh application:

1. Create a new file named `h2-migrate-db-file.sh` inside `<Mesh installation directory/bin>` with the following content:

```
#!/usr/bin/env bash

if [ -z "$SOURCE_H2_JAR_PATH" ]; then
  echo "Please provide the location of the H2 v1.4 JAR in the 'SOURCE_H2_JAR_PATH' environment
variable"
  exit 1
fi

# BIN_DIR & INST_DIR will be absolute paths, not relative
pushd $(dirname $0) > /dev/null
BIN_DIR=$(pwd)
popd > /dev/null
INST_DIR=$(dirname "$BIN_DIR")

source "$BIN_DIR"/set-jre-home.sh &&
    source "$BIN_DIR"/set-mesh-home.sh &&
    source "$BIN_DIR"/set-mesh-user.sh

DB_FILE_WITHOUT_EXT="$MESH_HOME/mesh"
DB_FILE="$DB_FILE_WITHOUT_EXT.mv.db"
DB_LOCK_FILE="$DB_FILE_WITHOUT_EXT.lock.db"

if [ -f "$DB_LOCK_FILE" ]; then
  echo "The file $DB_LOCK_FILE is present which means the database may be in use. Please stop
Mesh or any other clients using the $DB_FILE file and try again. If the database is not in use,
manually delete the file $DB_LOCK_FILE and try again."
  exit 1
fi

if [ ! -f "$DB_FILE" ]; then
  echo "Cannot run migration; $DB_FILE doesn't exist"
  exit 1
fi

if [ -z "$H2_JAR_PATH" ]; then
  H2_JAR_PATH="$BIN_DIR/h2.jar"
fi

JDBC_URL="jdbc:h2:$DB_FILE_WITHOUT_EXT"
SCRIPT_FILE="h2_script.sql"
SCRIPT_JAVA_OPTS="-cp $SOURCE_H2_JAR_PATH org.h2.tools.Script -user sa -url $JDBC_URL -script
$SCRIPT_FILE"
RUN_SCRIPT_JAVA_OPTS="-cp $H2_JAR_PATH org.h2.tools.RunScript -user sa -url $JDBC_URL -script
$SCRIPT_FILE -showResults -options FROM_1X"

BACKUP_FILE="$MESH_HOME/backup_mesh.mv.db"

echo "Creating script file..."
$JAVA_BINARY $SCRIPT_JAVA_OPTS
if [ $? -eq 0 ]; then
  echo "Script file created successfully"
  mv "$DB_FILE" "${BACKUP_FILE}"
else
  echo "Script generation failed"
  exit 1
fi

echo "Running script..."
$JAVA_BINARY $RUN_SCRIPT_JAVA_OPTS
if [[ $? -eq 0 && -f "$DB_FILE" ]]; then
  echo "Run script finished, DB file generated successfully at $DB_FILE"
  rm -rf "$SCRIPT_FILE"
  chmod u=rw,go=r $DB_FILE
else
  echo "Run script failed"
  rm -rf ${DB_FILE_WITHOUT_EXT}.*.db
  mv "${BACKUP_FILE}" "$DB_FILE"
  exit 1
fi
```

2. Download the following H2 driver jar files in any location on the disk

    - `https://repo1.maven.org/maven2/com/h2database/h2/1.4.200/h2-1.4.200.jar`
    - `https://repo1.maven.org/maven2/com/h2database/h2/2.1.214/h2-2.1.214.jar`
3. Make sure that the Mesh application is not running.
4. Change to your `<Mesh installation directory>/bin` and use the command `MESH_HOME=<Home directory> SOURCE_H2_JAR_PATH=<Path of h2-1.4.200.jar> H2_JAR_PATH=<Path of h2-2.1.214.jar> ./h2-migrate-db-file.sh`. You can customize the behavior of the script. Learn how to configure the migration script
5. When the script is successfully executed, it will generate output that looks similar to the following:

```
Creating script file...
Script file created successfully
Running script...
Run script finished, DB file generated successfully at /var/opt/atlassian-bitbucket/home/mesh.mv.
db
```

   A backup of the `mesh.mv.db` file gets stored at the same path as that of the original file with the prefix, `backup_`. For example, `backup_mesh.mv.db`

Configure the migration script

Variable	Description
`MESH_HOME`	Mesh home directory
`JAVA_HOME` or `JRE_HOME`	Set one of these variables so the script can run successfully.
`DB_FILE`	Set this variable only if you want to provide a custom location for the H2 database file. `<MESH_HOME>/mesh.mv.db` is used by default.
`H2_JAR_PATH`	This variable is used to set the path of the H2 jar file for v2.1.214.
`SOURCE_H2_JAR_PATH`	This variable is used to set the path of the H2 jar file for v1.4.200.

Revert your migration

If the migration is unsuccessful or you want to reconsider your upgrade decision, you can revert the migration:

1. Navigate to the directory from where you executed the script `h2-migrate-db-file.sh` and remove the `h2_script.sql` file, if present.
2. Change the directory to `<MESH_HOME>`.
3. If you see the file:
    - `backup_mesh.mv.db`, rename it to `mesh.mv.db`.
    - `mesh.mv.db`, delete it.

Migrate H2 database from 1.x to 2.x and later

If you're upgrading from a version older than 8.8 to Bitbucket 8.8 and later (for example, from 8.0 to 8.8 or 7.21 to 8.9) and use the H2 database (for a Bitbucket Mirror or Data Center), you'll need to migrate the on-disk database file so it's compatible with the new H2 driver version.

The distribution package under the `/bin` directory contains a script, `h2-migrate-db-file.sh`, that you can use to migrate the H2 database file.

⚠ If you start Bitbucket without migrating to the new disk format, a fatal error will occur and you can't start Bitbucket.

Migrate the H2 database for a Bitbucket Mirror or Data Center

To migrate your H2 database:

1. Make sure that the Bitbucket application isn't running.
2. Change to your `<Bitbucket installation directory>/bin` and use the command `BITBUCKET_HOME=<Home directory> SOURCE_INST_DIR=<Old installation directory> ./h2-migrate-db-file.sh`. You can customize the behavior of the script. Learn how to configure the migration script
3. When the script is successfully executed, it will generate output that looks similar to the following:

```
Creating script file...
Script file created successfully
Running script...
Run script finished, DB file generated successfully at /var/opt/atlassian-bitbucket/home/shared/data/db.
mv.db
```

A backup of the `db.h2.db` file gets stored at the same path as that of the original file with the prefix, `backup_`. For example, `backup_db.h2.db` or `backup_db.mv.db`.

Configure the migration script

Set the following environment variables to customize the behavior of the script.

Variable	Description
`BITBUCKET_HOME`	Bitbucket home directory
`JAVA_HOME` or `JRE_HOME`	Set one of these variables so the script can run successfully.
`BITBUCKET_SHARED_HOME`	Set this variable only if the shared home is different from `<BITBUCKET_HOME>/shared`. Note that you don't need to set `BITBUCKET_HOME` if you set this variable.
`DB_FILE`	Set this variable only if you want to provide a custom location for the H2 database file. `<BITBUCKET_SHARED_HOME>/data/db.h2.db` is used by default if present on the disk, otherwise `<BITBUCKET_SHARED_HOME>/data/db.mv.db`.
`H2_JAR_PATH`	This variable is optional and can be used to set the path of the H2 jar file. The H2 jar bundled in the installation directory is used by default.
`SOURCE_INST_DIR`	This is the path of the existing installation directory. For example, if you're upgrading from Bitbucket 7.21, then this is the path of the installation directory for 7.21.
`JDBC_USER`	This variable is optional and can be used to set the username to connect to the H2 database file. The default username is `sa`.

`JDBC_PASSWORD`	This variable is optional and can be used to set the password to connect to the H2 database file. The default password is blank (““).

Revert your migration

If the migration is unsuccessful or you want to reconsider your upgrade decision, you can revert the migration:

1. Navigate to the directory from where you executed the script `h2-migrate-db-file.sh` and remove the `h2_script.sql` file, if present.
2. Change the directory to `<BITBUCKET_HOME>/shared/data`.
3. If you see the file:
   - `backup_db.h2.db`, rename it to `db.h2.db`.
   - `backup_db.mv.db`, rename it to `db.mv.db`.
   - `db.mv.db`, delete it.

Migrate the H2 database for Bitbucket Mesh

To check which Bitbucket Mesh version is compatible with your Bitbucket application, check Bitbucket Mesh compatibility matrix.

If you're upgrading to Mesh 1.5 and later, you'll need to migrate your database file so it's compatible with the new H2 driver version.

In the following table, find the H2 driver version compatible with your Bitbucket Mesh version.

Mesh version	H2 version
1.4.2 and older	1.4.200
1.5.0-1.5.4	2.1.214
1.5.5-1.5.6	2.2.220
2.0.0-2.0.6	2.1.214
2.0.7-2.0.8	2.2.220
2.1.0	2.1.214
2.1.1-2.1.2	2.2.220

If you start Mesh with the database file using old disk format, a fatal error will occur and the Mesh application will not start.

To migrate your H2 database perform the following steps as the same user that runs the Mesh application:

1. Create a new file named `h2-migrate-db-file.sh` inside `<Mesh installation directory/bin>` with the following content:

   Substitute the `<source H2>` placeholder with the relevant version number of the H2 database you're currently using.

```
#!/usr/bin/env bash

if [ -z "$SOURCE_H2_JAR_PATH" ]; then
  echo "Please provide the location of the <source H2> JAR in the 'SOURCE_H2_JAR_PATH'
environment variable"
  exit 1
fi

# BIN_DIR & INST_DIR will be absolute paths, not relative
pushd $(dirname $0) > /dev/null
BIN_DIR=$(pwd)
popd > /dev/null
INST_DIR=$(dirname "$BIN_DIR")

source "$BIN_DIR"/set-jre-home.sh &&
    source "$BIN_DIR"/set-mesh-home.sh &&
    source "$BIN_DIR"/set-mesh-user.sh

DB_FILE_WITHOUT_EXT="$MESH_HOME/mesh"
DB_FILE="$DB_FILE_WITHOUT_EXT.mv.db"
DB_LOCK_FILE="$DB_FILE_WITHOUT_EXT.lock.db"

if [ -f "$DB_LOCK_FILE" ]; then
  echo "The file $DB_LOCK_FILE is present which means the database may be in use. Please stop
Mesh or any other clients using the $DB_FILE file and try again. If the database is not in use,
manually delete the file $DB_LOCK_FILE and try again."
  exit 1
fi

if [ ! -f "$DB_FILE" ]; then
  echo "Cannot run migration; $DB_FILE doesn't exist"
  exit 1
fi

if [ -z "$H2_JAR_PATH" ]; then
  H2_JAR_PATH="$BIN_DIR/h2.jar"
fi

JDBC_URL="jdbc:h2:$DB_FILE_WITHOUT_EXT"
SCRIPT_FILE="h2_script.sql"
SCRIPT_JAVA_OPTS="-cp $SOURCE_H2_JAR_PATH org.h2.tools.Script -user sa -url $JDBC_URL -script
$SCRIPT_FILE"
RUN_SCRIPT_JAVA_OPTS="-cp $H2_JAR_PATH org.h2.tools.RunScript -user sa -url $JDBC_URL -script
$SCRIPT_FILE -showResults -options FROM_1X"

BACKUP_FILE="$MESH_HOME/backup_mesh.mv.db"

echo "Creating script file..."
$JAVA_BINARY $SCRIPT_JAVA_OPTS
if [ $? -eq 0 ]; then
  echo "Script file created successfully"
  mv "$DB_FILE" "${BACKUP_FILE}"
else
  echo "Script generation failed"
  exit 1
fi

echo "Running script..."
$JAVA_BINARY $RUN_SCRIPT_JAVA_OPTS
if [[ $? -eq 0 && -f "$DB_FILE" ]]; then
  echo "Run script finished, DB file generated successfully at $DB_FILE"
  rm -rf "$SCRIPT_FILE"
  chmod u=rw,go=r $DB_FILE
else
  echo "Run script failed"
  rm -rf ${DB_FILE_WITHOUT_EXT}.*.db
  mv "${BACKUP_FILE}" "$DB_FILE"
  exit 1
fi
```

Here and in the commands and variables below, `<source H2 version>` is your current H2 database version. `<target H2 version>` is the H2 database version you're migrating to.

2. Download the following H2 driver jar files in any location on the disk:
   a. `https://repo1.maven.org/maven2/com/h2database/h2/ H2 version>/h2-<source H2 version>.jar`
   b. `https://repo1.maven.org/maven2/com/h2database/h2/ H2 version>/h2-<target H2 version>.jar`
3. Make sure that the Mesh application isn't running.
4. Change to your `<Mesh installation directory>/bin` and use the command `MESH_HOME=<Home directory> SOURCE_H2_JAR_PATH=<Path of h2-<source H2 versio>.jar> H2_JAR_PATH=<Path of h2-<target H2 version>.jar>./h2-migrate-db-file.sh`. You can customize the behavior of the script. Learn how to configure the migration script
5. When the script is successfully executed, it will generate output that looks similar to the following:

```
Creating script file...
Script file created successfully
Running script...
Run script finished, DB file generated successfully at /var/opt/atlassian-bitbucket/home/mesh.mv.db
```

A backup of the `mesh.mv.db` file gets stored at the same path as that of the original file with the prefix, `backup_`. For example, `backup_mesh.mv.db`.

Configure the migration script

Set the following environment variables to customize the behavior of the script.

Variable	Description
`MESH_HOME`	Mesh home directory
`JAVA_HOME` or `JRE_HOME`	Set one of these variables so the script can run successfully.
`DB_FILE`	Set this variable only if you want to provide a custom location for the H2 database file. `<MESH_HOME>/mesh.mv.db` is used by default.
`H2_JAR_PATH`	This variable is used to set the path of the H2 jar file for the version you're migrating to. For example, `2.2.200`.
`SOURCE_H2_JAR_PATH`	This variable is used to set the path of the H2 jar file for your current version. For example, `1.4.200`.

Revert your migration

If the migration is unsuccessful or you want to reconsider your upgrade decision, you can revert the migration:

1. Navigate to the directory from where you executed the script `h2-migrate-db-file.sh` and remove the `h2_script.sql` file, if present.
2. Change the directory to `<MESH_HOME>`.
3. If you see the file:
   - `backup_mesh.mv.db`, rename it to `mesh.mv.db`.
   - `mesh.mv.db`, delete it.

Use Bitbucket in the enterprise

This page describes best practices for using Bitbucket Data Center in enterprise environments. If you're evaluating Bitbucket, we suggest that you begin with Install a Bitbucket Data Center trial, instead of this page.

Bitbucket is the Git code management solution for enterprise teams. It allows everyone in your organization to easily collaborate on your Git repositories, while providing enterprise-grade support for:

- user authentication
- repository security
- integration with existing databases and dev environment.

Atlassian offers two deployment options for Bitbucket.

Bitbucket Server

Bitbucket Server 8.14 is the last Bitbucket feature release available to download for Server, prior to the Server end of support date on Feb 15, 2024.

For most organizations, a single instance of Bitbucket Server provides good performance. Continue reading this page for guidance on best practices in setting up a Bitbucket Server instance in a production environment.

Bitbucket Data Center

Starting from Bitbucket 8.15.x, new releases will be available only to Data Center customers. If you have a Server license, learn about your options.

For larger enterprises that require high availability and greater performance at scale, Bitbucket Data Center resources uses a cluster of Bitbucket Server nodes to provide Active/Active failover, and is the deployment option of choice.

If you manage your own Bitbucket site (it's not hosted by Atlassian), you'll have either a **Bitbucket Server** or **Bitbucket Data Center** license.

Starting from Bitbucket 8.15.x, the comparison of Server and Data Center features will not be updated and supported any longer.

Bitbucket 8.15.x is the first **Data Center-only** release and does not support Server licenses. If you have a Server license, learn more about your options.

Bitbucket Server 8.14.x release will continue to support Server licenses until February 15, 2024.

Your Bitbucket license determines which features and infrastructure choices are available.

We want all teams to get the most out of Bitbucket, so all the core features are available for everyone - including projects, repositories, pull requests, and workflows.

Feature comparison

Here's a summary of what you get with each license.

Code and collaboration	Server license	Data Center license
Code owners Define code owners who will be added as a reviewer to a pull request to review changes in specific files and directories. Learn more about code owners	✓	✓
Pull requests Review and discuss your code with your team before merging changes. Learn more about collaboration via pull requests Draft multiple comments on files and code during a review process. Learn more about the new code review workflow	✓	✓
Branch permissions Control what users can do on a single branch, branch type, or branch pattern within a repository or project. Learn more about branch permissions	✓	✓
Flexible workflows Use centralized, forking, gitflow or forking workflows. Learn more about flexible workflows	✓	✓
Reviewer groups Reviewer groups help quickly add the right reviewers in bulk for code reviews. Learn more about reviewer groups	✗	✓ 7.13+
Default tasks Create consistent requirements when pull requests are opened with default tasks. L earn more about default tasks	✓ 8.4+	✓ 8.4+
Jira Software Server and Data Center integration Connect Jira Server and Data Center and Bitbucket to automatically link issues and track progress simultaneously across both platforms. Learn more about integrating with Jira Software	✓	✓
Jira Software Cloud integration Connect Jira Cloud and Bitbucket to automatically link issues and track progress simultaneously across both platforms. Learn more about integrating with Jira Software	✓ 7.17+	✓ 7.14+
CI/CD integrations Seamlessly integrate Bitbucket with the world's leading CI/CD vendors to streamline the path to production. Learn more about our CI/CD integrations	✓ 7.4+	✓ 7.4+
Code insights Get reports, annotations, and metrics to help you and your team improve code quality in pull requests throughout the code review process. Learn more about code insights	✓	✓

APIs and 3rd party integrations Use the Bitbucket API and 3rd party integrations to automate simple tasks, embed data into your own site, and customize your workflow. Learn more about APIs and 3rd party integrations	✓	✓
Project-level webhooks Create webhooks at the project level instead of creating webhooks for each repository. Learn more about webhooks	✓ 8.8+	✓ 8.8+
High availability and performance at scale		
Clustering Run Bitbucket on multiple nodes for high availability. Learn more about clustering	✗	✓
Smart mirroring Improve Git clone speeds for distributed teams working with large repositories. Lear n more about Smart Mirroring	✗	✓
Distributed Git storage Increase performance and high availability of repositories. Learn more about Bitbucket Mesh	✗	✓ 8.0 +
Git LFS (Large File Storage) Store large files without the need for an external object store. Learn more about Git LFS	✓	✓
Disaster recovery Keep your teams online and source code data available in the event that your primary system becomes unavailable. Learn more about disaster recovery	✗	✓ 6.8+
Search server Connect Bitbucket to a remote search server for improved scalability (required for Data Center sites). Learn more about using a remote search server	✓	✓
Content Delivery Network (CDN) support Improve geo-performance for distributed teams. Learn more about CDN	✗	✓ 6.8+
Security and compliance		
(Enforced) merge checks Stop pull requests from being merged until they meet the requirements that you’ve set. Learn more about merge checks	✓	✓
Advanced auditing Get more insight into what is happening in your Bitbucket instance. Advanced auditing gives you the ability to track and log actions in your instance developing a security-relevant chronological record that can be exported and stored in third-party monitoring tools. Learn more about advanced auditing	✗	✓ 7.0+

HTTP access tokens Create access tokens that aren't fixed to individual user accounts, for teams working on specific projects and repositories. Learn more about HTTP access tokens	✗	✓ 7.18+
OAuth 2.0 Configure Bitbucket as an OAuth 2.0 provider, allowing external applications to access Bitbucket. Learn more about incoming links	✗	✓ 7.20 +
Secret scanning Get notified of secrets added in new commits and revoke secrets to prevent exposure. Learn more about secret scanning	✗	✓ 8.3 +
Stricter control on repository settings Tighter control on repository settings to help you meet your security and compliance needs and create consistent settings across all repositories in your project. Learn more about how to restrict repository-level changes	✗	✓ 8.8 +
User management		
External user directories Store users in Active Directory, Crowd, Jira or another LDAP directory. Learn more about external user directories	✓	✓
Multiple identity providers Use more than one IdP, and disable login methods you don't want to use (such as basic authentication). Learn more about using multiple IdPs	✗	✓ 7.12+
Single sign-on Use a SAML or OpenID Connect identity provider for authentication and single sign-on. Learn more about SSO	✗	✓ 6.8+
Just-in-time provisioning Just-in-time user provisioning (JIT provisioning) allows users to be created and updated automatically when they log in through SAML SSO or OpenID Connect (OIDC) SSO to Atlassian Data Center applications such as Jira, Confluence, or Bitbucket. Learn more about just-in-time provisioning	✗	✓ 7.5+
Infrastructure and Control		
Rate limiting Control how many external REST API requests users and automations can make. Learn more about rate limiting	✗	✓ 6.6+
Advanced repository management Manage all of your repositories from global repositories page. Find repositories that are active, and identify which inactive ones are taking up space. Learn more about Advanced repository management	✗	✓ 7.13+
Repository archiving Archive unused repositories to declutter your Bitbucket instance. Learn more about archiving and unarchiving repositories	✗	✓ 8.0+

Rolling upgrades Upgrade to the latest bug fix update of the same feature release with no downtime. Learn more about rolling upgrades	✗	✓ 7.9+
Integrity tests for zero-downtime backup Find and resolve any inconsistencies between the database and home directory, for example after restoring a backup. Learn more about Integrity tests for zero-downtime backup	✗	✓
App diagnostics Get an overview of the health of your site, including potential performance issues relating to third-party apps. Learn more about app diagnostics	✓	✓
Business intelligence and monitoring		
Data pipeline Export all Bitbucket data for analysis in your preferred business intelligence platform. Learn more about the data pipeline	✗	✓ 7.13+
Deployment options		
Your own hardware Run Bitbucket on your own physical servers, virtualized servers, or in the data center of your choice.	✓	✓
Kubernetes Run Bitbucket in Kubernetes cluster on Amazon EKS, Azure Kubernetes Service, Google Kubernetes Engine or on-premises. Learn more about Kubernetes support	✗	✓
AWS Quick Start and Cloud Formation Templates Use our Cloud Formation Templates to deploy Bitbucket on AWS. Learn more about AWS Quick Start and Cloud Formation Templates	✗	✓

Platform requirements

Although Bitbucket can be run on Windows, Linux and Mac systems, for enterprise use we only recommend, and support using Linux. This recommendation is based on our own testing and experience with using Bitbucket.

See the Supported platforms page for details of the supported versions of Java, external databases, web browsers and Git.

See Installing Bitbucket Data Center for detailed information about Bitbucket Data Center requirements.

Performance considerations

In general, Bitbucket is very stable and has low memory consumption. There are no scalability limits other than for Git hosting operations (clone in particular). We know this is the scalability limit of the product; the limit is proportional to the number of cores on the system.

As an example, data collected from an internal Bitbucket instance indicate that for a team of approximately 50 developers, with associated continuous integration infrastructure, we see a peak concurrency of 30 simultaneous clone operations and a mean of 2 simultaneous clone operations. We conservatively expect that a customer with similar usage patterns would be capable of supporting 1000 users on a machine with 40 cores and a supporting amount of RAM. While we expect a peak concurrency larger than 40, Bitbucket is designed to queue incoming requests so as to avoid overwhelming the server.

Check Bitbucket Data Center production server data for data from the Bitbucket Data Center production instance we run internally at Atlassian. Also, visit Bitbucket Data Center Performance for the results of our performance testing for clusters of different sizes.

High availability

If Bitbucket is a critical part of your development workflow, maximizing Bitbucket availability becomes an important consideration.

See High availability for Bitbucket for the background information you need to set up Bitbucket in a highly available configuration.

See Failover for Bitbucket Data Center for information about how Bitbucket Data Center provides HA and almost instant failover.

Scalability

Bitbucket is built with enterprise scaling and infrastructure flexibility in mind, giving administrators control over how Bitbucket fits into their environment:

- For most organizations, a single instance of Bitbucket provides good performance. Continue reading this page for guidance on best practice in setting up a Bitbucket instance in a production environment.
- For larger enterprises that require HA and greater performance at scale, Bitbucket Data Center uses a cluster of Bitbucket nodes and is the deployment option of choice.

Your single instance of Bitbucket can be easily upgraded to Bitbucket Data Center when the time comes.

See Scaling Bitbucket Data Center for information about how you can tune your Bitbucket instance to grow with your organization's needs. See also Scaling Bitbucket Data Center for Continuous Integration performance for information specific to Bitbucket performance when CI tools poll Bitbucket for changes.

See Adding and removing Data Center nodes for information about how you can rapidly provision extra capacity without downtime.

Provisioning

Some possible approaches to provisioning Bitbucket include:

- Run the Bitbucket installer in either console or unattended mode
- Bitbucket Data Center resources - clustered Bitbucket
- Docker container image for Bitbucket Data Center and Server

Setting up a production environment

When setting up Bitbucket for a production or enterprise environment, we highly recommend that you configure the following aspects:

Run Bitbucket as a dedicated user

- For production environments Bitbucket should be run from a dedicated user account with restricted privileges. See Running Bitbucket Data Center with a dedicated user.

Install Bitbucket as a service

- See Run the Bitbucket installer.

Use an external database

- For production environments Bitbucket should use an external database, rather than the embedded database. Set up your external DBMS (for example MySQL) before starting Bitbucket for the first time. This allows you to connect Bitbucket to that DBMS using the Setup Wizard that launches when you first run Bitbucket. See Connect Bitbucket to an external database.

Connect to your existing user directory

- Connect Bitbucket to your existing user directory (for example Active Directory). See External user directories.

Secure the Bitbucket home directory

- For production environments the Bitbucket home directory should be secured against unauthorized access. See Set the home directory.

Secure Bitbucket with HTTPS

- Access to Bitbucket should be secured using HTTP over SSL, especially if your data is sensitive and Bitbucket is exposed to the internet. See Securing Bitbucket with Tomcat using SSL.

Enable SSH access to Git repositories

- Enable SSH access for your Bitbucket users to Git repositories in Bitbucket so that they can add their own SSH keys to Bitbucket, and then use those SSH keys to secure Git operations between their computer and the Bitbucket instance. See Enable SSH access to Git repositories.

Change the context path for Bitbucket

- If you are running Bitbucket behind a proxy, or you have another Atlassian application (or any Java web application), available at the same hostname and context path as Bitbucket, then you should set a unique context path for Bitbucket. See Change Bitbucket's context path.

Administering a production environment

Upgrading Bitbucket

- For production environments we recommend that you test the Bitbucket upgrade on a QA server before deploying to production. See the Bitbucket Server upgrade guide.

Backups and recovery

- **We highly recommend** that you establish a data recovery plan that is aligned with your company's policies. See Data recovery and backups for information about tools and backup strategies for Bitbucket.

Logging

- Bitbucket instance logs can be found in `<Bitbucket home directory>/log`. Logs for the bundled Tomcat webserver can be found in `<Bitbucket installation directory>/log`. See Enable debug logging.
- Bitbucket displays recent audit events for each repository and project (only visible to Bitbucket admins and system admins), and also creates full audit log files that can be found in the `<Bitbucket home directory >/audit/logs` directory. Note that Bitbucket has an upper limit to the number of log files it maintains, and deletes the oldest file when a new file is created – we recommend an automated backup of log files. See View and configure the audit log.

Upgrade Bitbucket without downtime

To upgrade Bitbucket with no downtime, you'll need to perform a rolling upgrade. A rolling upgrade allows you to upgrade Bitbucket Data Center to a later bug fix version with no downtime. This involves upgrading nodes individually within a multi-node cluster. When you take a node offline to upgrade it, other active nodes keep your Bitbucket site available to users. This allows you to avoid downtime.

On this page

Bug fix upgrades only

Bitbucket only allows rolling upgrades for bug fix upgrades (for example, from Bitbucket `7.9.0` to `7.9.4`). For platform upgrades (such as Bitbucket 7 to 8) or feature upgrades (such as `7.4` to `7.8`) , see Bitbucket Data Center upgrade guide instead.

Learn more about the different types of upgrades/versions

Bitbucket Data Center features an upgrade mode that allows Bitbucket nodes with different bug fix versions to form a cluster. Upgrade mode lets you upgrade a node to a later bug fix version and then re-connect it to your cluster, letting you take another node offline to upgrade it.

Before you begin

Before you start planning a rolling upgrade, there’s a few questions you need to answer.

Does my Bitbucket deployment support rolling upgrades?	You can only perform a rolling upgrade with no downtime on a multi-node Bitbucket cluster. Clustering is only supported on a Bitbucket Data Center license. In addition, a rolling upgrade involves enabling upgrade mode, which is only available in Bitbucket Data Center. Learn more about multi-node clustering in Bitbucket
Do I have enough nodes to support user requests during the rolling upgrade?	You need to take a node offline to upgrade it. During this time, other active nodes will take over the offline node’s workload. Make sure you have enough active nodes to handle user traffic at any given time. Whenever possible, add a node temporarily to your cluster to compensate for offline nodes.

Prepare for the rolling upgrade

1. Complete pre-upgrade checks

1. Check the Version specific upgrade notes for the version you plan to upgrade to (and any in between).
2. Go to ⚙ > **Support Tools**, then review the Log analyzer for any issues that may need to be resolved.
3. Check the compatibility of your apps with the version you plan to upgrade to.
   a. Go to ⚙ > **Manage apps** > **Bitbucket update check**.
   b. Choose the version you plan to upgrade to then hit **Check**.

      If your users rely on particular apps, you may want to wait until they are compatible before upgrading Bitbucket. App vendors generally update their apps very soon after a major release.

      Good to know:

- If you're performing a major version upgrade, user-installed apps will be disabled. You will need to enable your apps after successfully upgrading, regardless of compatibility with Bitbucket Server.
- You can disable an app temporarily if it is not yet compatible.

2. Prevent the installation or upgrade of apps during the upgrade period

If you manage Bitbucket with a team of admins, schedule the rolling upgrade with them. Notify them to postpone any app installs or upgrades until after the rolling upgrade. Installing or upgrading apps during a rolling upgrade could result in unexpected errors.

3. Back up Bitbucket

1. Determine which backup strategy to use.

   For **Bitbucket Data Center** (version 4.8 or later) instances, you can use Zero Downtime Backup, DIY Backup, or take snapshots of the shared home directory (on NFS) and database while all nodes are stopped.

   For **Bitbucket mirrors**, the home directory doesn't store any persistent state that can't be reconstructed from the primary Bitbucket instance, but you should still make sure you have a backup of at least the important configuration files such as SSL certificate, `server.xml`, `config/ssh-server-keys.pem`, `bitbucket.properties` file, and so on in a safe place. See How do I back up my mirrors? for more information.

   See the article Data recovery and backups for detailed information and guidance on creating an effective backup strategy.
2. Back up all the data in your Bitbucket home directory and external database.

If your deployment is hosted on AWS, we recommend that you use the AWS native backup facility, which utilizes snapshots to back up your site. For more information, see AWS Backup.

4. Set up a staging environment to test the rolling upgrade

We strongly recommend that you perform the rolling upgrade on a staging or test environment first.

1. Create a staging copy of your current production environment.
2. Follow the steps below to upgrade your test environment.
3. Test any unsupported apps, customizations and proxy configuration (if possible) before upgrading your production environment.

Perform the rolling upgrade

There are three methods for performing a rolling upgrade, depending on what orchestration tools your deployment uses:

Method	Description	Instructions
Manual upgrade	A manual upgrade is suitable for deployments that feature minimal orchestration, particularly in node upgrades. If your deployment is based on our Azure templates, you'll also need to perform a manual upgrade.	Upgrade a Bitbucket cluster manually without downtime
AWS CloudFormation	If your deployment is defined by an AWS CloudFormation template (like our AWS Quick Start), then you can use the same template to orchestrate your upgrade.	Upgrade a Bitbucket cluster on AWS without downtime
API-driven	You can orchestrate the entire rolling upgrade process through API calls.	Upgrade a Bitbucket cluster through the API without downtime

Upgrade a Bitbucket cluster manually without downtime

This document provides step-by-step instructions on how to perform a rolling upgrade on deployments with little or no automation. These instructions are also suitable for deployments based on our Azure templates.

For an overview of rolling upgrades (including planning and preparation information), see Upgrade Bitbucket without downtime.

On this page:

Step 1: Download upgrade files

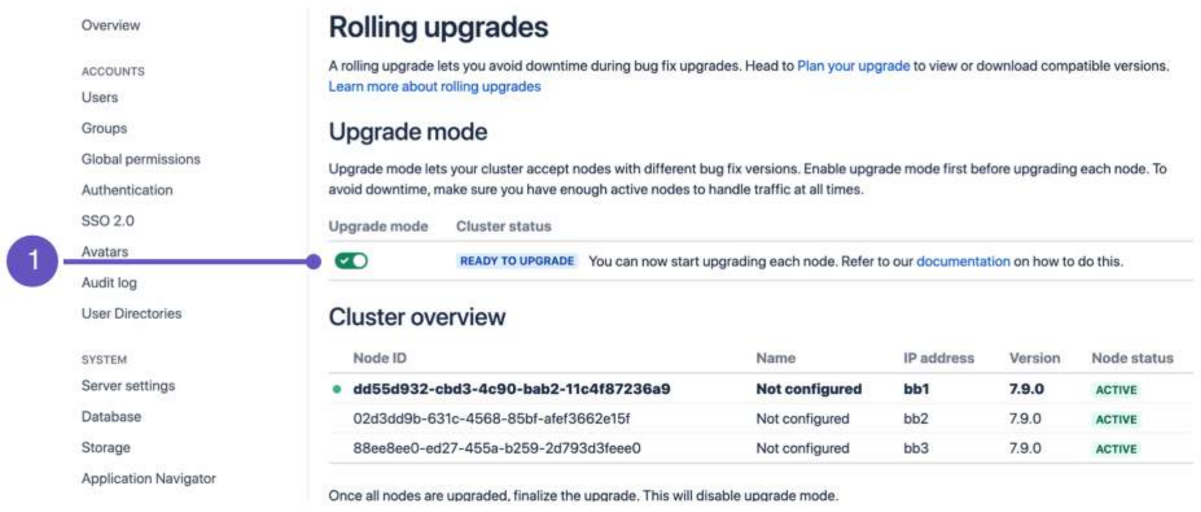
Before you start the upgrade, download the right Bitbucket version first. You'll be installing this on each node. Remember, you can only upgrade to a higher bug fix version (for example, from Bitbucket 7.9.0 to 7.9.4). Download the file directly from here:

https://www.atlassian.com/software/bitbucket/download

Alternatively, you can also use the Pre-upgrade planning tool to help you download a compatible bug fix version. Choose ⚙ > **Administration** > **Plan your upgrade** to open the tool.

Step 2: Enable upgrade mode

1. Go to ⚙ **> Administration > Rolling upgrades**.
2. Select the Upgrade mode toggle (1).



Rolling upgrades

A rolling upgrade lets you avoid downtime during bug fix upgrades. Head to Plan your upgrade to view or download compatible versions. Learn more about rolling upgrades

Upgrade mode

Upgrade mode lets your cluster accept nodes with different bug fix versions. Enable upgrade mode first before upgrading each node. To avoid downtime, make sure you have enough active nodes to handle traffic at all times.

Upgrade mode	Cluster status
✓	READY TO UPGRADE You can now start upgrading each node. Refer to our documentation on how to do this.

Cluster overview

Node ID	Name	IP address	Version	Node status
● **dd55d932-cbd3-4c90-bab2-11c4f87236a9**	**Not configured**	**bb1**	**7.9.0**	ACTIVE
02d3dd9b-631c-4568-85bf-afef3662e15f	Not configured	bb2	7.9.0	ACTIVE
88ee8ee0-ed27-455a-b259-2d793d3feee0	Not configured	bb3	7.9.0	ACTIVE

Once all nodes are upgraded, finalize the upgrade. This will disable upgrade mode.

Enabling upgrade mode allows your cluster to accept nodes running a later bug fix version. This lets you upgrade one node and let it rejoin the cluster (along with the other non-upgraded nodes). Both upgraded and non-upgraded active nodes work together in keeping Bitbucket available to all users.

You can disable Upgrade mode as long as you haven't upgraded any nodes yet.

Step 3: Upgrade the first node

For most environments, upgrading a node during a rolling upgrade consists of four phases:

Start with the least busy node

We recommend that you start upgrading the node with the least number of running tasks and active users. This will typically be the node with the lowest amount of CPU usage.

When you disconnect a node from the load balancer, user requests will no longer be routed to the node. The following table provides guidance how to do so for popular load balancers:

NGINX	NGINX defines groups of cluster nodes through the `upstream` directive . To prevent the load balancer from connecting to a node, delete the node's entry from its corresponding `upstream` group. Learn more about the `upstream` directive in the `ngx_http_upstream_module` module
HAProxy	With HAProxy, you can disable all traffic to the node by putting it in a `maint` state: `set server <node IP or hostname> state maint` Learn more about forcing a server's administrative state
Apache	You can disable a node (or "worker") by setting its `activation` member attribute to `disabled`. Learn more about advanced load balancer worker properties in Apache
Azure Application Gateway	We provide a deployment template for Bitbucket Data Center on Azure; this template uses the Azure Application Gateway as its load balancer. The Azure Application Gateway defines each node as a target within a backend pool. Use the **Edit backend pool** interface to remove your node's corresponding entry. Learn more about adding (and removing) targets from a backend pool

With upgrade mode enabled, you can now upgrade your first node. Start by shutting down Bitbucket gracefully on the node:

1. Access the node through a command line or SSH.

2. Shut down Bitbucket gracefully on the node. This will provide Bitbucket with some time to finish all of its tasks first before going offline. If you installed Bitbucket manually, run the `bin/stop-bitbucket.sh` script to gracefully shut down Bitbucket. Learn more about gracefully shutting down Bitbucket
3. Wait for the node to go offline. You can monitor its status on the Node status column of the Rolling upgrade page's Cluster overview section.

Once the node's status is offline, you can start upgrading the node. Copy the Bitbucket files you downloaded (from Step 1: Download upgrade files section) to the node's local file system:

To upgrade the first node:

1. Extract (unzip) the files to a directory (this will be your new installation directory, and must be different to your existing installation directory)
2. Update the value of BITBUCKET_HOME in the `<Installation-directory>/bin/set-bitbucket-home.sh` file so the new Bitbucket installation points to your existing Bitbucket home directory.

   If you use a BITBUCKET_HOME environment variable to specify the home directory location, no change is required

3. Copy any other immediately required customizations from the old version to the new one (for example if you are not running Bitbucket on the default ports or if you manage users externally, you'll need to update / copy the relevant files)

   If you configured Bitbucket to run as a Linux service, don't forget to update its service configuration as well. Learn more about running Bitbucket as a Linux service.

4. Start Bitbucket on the node. Learn more about starting Bitbucket

After Bitbucket starts successfully on the node, reconnect it to the load balancer. This will allow the node to rejoin the cluster. Wait for it to show up in the **Cluster overview** with an **Active** status. As soon as the first upgraded node joins the cluster, your cluster status will transition to Mixed. This means that you won't be able to disable Upgrade mode until all nodes are running the same version.

Step 4: Upgrade all other nodes individually

After starting the upgraded node, wait for it to show up on the Cluster overview with an Active status. When it does, you can start upgrading another node using the instructions from the previous step. Do this for each remaining node – as always, we recommend that you upgrade the node with the lowest level of CPU activity.

Step 5: Finalize the upgrade

Once all nodes are Active and running the same upgraded version, the Finalize upgrade button will become enabled. Click this to complete the rolling upgrade.

After completing the rolling upgrade, you should:

- Update your apps accordingly
- Perform UAT and other tests as needed

Troubleshooting

Node errors during rolling upgrade

If a node's status transitions to **Error**, it means something went wrong during the upgrade. You can't finish the rolling upgrade if any node has an **Error** status. However, you can still disable Upgrade mode as long as the cluster status is still **Ready to upgrade**.

There are several ways to address this:

- Shut down Bitbucket gracefully on the node. This should disconnect the node from the cluster, allowing the node to transition to an **Offline** status.
- If you can’t shut down Bitbucket gracefully, shut down the node altogether.

Once all active nodes are upgraded with no nodes in Error, you can finalize the rolling upgrade. You can investigate any problems with the problematic node afterwards and re-connect it to the cluster once you address the error.

Disabling upgrade mode

You can disable Upgrade mode as long as all nodes in the cluster:

- haven't been upgraded yet
- aren't in an Error state

The cluster's status will transition to Mixed if an upgraded node joins the cluster or a node enters an error state.

Mixed status with Upgrade mode disabled

If a node is in an Error state with Upgrade mode disabled, you can't enable Upgrade mode. Fix the problem or remove the node from the cluster to enable Upgrade mode.

Rolling back to the original version

To roll back upgraded nodes to their original version:

1. Access the node through a command line or SSH.
2. Shut down Bitbucket gracefully on the node.
3. Wait for the node to go offline. You can monitor its status on the Node status column of the Rolling upgrade page’s Cluster overview section.
4. Start Bitbucket on the node from your old installation directory. You should not see the setup wizard.
5. If you configured Bitbucket to run as a Linux service, don't forget to update its service configuration as well. Learn more about running Bitbucket as a Linux service.

Once all nodes are running the same version, the cluster’s status will revert back to Ready to upgrade. This will also allow you to disable Upgrade mode.

Traffic is disproportionately distributed during or after upgrade

Some load balancers might use strategies that send a disproportionate amount of active users to a newly-upgraded node. When this happens, the node might become overloaded, slowing down Bitbucket for all users logged in to the node.

To address this, you can also temporarily disconnect the node from the cluster. This will force the load balancer to re-distribute active users between all other available nodes. Afterwards, you can add the node again to the cluster.

Upgrade a Bitbucket cluster on AWS without downtime

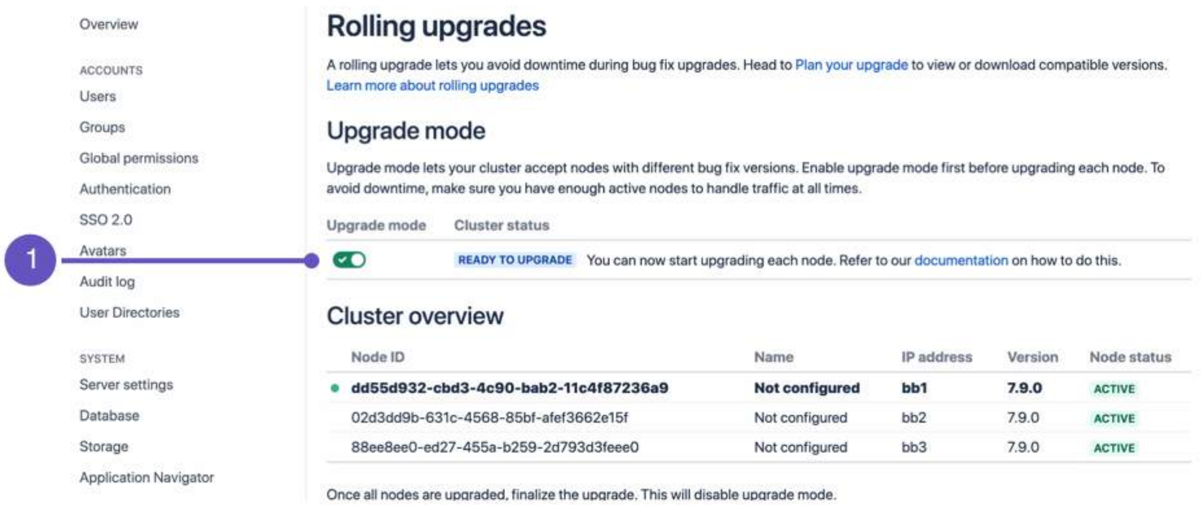
This document provides step-by-step instructions on performing a rolling upgrade on an AWS deployment orchestrated through CloudFormation. In particular, these instructions are suitable for Bitbucket Data Center deployments based on our AWS Quick Starts.

For an overview of rolling upgrades (including planning and preparation information), see Upgrade Bitbucket without downtime.

On this page:

Step 1: Enable upgrade mode

1. Go to ⚙ > **Administration > Rolling upgrades**.
2. Select the Upgrade mode toggle (1).



Rolling upgrades

A rolling upgrade lets you avoid downtime during bug fix upgrades. Head to Plan your upgrade to view or download compatible versions. Learn more about rolling upgrades

Upgrade mode

Upgrade mode lets your cluster accept nodes with different bug fix versions. Enable upgrade mode first before upgrading each node. To avoid downtime, make sure you have enough active nodes to handle traffic at all times.

Upgrade mode	Cluster status
✓	READY TO UPGRADE You can now start upgrading each node. Refer to our documentation on how to do this.

Cluster overview

Node ID	Name	IP address	Version	Node status
● **dd55d932-cbd3-4c90-bab2-11c4f87236a9**	**Not configured**	**bb1**	**7.9.0**	ACTIVE
02d3dd9b-631c-4568-85bf-afef3662e15f	Not configured	bb2	7.9.0	ACTIVE
88ee8ee0-ed27-455a-b259-2d793d3feee0	Not configured	bb3	7.9.0	ACTIVE

Once all nodes are upgraded, finalize the upgrade. This will disable upgrade mode.

Enabling upgrade mode allows your cluster to accept nodes running a later bug fix version. This lets you upgrade one node and let it rejoin the cluster (along with the other non-upgraded nodes). Both upgraded and non-upgraded active nodes work together in keeping Bitbucket available to all users.

You can disable Upgrade mode as long as you haven't upgraded any nodes yet.

Step 2: Find all the current application nodes in your stack

1. In the AWS console, go to **Services > CloudFormation**. Select your deployment's stack to view its Stack Details.
2. Expand the **Resources** drop-down. Look for the **ClusterNodeGroup** and click its Physical ID. This will take you to a page showing the Auto Scaling Group details of your application nodes.
3. In the Auto Scaling Group details, click on the **Instances** tab. Note all of the Instance IDs listed there; you'll be terminating them at a later step.

Step 3: Update your CloudFormation template

Your deployment uses a CloudFormation template that defines each component of your environment. In this case, upgrading Bitbucket means updating the version used in the template. During the upgrade, we highly recommend that you add a node temporarily to your cluster as well.

1. In the AWS console, go to **Services > CloudFormation**. Select your deployment's stack to view its Stack Details.
2. In the Stack Details screen, click **Update Stack**.
3. From the **Select Template** screen, select **Use current template** and click **Next**.
4. Set the **Version** parameter to the version you're updating to. Since this is a rolling upgrade, you can only set this to a later bug fix version (for example, from Bitbucket 7.9.0 to 7.9.4).
5. Add an extra node to your cluster. This will help ensure that your cluster won't have a shortage of nodes for user traffic. To do this, increase the value of the following parameters by 1:
   - **Maximum number of cluster nodes**
   - **Minimum number of cluster nodes**
6. Click **Next**. Click through the next pages, and then to apply the change using the **Update** button.

After updating the stack, you will have one extra node already running the new Bitbucket version. With Upgrade mode enabled, that node will be allowed to join the cluster and start work. Your other nodes won't be upgraded yet.

Mixed status

As soon as the first upgraded node joins the cluster, your cluster status will transition to Mixed. This means that you won't be able to disable Upgrade mode until all nodes are running the same version.

Once the new upgraded node is running an in an Active state, you can start upgrading another node. To do that, shut down and terminate the Bitbucket node – AWS will then replace the node with a new one running the updated Bitbucket version.

Step 4: Upgrade another node

Start with the least busy node

We recommend that you start upgrading the node with the least number of running tasks and active users. This is typically the node with the lowest CPU utilization. If you deployed Bitbucket with Amazon CloudWatch, you can view each node's CPU utilization through your CloudWatch dashboard. Learn more about listing available CloudWatch metrics

In Step 2, you noted the instance ID of each node in your cluster. Choose a node to upgrade first, and terminate it:

1. In the AWS console, go to **Services** > **EC2**. From there, click **Running Instances**.
2. Check the instance matching your chosen node.

3. From the **Actions** drop-down, select Instance **State** > **Terminate**.
4. Click through to terminate the instance.

Each time you terminate a Bitbucket node, AWS will automatically replace it. The replacement will be running the new version of Bitbucket. Once the new node's status is Active, you can move on to upgrading another node.

⚠ Only terminate the Bitbucket nodes. Do *not* terminate the NFS Server EC2 instance.

Step 5: Upgrade all other nodes individually

At this point, your cluster should have two nodes running the new version of Bitbucket. You can now upgrade other nodes. To do so, simply repeat the previous step on another node. As always, we recommend that you upgrade the node with the lowest CPU utilization each time.

Step 6: Finalize the upgrade

Once all nodes are Active and running the same upgraded version, the Finalize upgrade button will become enabled. Click this to complete the rolling upgrade.

After completing the rolling upgrade, you should:

- Update your apps accordingly
- Perform UAT and other tests as needed

Scale down cluster

In Step 3, we added a node temporarily to the cluster as a replacement for each one we terminated. This was to help ensure we'd have enough nodes to handle normal user traffic. After finalizing the upgrade, you can remove that node:

1. In the AWS console, go to **Services > CloudFormation**. Select your deployment's stack to view its Stack Details.
2. In the Stack Details screen, click **Update Stack**.
3. From the **Select Template** screen, select **Use current template** and click **Next**.
4. Decrease the value of the following parameters by 1:
   - **Maximum number of cluster nodes**
   - **Minimum number of cluster nodes**
5. Select **Next**. Click through the next pages, and then to apply the change using the **Update** button.

You can now remove one node from your cluster without AWS replacing it. Find the least busy Bitbucket node and terminate it (refer to Step 4 for detailed instructions).

Troubleshooting

Disconnect a node from the cluster through the load balancer

If an error prevents you from terminating a node, try disconnecting the node from the cluster through the load balancer. In the AWS Classic Load Balancer, each node is registered as a target – so to disconnect a node, you'll have to de-register it. See Register or deregister instances and Configure connection draining for more information.

Node errors during rolling upgrade

If a node's status transitions to **Error**, it means something went wrong during the upgrade. You can't finish the rolling upgrade if any node has an **Error** status. However, you can still disable Upgrade mode as long as the cluster status is still **Ready to upgrade**.

There are several ways to address this:

- Shut down Bitbucket gracefully on the node. This should disconnect the node from the cluster, allowing the node to transition to an **Offline** status.
- If you can’t shut down Bitbucket gracefully, shut down the node altogether.

Once all active nodes are upgraded with no nodes in Error, you can finalize the rolling upgrade. You can investigate any problems with the problematic node afterwards and re-connect it to the cluster once you address the error.

Rolling back to the original version

To roll back the upgraded nodes to the original version:

1. In the AWS console, go to **Services > CloudFormation**. Select your deployment’s stack to view its Stack Details.
2. In the Stack Details screen, click **Update Stack**.
3. From the **Select Template** screen, select **Use current template** and click **Next**.
4. Set the **Version** parameter to your original version.
5. Click **Next**. Click through the next pages, and then to apply the change using the **Update** button.

Afterwards, terminate each Bitbucket node running the new version of Bitbucket. Each time you do, AWS will replace the node with one running the original version. Wait until the AWS replacement node is Active before terminating another node.

Once all nodes are running the same version, the cluster’s status will revert back to Ready to upgrade. This will also allow you to disable Upgrade mode.

Disabling upgrade mode

You can disable Upgrade mode as long as all nodes in the cluster:

- haven't been upgraded yet
- aren't in an Error state

The cluster's status will transition to Mixed if an upgraded node joins the cluster or a node enters an error state.

Mixed status with Upgrade mode disabled

If a node is in an Error state with Upgrade mode disabled, you can't enable Upgrade mode. Fix the problem or remove the node from the cluster to enable Upgrade mode.

Upgrade a Bitbucket cluster through the API without downtime

This document provides guidance on how to initiate and finalize a rolling upgrade through API calls. This upgrade method is suitable for admins with the skills and automation tools to orchestrate maintenance tasks (like upgrades).

For an overview of rolling upgrades (including planning and preparation information), see Upgrade Bitbucket without downtime.

On this page:

API reference

The entire rolling upgrade process is governed by the following API:

```
https://<host>:<port>/rest/zdu/cluster
```

This API has the following calls:

GET /rest/zdu/cluster	Get an overview of the cluster's status.
POST /rest/zdu/start	Enable upgrade mode.
GET /rest/zdu/state	Get the status of the cluster.
GET /rest/zdu/nodes/{nodeId}	Get an overview of a node's status.
POST /rest/zdu /cancel	Disable upgrade mode. You can only use this call if the upgrade progress is not MIXED.
POST /rest/zdu /approve	Once all nodes are upgraded, finalize the rolling upgrade. This will automatically disable upgrade mode.

For detailed information about each API call, see Bitbucket REST API Documentation.

Authenticating REST API calls

In a secure environment, you'll need to authenticate your REST API calls. See Personal access tokens and Bitbucket Server REST API Example - Basic Authentication for more information.

Downloading upgrade files

Before you start the upgrade, download the right Bitbucket version first. You'll be installing this on each node. Remember, you can only upgrade to a higher bug fix version (for example, from Bitbucket 7.9.0 to 7.9.4). Download the file directly from here:

https://www.atlassian.com/software/bitbucket/download

Alternatively, you can also use the Pre-upgrade planning tool to help you download a compatible bug fix version. Choose ⚙ > **Administration** > **Plan your upgrade** to open the tool.

Initiating a rolling upgrade

To initiate a rolling upgrade, enable rolling upgrade first. To do this, use:

```
https://<host>:<port>/rest/zdu/start
```

Enabling upgrade mode allows your cluster to accept nodes running a later bug fix version. This lets you upgrade one node and let it rejoin the cluster (along with the other non-upgraded nodes). Both upgraded and non-upgraded active nodes work together in keeping Bitbucket available to all users.

You can disable upgrade mode as long as you haven't upgraded any nodes yet.

Upgrading each node individually

In general, upgrading a node during a rolling upgrade consists of four phases:

Start with the least busy node

We recommend that you start upgrading the node with the least number of running tasks and active users. This will typically be the node with the lowest amount of CPU usage.

When you disconnect a node from the load balancer, user requests will no longer be routed to the node. The following table provides guidance how to do so for popular load balancers:

NGINX	NGINX defines groups of cluster nodes through the `upstream` directive . To prevent the load balancer from connecting to a node, delete the node's entry from its corresponding `upstream` group. Learn more about the `upstream` directive in the `ngx_http_upstream_module` module
HAProxy	With HAProxy, you can disable all traffic to the node by putting it in a `maint` state: `set server <node IP or hostname> state maint` Learn more about forcing a server's administrative state
Apache	You can disable a node (or "worker") by setting its `activation` member attribute to `disabled`. Learn more about advanced load balancer worker properties in Apache
Azure Application Gateway	We provide a deployment template for Bitbucket Data Center on Azure; this template uses the Azure Application Gateway as its load balancer. The Azure Application Gateway defines each node as a target within a backend pool. Use the **Edit backend pool** interface to remove your node's corresponding entry. Learn more about adding (and removing) targets from a backend pool

With upgrade mode enabled, you can now upgrade your first node. Start by shutting down Bitbucket gracefully on the node:

1. Access the node through a command line or SSH.
2. Shut down Bitbucket gracefully on the node. This will provide Bitbucket with some time to finish all of its tasks first before going offline. If you installed Bitbucket manually, run the `bin/stop-bitbucket.sh` script to gracefully shut down Bitbucket. Learn more about gracefully shutting down Bitbucket

3. Wait for the node to go offline. You can monitor its status on the Node status column of the Rolling upgrade page's Cluster overview section.

Once the node's status is offline, you can start upgrading the node. Copy the Bitbucket files you downloaded (from Downloading upgrade files section) to the node's local file system:

To upgrade the first node:

1. Extract (unzip) the files to a directory (this will be your new installation directory, and must be different to your existing installation directory)
2. Update the value of BITBUCKET_HOME in the `<Installation-directory>/bin/set-bitbucket-home.sh` file so the new Bitbucket installation points to your existing Bitbucket home directory.

   > If you use a BITBUCKET_HOME environment variable to specify the home directory location, no change is required

3. Copy any other immediately required customizations from the old version to the new one (for example if you are not running Bitbucket on the default ports or if you manage users externally, you'll need to update / copy the relevant files)

   > If you configured Bitbucket to run as a Linux service, don't forget to update its service configuration as well. Learn more about running Bitbucket as a Linux service.

4. Start Bitbucket on the node. Learn more about starting Bitbucket

After Bitbucket starts successfully on the node, reconnect it to the load balancer. This will allow the node to rejoin the cluster. As soon as the first upgraded node joins the cluster, your cluster status will transition to Mixed. This means that you won't be able to disable Upgrade mode until all nodes are running the same version.

Finalizing the rolling upgrade

Once all nodes are upgraded, finalize the rolling upgrade. To do this, use:

```
https://<host>:<port>/rest/zdu/approve
```

This call will automatically disable upgrade mode.

After completing the rolling upgrade, you should:

- Update your apps accordingly
- Perform UAT and other tests as needed

Node statuses

To get the status of a node, use:

```
https://<host>:<port>/rest/zdu/nodes/<nodeID>
```

ACTIVE	Bitbucket is connected to the cluster and running with no errors.
STARTING	Bitbucket is still loading, and should transition to Active once finished.
TERMINATING	Bitbucket was gracefully shut down, and should transition to Offline once finished.

OFFLINE	Bitbucket is not responding on the node. This node will be removed from the cluster completely if it is still offline after Upgrade mode is disabled.
ERROR	Something went wrong with Bitbucket on the node.

Cluster statuses

To get the status of the cluster, use:

```
https://<host>:<port>/rest/zdu/state
```

STABLE	You can turn on Upgrade mode now.
READY_TO_UPGRADE	Upgrade mode is enabled, but no nodes have been upgraded yet. You can start upgrading your first node now.
MIXED	At least one node is upgraded, but you haven't finished upgrading all nodes yet. Your cluster has nodes running different Bitbucket versions. You need to upgrade all nodes to the same bug fix version to transition to the next status (**READY_TO_RUN_UPGRADE_TASKS**)
READY_TO_RUN_UPGRADE_TASKS	All nodes have node been upgraded. You can now finalize the rolling upgrade: `https://<host>:<port>/rest/zdu/zdu/approve`

Troubleshooting

Node errors during rolling upgrade

If a node's status transitions to **Error**, it means something went wrong during the upgrade. You can't finish the rolling upgrade if any node has an **Error** status. However, you can still disable Upgrade mode as long as the cluster status is still **Ready to upgrade**.

There are several ways to address this:

- Shut down Bitbucket gracefully on the node. This should disconnect the node from the cluster, allowing the node to transition to an **Offline** status.
- If you can't shut down Bitbucket gracefully, shut down the node altogether.

Once all active nodes are upgraded with no nodes in Error, you can finalize the rolling upgrade. You can investigate any problems with the problematic node afterwards and re-connect it to the cluster once you address the error.

Disabling upgrade mode

You can disable Upgrade mode as long as all nodes in the cluster:

- haven't been upgraded yet
- aren't in an Error state

The cluster's status will transition to Mixed if an upgraded node joins the cluster or a node enters an error state.

Mixed status with Upgrade mode disabled

If a node is in an Error state with Upgrade mode disabled, you can't enable Upgrade mode. Fix the problem or remove the node from the cluster to enable Upgrade mode.

Downgrade Bitbucket when upgrading with Server license to Bitbucket Data Center 8.15 and later

Starting from 8.15.x, new releases of Bitbucket will be available only to Data Center customers. If you have a Server license, learn about your options.

If you've upgraded your **Bitbucket Server** instance to Bitbucket 8.15 and later, you may come across the following error:

> *This Bitbucket version no longer supports Server licenses*

This is because Bitbucket 8.14 is the last supported Server release.

There are no home directory or database upgrades run when upgrading from Server instances to Bitbucket 8.15 and later. Server customers will be able to safely downgrade from Bitbucket Data Center 8.15+.

To use Bitbucket, you'll need to downgrade your previous Bitbucket version to 8.14 or older:

1. Stop Bitbucket by running `./stop-bitbucket.sh` from `<your new Bitbucket installation directory>/bin`.
2. Go to the installation directory of your *previous* Bitbucket version.
    a. In `/bin`, make sure that your `BITBUCKET_HOME` is set to your *existing* home directory through `set-bitbucket-home.sh`. If you use a `BITBUCKET_HOME` environment variable to specify the home directory location, no change is required.
    b. Start Bitbucket with `./start-bitbucket.sh`.
3. If your Bitbucket installation is configured to run the bundled search server, you may encounter the bundled search server failing to start after the downgrade with the following error message in the `BITBUCKET_HOME/log/search` logs:

    ```
    java.lang.IllegalStateException: cannot downgrade a node from version [1.3.12] to version [1.3.11]
    ```

    In this case, you should do the following to allow Bitbucket to repair the search data:

    a. Stop Bitbucket by running `./stop-bitbucket.sh` from `<your new Bitbucket installation directory>/bin`.
    b. Delete the `BITBUCKET_HOME/shared/search/data/.version` file.
    c. Start Bitbucket with `./start-bitbucket.sh`.

If you’d like to use Bitbucket 8.15 and later, you need to update your license to Data Center. To do this:

1. Go to **Administration** > **Licensing**.
2. Select **Edit license** and enter your Data Center license key.
3. Select **Save**.
4. Perform the upgrade to Bitbucket 8.15 and later.

Bitbucket Data Center

Starting from 8.15.x, new releases of Bitbucket will be available only to Data Center customers. Lear n what this means to you

Data Center is our self-managed edition of Bitbucket built for enterprises. It provides the deployment flexibility and administrative control you need to manage mission-critical Bitbucket sites. Learn more about the benefits of Bitbucket Data Center on our website.

Server and Data Center features comparison

Want to see what's included with a Data Center license? Head to the Bitbucket Data Center and Server feature comparison.

You can purchase a Data Center license or create an evaluation license at my.atlassian.com.

Data Center deployment options

You can deploy Bitbucket Data Center in two ways:

Non-clustered (single node)

Run Bitbucket Data Center on a single node, just like a Server installation. This option doesn't require any changes to your infrastructure, but it does allow you to take advantage of Data Center-only features. Quick and easy. L earn more

Clustered

Run Bitbucket Data Center in a cluster with multiple nodes, and a load balancer to distribute traffic. Clustering is designed for large, or mission-critical, Bitbucket instances, allowing you to provide high availability, and maintain performance as you scale. Learn more

Get started

Non-clustered

- Learn about non-clustered architecture and requirements
- Install Bitbucket Data Center from scratch
- Upgrade from Bitbucket Server to Bitbucket Data Center
- Move from non-clustered to clustered Data Center

Clustered

- Learn about clustering architecture and requirements
- Set up a Data Center cluster
- Add or remove application nodes
- Revert to a non-clustered Data Center installation
- Upgrade Bitbucket without downtime

Get a Bitbucket Data Center trial license

Starting from 8.15.x, new releases of Bitbucket will be available only to Data Center customers. If you have a Server license, learn more about your options.

A trial license gives you access to a full instance of Bitbucket Data Center for 30 days. At the end of the trial period, your Bitbucket Data Center site will become read-only and you'll have the option to buy a full license to continue using it, so you won't lose any of your projects or data.

We support single-node Bitbucket Data Center both for trial and full license instances, so you don't have to modify your current number of application nodes if you don't want to scale up to a cluster yet.

To create a Bitbucket Data Center trial license:

1. Head to my.atlassian.com and log in with your Atlassian ID.
2. From the list of Atlassian products, select **Bitbucket**, then select the **Data Center** option and fill out the form with your organization's information.
3. Select **Generate license**.

If you're ready to scale up your instance, check out how to upgrade from Bitbucket Server to Bitbucket Data Center.

If you're a new customer, the next step is to download and set up your new Bitbucket Data Center trial instance.

Upgrade from Bitbucket Server to Bitbucket Data Center

If you're a current Bitbucket Server customer looking to upgrade to Bitbucket Data Center, this page will help you create a free trial license and set up Data Center. There are several ways to get started with Bitbucket Data Center, depending on your current setup.

If you're installing Bitbucket Data Center for the first time with no existing Bitbucket Server data to migrate, check out how to install Bitbucket Data Center.

Set up Data Center

Things you should know about when setting up your Data Center:

It's your Bitbucket license that determines the type of Bitbucket you have: Server or Data Center. Bitbucket will auto-detect the license type when you enter your license key, and automatically unlock any license-specific features.

To upgrade from Bitbucket Server to Bitbucket Data Center, you will need a Data Center license. You can either purchase a full Data Center license or get a free trial license for 30 days. When your 30-day trial finishes, you'll have the option to purchase a Data Center license and carry on using Bitbucket Data Center without losing any data you've created during the trial. If you decide Bitbucket Data Center is not for you, you can easily revert to your existing Server license.

Note that as of February 15, 2024 PT, your Server products will reach the end of support.

See our Supported platforms page for information on the database, Java, and operating systems you'll be able to use.
Apps extend what your team can do with Atlassian applications, so it's important to make sure that your team can still use their apps after migrating to Data Center. When you switch to Data Center, you'll be required to switch to the Data Center compatible version of your apps, if one is available.

See Evaluate apps for Data Center migration for more information.
To use Bitbucket Data Center, you must:

- Have a Data Center license (you can purchase a Data Center license or create an evaluation license at my.atlassian.com)
- Use a supported external database, operating system and Java version
- Use OAuth authentication if you have application links to other Atlassian products (such as Confluence)

To run Bitbucket in a cluster, you'll need to meet additional requirements, like setting up a shared home directory or load balancer. You can learn more about it after going to 'Set up your cluster'.

Upgrade to Data Center

Review and upgrade your apps

If you have any apps installed on your site, you'll need to upgrade to the Data Center app version, if one is available. To avoid any impact to your apps, we recommend you do this before you enter your Bitbucket Data Center license key. Learn more about upgrading Server apps when you migrate to Data Center.

Upgrade your Bitbucket license

To upgrade from Bitbucket Server to Bitbucket Data Center:

1. Go to **Administration > Licensing**.
2. Enter your Bitbucket Data Center license key.

Data Center features such as rate limiting and SAML single sign-on will now be available.

Set up your cluster

If your organization requires continuous uptime, scalability, and performance under heavy load, you'll want to run Bitbucket Data Center in a cluster.

To find out more about clustering, including infrastructure requirements, see Clustering with Bitbucket.

If you're ready to set up your cluster now, head to Set up a Bitbucket Data Center cluster.

Looking to migrate all your Atlassian applications to Data Center? We've got you covered:

- Upgrade from Bitbucket Server to Bitbucket Data Center
- Migrate to Crowd Data Center
- Migrate to Confluence Data Center
- Migrate to Jira Data Center

Considering moving to cloud? Plan your cloud migration.

Running Bitbucket Data Center on a single node

You can run Bitbucket Data Center on a single node, just like a Server installation. This is useful if you don't need cluster-specific benefits – such as high availability and performance at scale.

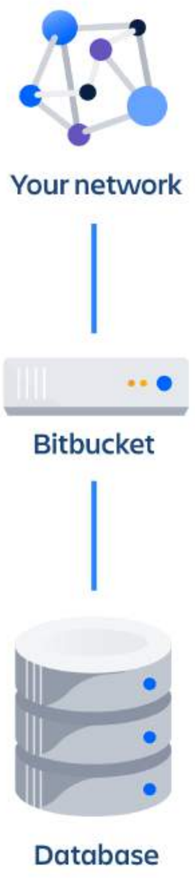
Benefits of running a non-clustered Data Center deployment

There are a range of reasons you may choose a single node Data Center. Some of the benefits include:

- **Keeping your existing infrastructure**
  Running on a single node means that you can upgrade from Server to Data Center without adding to your infrastructure. In most cases, moving to Data Center will be as simple as updating your license.
- **Accessing Data Center-only features**
  Your Data Center license unlocks a suite of additional security, compliance, and administration features to help you easily manage enterprise-grade Bitbucket instance – like SAML single sign-on, smart mirroring, rate limiting, and more. See the complete list

Architecture

The image below shows a typical configuration:



Bitbucket Data Center deployed on a single node looks just as a Server installation, and consists of:

- Bitbucket Data Center, running on a single node
- A database that Bitbucket read and writes to

Requirements

Non-clustered Data Center deployments follow the same minimum requirements as a Server installation. Check our Bitbucket Supported platforms for more details.

App compatibility

The process for installing Marketplace apps (also known as add-ons or plugins) in Bitbucket Data Center is the same as for Server. You won’t have to stop Bitbucket to install or update an app.

The Atlassian Marketplace indicates apps that are compatible Bitbucket Jira Data Center. Learn more about Data Center approved apps

Ready to get started?

Deploying Data Center on a single node will be the same as deploying a Server installation, just with a different license. Head to Bitbucket installation guide to learn about all the ways in which you can install Bitbucket.

Clustering with Bitbucket

This feature is only for customers with an active Bitbucket Data Center resources license.

On this page:

Bitbucket Data Center allows you to run a cluster of multiple Bitbucket nodes, providing high availability, scalable capacity, and performance and scale. We'll tell you about the benefits, and give you an overview of what you'll need to run Bitbucket in a clustered environment.

Ready to get started? See Set up a Bitbucket Data Center cluster.

Benefits of clustering

Clustering is designed for enterprises with large or mission-critical Data Center deployments that require continuous uptime, instant scalability, and performance under high load.

Here are some of the benefits:

- **High availability and failover**

  If one node in your cluster goes down, the others take on the load, ensuring your users have uninterrupted access to Bitbucket.

- **Performance at scale**

  Each node added to your cluster increases concurrent user capacity, and improves response time as user activity grows.

- **Instant scalability**

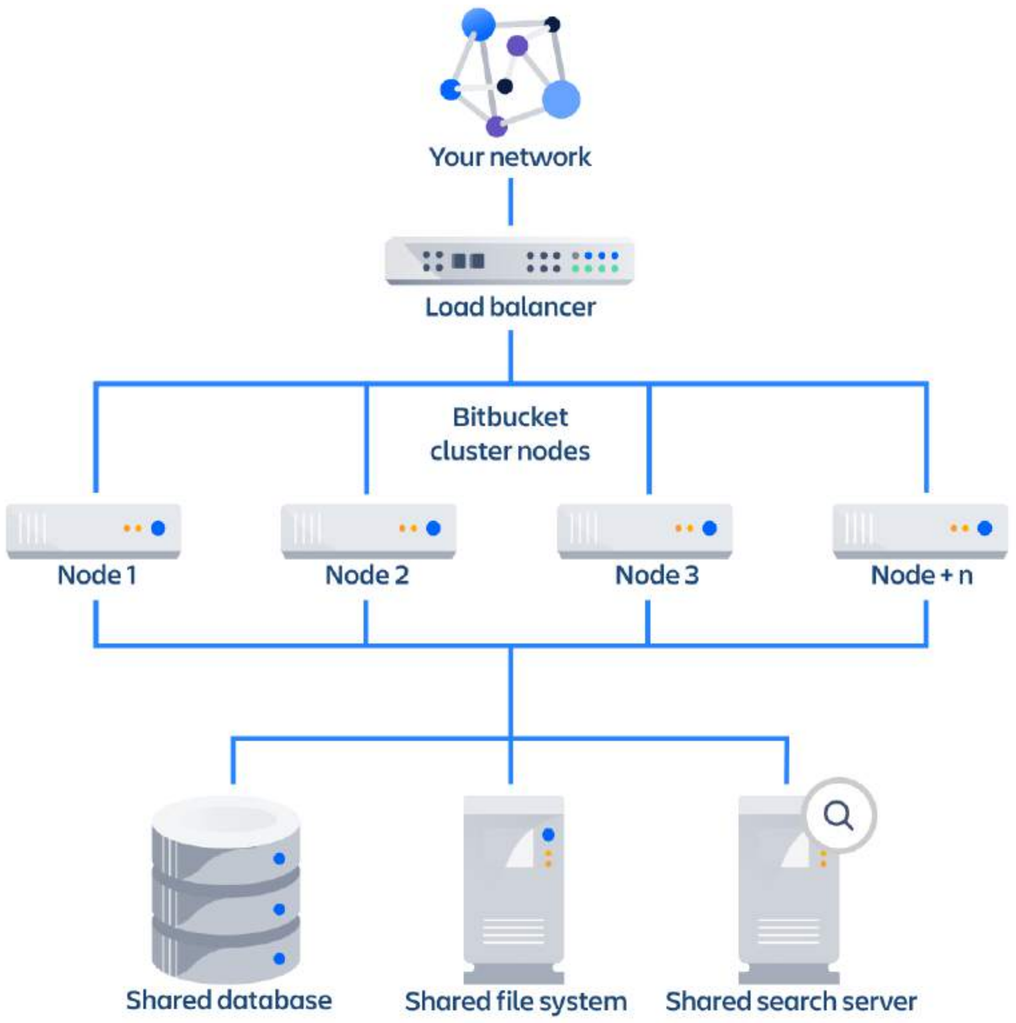
  Add new nodes to your cluster without downtime or additional licensing fees. Data and apps are automatically synced.

- **Upgrade with no downtime**

Perform a rolling upgrade to the latest bug fix update of your feature release, without any downtime. Apply critical bug fixes and security updates to your site while providing users with uninterrupted access to Bitbucket.

Architecture

The image below shows a typical configuration:



A Bitbucket Data Center cluster consists of:

- Multiple identical application nodes running Bitbucket Data Center.
- A load balancer to distribute traffic to all of your application nodes.
- A shared file system that stores repositories, attachments, and other shared files.
- A database that all nodes read and write to.
- A shared search server that enables searching for projects, repositories, and code

All application nodes are active and process requests. A user will access the same Bitbucket node for all requests until their session times out, they log out, or a node is removed from the cluster.

Learn more
Your Data Center license is based on the number of users in your cluster, rather than the number of nodes. This means you can scale your environment without additional licensing fees for new servers or CPU.

You can monitor the available license seats in the Licensing page in the admin console.

If you wanted to automate this process (for example to send alerts when you are nearing full allocation) you can use the REST API.

Your Bitbucket license determines which features and infrastructure choices are available. Head to Bitbucket Server and Data Center feature comparison for a full run down of the differences between a Server license and a Data Center license.
To run Bitbucket in a cluster, you'll need an additional home directory, known as the shared home.

Each Bitbucket node has a local home that contains logs, caches, and temporary files. Everything else is stored in the shared home, which is accessible to each Bitbucket node in the cluster.

Here's a summary of what is found in the local home and shared home:

Local home	Shared home

• logs
• caches
• temporary files
	• configuration files
	• data directory with:
	  ◦ repositories
	  ◦ attachments
	  ◦ avatars
	• plugins

When clustered, Bitbucket uses a distributed cache that is managed using Hazelcast. Caches are kept in sync through remote invalidation instead of being replicated or partitioned across all the Bitbucket nodes in a cluster.

Because of this caching solution, to minimize latency, your nodes should be located in the same physical location, or region (for AWS and Azure).
When configuring your cluster nodes you can either supply the IP address of each cluster node, or a multicast address.

If you're using multicast:

Bitbucket will broadcast a join request on the multicast network address. Bitbucket must be able to open a UDP port on this multicast address, or it won't be able to find the other cluster nodes. Once the nodes are discovered, each responds with a unicast (normal) IP address and port where it can be contacted for cache updates. Bitbucket must be able to open a UDP port for regular communication with the other nodes.

A multicast address can be auto-generated from the cluster name, or you can enter your own, during the set-up of the first node.
A search server provides search functionality for Bitbucket. It provides a fast, full-text search engine that enables searching for projects, repositories, and code within Bitbucket.

Infrastructure and requirements

The choice of hardware and infrastructure is up to you. Below are some areas to think about when planning your hardware and infrastructure requirements.

Deploying Bitbucket Data Center on AWS and Azure

If you plan to run Bitbucket Data Center on AWS or Azure, you can use our templates to deploy the whole infrastructure. You'll get your Bitbucket Data Center nodes, a search server, database and storage all configured and ready to use in minutes. For more info, see the following resources:

- Deploy Bitbucket Data Center in AWS
- Deploy Bitbucket Data Center in Azure

Server requirements

You should not run additional applications (other than core operating system services) on the same servers as Bitbucket. Running Bitbucket, Jira, and Confluence on a dedicated Atlassian software server works well for small installations but is discouraged when running at scale.

Bitbucket Data Center can be run successfully on virtual machines.

Cluster nodes requirements

Each node does not need to be identical, but for consistent performance we recommend they are as close as possible. All cluster nodes must:

- be a dedicated machine, physical or virtual
- be located in the same data center, or region (for AWS and Azure)
- be connected in a high speed LAN (that is, high bandwidth and low latency)
- have the same OS, Java and application server version. See Supported platforms
- have the same memory configuration (both the JVM and the physical memory) (recommended)
- be configured with the same time zone (and keep the current time synchronized). Using ntpd or a similar service is a good way to ensure this
- Although a password is used to authenticate the nodes, we recommend that you use a firewall and/or network segregation to make sure that only specific nodes are allowed to connect to a Bitbucket cluster node's Hazelcast port, which by default is port 5701

You must ensure the clocks on your nodes don't diverge, as it can result in a range of problems with your cluster.

How many nodes?

Your Data Center license does not restrict the number of nodes in your cluster. The right number of nodes depends on the size and shape of your Bitbucket instance, and the size of your nodes.

See our Bitbucket Data Center load profiles guide for help sizing your instance. In general, we recommend starting small and growing as you need.

Database

You should ensure your intended database is listed in the current Supported platforms, with one exception: we do ***not*** support MySQL due to inherent deadlocks that can occur in this database engine at high load. The load on an average cluster solution is higher than on a standalone installation, so it is crucial to use a supported database.

Additional requirements for database high availability

Running Bitbucket Data Center in a cluster removes the application server as a single point of failure. You can also do this for the database through the following supported configurations:

- Amazon RDS Multi-AZ: this database setup features a primary database that replicates to a standby in a different availability zone. If the primary goes down, the standby takes its place.
- Amazon PostgreSQL-Compatible Aurora: this is a cluster featuring a database node replicating to one or more readers (preferably in a different availability zone). If the writer goes down, Aurora will promote one of the writers to take its place.

The **AWS Quick Start deployment option** allows you to deploy Bitbucket Data Center with either one, from scratch. If you want to set up an Amazon Aurora cluster with an existing Bitbucket Data Center instance, refer to Configuring Bitbucket Data Center to work with Amazon Aurora.

Shared home and storage requirements

Bitbucket Data Center requires a high performance shared file system such as a SAN, NAS, RAID server, or high-performance file server optimized for I/O.

- The shared file system must run on a dedicated machine.
- The file system must be available to all cluster nodes via a high-speed LAN (it must be in the same physical data center).
- The shared file system should be accessible via NFS as a single mount point.
- Due to known performance issues, we only support NFSv3 at this time.

Load balancer

You can use the load balancer of your choice. Bitbucket Data Center does ***not*** bundle a load balancer.

- Your load balancer should run on a dedicated machine.
- Your load balancer must have a high-speed LAN connection to the Bitbucket cluster nodes (that is, high bandwidth and low latency).
- Your load balancer must support ***both*** HTTP mode (for web traffic) ***and*** TCP mode (for SSH traffic).
- Terminating SSL (HTTPS) at your load balancer and running plain HTTP from the load balancer to Bitbucket is highly recommended for performance.
- Your load balancer should support "session affinity" (also known as "sticky sessions").
- If you don't have a preference for your load balancer, we provide instructions for haproxy, a popular Open Source software load balancer.

Many load balancers require a URL to constantly check the health of their backends in order to automatically remove them from the pool. It's important to use a stable and fast URL for this, but lightweight enough to not consume unnecessary resources. The following URL returns Bitbucket's status and can be used for this purpose.

URL	Expected content	Expected HTTP status
`http://<bitbucketurl>/status`	{"state":"RUNNING"}	200 OK

HTTP status code	Response entity	Description
200	{"state":"RUNNING"}	Running normally
500	{"state":"ERROR"}	An error state
503	{"state":"STARTING"}	Application is starting
503	{"state":"STOPPING"}	Application is stopping
200	{"state":"FIRST_RUN"}	Application is running for the first time and has not yet been configured
404		Application failed to start up in an unexpected way (the web application failed to deploy)

Here are some recommendations, when setting up monitoring, that can help a node survive small problems, such as a long GC pause:

- Wait for two consecutive failures before removing a node.
- Allow existing connections to the node to finish, for say 30 seconds, before the node is removed from the pool.

For more info, see Load balancer configuration options or Install Bitbucket Data Center (section about configuring the load balancer).

Network adapters

Use separate network adapters for communication between servers. Cluster nodes should have a separate physical network (i.e. separate NICs) for inter-server communication. This is the best way to get the cluster to run fast and reliably. Performance problems are likely to occur if you connect cluster nodes via a network that has lots of other data streaming through it.

Search server node

Bitbucket Data Center requires a connection to a remote search server to enable code search. Although code search is not critical for high availability, it is possible run a cluster of search server nodes to achieve high availability for the Bitbucket's code search index. The easiest way to set up and deploy a search server cluster for Bitbucket Data Center is to use the Amazon's OpenSearch Service, but you can also set up a remote search server instance on your own hardware.

Requirements:

- For details on supported search server versions, see the Supported platforms page.
- Bitbucket Data Center can have *only one* remote connection to a remote search server for your cluster.
- This may be a standalone search server or a clustered installation behind a load balancer.

For more info, see Administer code search, Install and configure a remote Elasticsearch server and Install and configure a remote OpenSearch server.

App compatibility

The process for installing Marketplace apps (also known as add-ons) in a Bitbucket cluster is the same as for a standalone installation. You will not need to stop the cluster, or bring down any nodes to install or update an app.

The Atlassian Marketplace indicates apps that are compatible with Bitbucket Data Center. Learn more about Data Center approved apps

Ready to get started?

Head to Set up a Bitbucket Data Center cluster for a step-by-step guide to enabling and configuring your cluster.

Set up a Bitbucket Data Center cluster

Bitbucket Data Center allows you to run a cluster of multiple Bitbucket nodes, providing high availability, scalable capacity, and performance at scale. This guides walks you through the process of configuring a Data Center cluster on your own infrastructure.

Not sure if clustering is right for you? Check out Running Bitbucket Data Center in a cluster for a detailed overview.

Before you begin

Things you should know about when setting up your Data Center:

See our Supported platforms page for information on the database, Java, and operating systems you'll be able to use. These requirements are the same for Server and Data Center deployments.
You can see a component diagram of a typical Bitbucket Data Center instance, and read about detailed requirements of each component on the page Bitbucket Data Center requirements and on the Supported platforms page.

A Bitbucket Data Center instance consists of a cluster of components, each running on a dedicated machine:

- A **cluster of Bitbucket application nodes** all running the same version of Bitbucket Data Center web application. These can be virtual or physical machines, have synchronized clocks (for example, using NTP) and be configured with the identical timezone, are allowed to connect to a Bitbucket cluster node's Hazelcast port, which by default is port 5701.
- A **load balancer** that supports *both* HTTP mode (for web traffic) *and* TCP mode (for SSH traffic), and support session affinity ("sticky sessions").
- A **supported external database**, shared and available to all all cluster nodes.
- A **shared file system** that is physically located in the same data center, available to all clusters nodes, and accessible by NFS as a single mount point.
- A **remote Elasticsearch instance** with only one remote connection to Bitbucket. The instance may be a standalone Elasticsearch installation or a clustered installation behind a load balancer. For help installing and configuring a remote Elasticsearch instance see our how to guide.

Apps extend what your team can do with Atlassian applications, so it's important to make sure that your team can still use their apps after migrating to Data Center. When you switch to Data Center, you'll be required to switch to the Data Center compatible version of your apps, if one is available.

See Evaluate apps for Data Center migration for more information.
In this guide we'll use the following terminology:

- **Installation directory**: The directory where you installed Bitbucket.
- **Local home directory**: The home or data directory stored locally on each cluster node (if Bitbucket is not running in a cluster, this is simply known as the home directory).
- **Shared home directory**: The directory you created that is accessible to all nodes in the cluster via the same path.

Set up and configure your cluster

We recommend completing this process in a staging environment, and testing your clustered installation, before moving to production.

Install Bitbucket Data Center on the first application node

First, you'll need to install Bitbucket Data Center one node:

1. Download the latest installer - www.atlassian.com/software/bitbucket/download.
2. Make the installer executable.

   Change to the directory where you downloaded the installer, then execute this command:

chmod +x atlassian-bitbucket-x.x.x-x64.bin

Where `x.x.x` is the version you downloaded.

3. Run the installer – we recommend using `sudo` to run the installer as this will create a dedicated account to run Bitbucket and allow you to run Bitbucket as a service.

   To use `sudo` to run the installer execute this command:

   ```
   $ sudo ./atlassian-bitbucket-x.x.x-x64.bin
   ```

   You can also run the installer with root user privileges.Where `x.x.x` is the version you downloaded.
4. Follow the prompts to install Bitbucket. You'll be asked for the following info:
   a. **Type of Bitbucket instance -** the type of installation, for these instructions select **Data Center**.
   b. **Installation directory -** where Bitbucket will be installed.
   c. **Home directory** - where Bitbucket application data will be stored.
   d. **TCP ports -** the HTTP connector port and control port Bitbucket will run on.

Provision the shared database, filesystem, and search server

Once you've installed the first Bitbucket application node, you now need to provision the share database, shared filesystem and shared search server to use with Bitbucket Data Center.

Step 1. Provision your shared database

Set up your shared database server.

- Connect Bitbucket to PostgreSQL
- Connect Bitbucket to SQL Server
- Connect Bitbucket to Oracle

Ensure your database is configured to allow enough concurrent connections. Bitbucket Server by default uses up to 80 connections ***per cluster node***, which can exceed the default connection limit of some databases. For example, in PostgreSQL the default limit is usually 100 connections. If you use PostgreSQL, you may need to edit your `postgresql.conf` file, to increase the value of `max_connections`, and restart Postgres.

See Connect Bitbucket to an external database for more information, and note that clustered databases are not supported.

We do ***not*** support MySQL for Bitbucket Data Center at this time due to inherent deadlocks that can occur in this database engine at high load. If you currently use MySQL, you should migrate your data to another supported database (such as PostgreSQL) before upgrading your Bitbucket Server instance to Bitbucket Data Center. You can migrate databases (on a standalone Bitbucket Server instance) using the Migrate database feature in Bitbucket Server's Administration pages.

Step 2. Provision your shared file system

A properly resourced and configured NFS server can perform well even under very heavy load. We've created some recommendations for setting up and configuring your file server for optimal performance.

Bitbucket Data Center requires a high performance shared file system, such as a storage area network (SAN), network-attached storage (NAS), RAID server, or high-performance file server optimized for input /output.

If you aren't using Bitbucket Mesh or haven't migrated all Git repositories to it, the file system must:

- run on a dedicated machine; avoid hosting other services on your NFS server
- be in the same physical data center
- be available to all Bitbucket nodes via a high-speed LAN (such as 10GB ethernet or Fibre Channel)
- be accessible via NFS as a single mount point

- have the NFS lock service enabled

For reference, our AWS Quick Start for Bitbucket Data Center deploys NFS and the Bitbucket cluster nodes on the same VPC, availability zone, and subnet.

If you're using Bitbucket Mesh and have migrated all Git repositories to it, you can use the following file system options for the shared home directory:

- NFSv4
- Amazon Elastic File System (EFS)
- Amazon FSx for NetApp ONTAP NFS
- Amazon FSx for OpenZFS
- Amazon FSx for Lustre

You need to create a user account named bitbucket on the shared file system server. This user account should have read/write permissions to the shared subdirectory of the Bitbucket Server home directory.

To ensure this:

- set bitbucket to own all files and folders in the shared subdirectory
- create bitbucket with the user umask 0027
- assign the same UID to bitbucket on all NFS Server and Bitbucket cluster nodes

Where possible, enable the SCM Cache plugin (already bundled in Bitbucket Data Center) with as much disk or SSD space on your cluster nodes as you can.

An effective SCM Cache can greatly reduce load on your shared file server. Note that the drive or partition used by the SCM Cache is local to each cluster node, not NFS mounted.

See Scaling Bitbucket Server for Continuous Integration performance for more information.
On your file server, ensure that NFS is configured with enough server processes. For example, some versions of Red Hat Enterprise Linux and CentOS have a default of 8 server processes. If you use either distribution, you may need to edit your /etc/sysconfig/nfs file, increase the value of RPCNFSDCOUNT, and restart the nfs service.

For the file server and cluster nodes, avoid kernel and NFS version combinations that are unstable or have known NFS bugs. We recommend avoiding Linux kernel versions 3.2 to 3.8.
When you provision your application cluster nodes later, we recommend using the following NFS mount options:

```
rw,nfsvers=3,lookupcache=pos,noatime,intr,rsize=32768,wsize=32768,_netdev
```

Step 3. Migrating from an existing Bitbucket Server instance (optional)

The `shared` subdirectory of the Bitbucket Server home directory contains all the GIT repositories, configuration data, and other important files. When migrating from an existing Bitbucket Server instance, back up shared and restore it on the new Bitbucket Data Center's NFS file system.

The remaining subdirectories (`bin`, `caches`, `export`, `lib`, `log`, `plugins`, and `tmp`) contain only caches and temporary files. You don't need to restore them.

Step 4. Provision your search server

To set up your search server, you will

1. Install the search server on a remote machine.
2. Configure the search server to work with Bitbucket Data Center.
3. Secure the search server with a username and password that Bitbucket will use to access the search server, with a minimum of HTTP restricted access.
4. Connect the search server to Bitbucket.

There are detailed instructions on the pages Install and configure a remote Elasticsearch server and Install and configure a remote OpenSearch server to help you provision your remote search server.

Provision application cluster nodes

Provision cluster node infrastructure. You can automate this using a configuration management tool such as Chef, Puppet, or Vagrant, and/or by spinning up identical virtual machine snapshots.

Step 1. Configure file share mounts

NFSv3 is supported. If you're using Bitbucket Mesh and have migrated all Git repositories to it, you can use NFSv4 for the shared home directory.

On each cluster node, mount the shared home directory as `${BITBUCKET_HOME}/shared`. Note that ***only*** the `${BITBUCKET_HOME}/shared` directory should be shared between cluster nodes. All other directories, including `${BITBUCKET_HOME}`, should be node-local (that is, private to each node).

Example

For example, suppose your Bitbucket home directory is `/var/atlassian/application-data/bitbucket` , and your shared home directory is available as an NFS export called `bitbucket-san:/bitbucket-shared`. To configure the mount on each cluster node:

1. Add the following line to `/etc/fstab` on each cluster node.
   /etc/fstab

```
bitbucket-san:/bitbucket-shared /var/atlassian/application-data/bitbucket/shared nfs
rw,nfsvers=3,lookupcache=pos,noatime,intr,rsize=32768,wsize=32768,_netdev 0 0
```

2. Mount the share on each node:

```
mkdir -p /var/atlassian/application-data/bitbucket/shared
sudo mount -a
```

Step 2. Synchronize system clocks

Ensure all your cluster nodes have synchronized clocks and identical timezone configuration. Here are some examples for how to do this:

```
sudo yum install ntp
sudo service ntpd start
sudo tzselect
```

```
sudo apt-get install ntp
sudo service ntp start
sudo dpkg-reconfigure tzdata
```

Step 3. Install Bitbucket Data Center on each node

On each cluster node, perform the same steps from Install Bitbucket Data Center on the first application node section.

Step 4. Start the first cluster node

Edit the file `${BITBUCKET_HOME}/shared/bitbucket.properties` and add the following lines:

```
# Use multicast to discover cluster nodes (recommended).
hazelcast.network.multicast=true

# If your network does not support multicast, you may uncomment the following lines and substitute
# the IP addresses of some or all of your cluster nodes. (Not all of the cluster nodes have to be
# listed here but at least one of them has to be active when a new node joins.)
#hazelcast.network.tcpip=true
#hazelcast.network.tcpip.members=192.168.0.1:5701,192.168.0.2:5701,192.168.0.3:5701

# The following should uniquely identify your cluster on the LAN.
hazelcast.group.name=your-bitbucket-cluster
hazelcast.group.password=your-bitbucket-cluster
```

If you are installing Bitbucket Server in an IPv6 environment, Hazelcast needs an additional system property to work.

This property is only needed if the nodes are configured to use IPv6 to talk to each other.

Edit the file ${BITBUCKET_INSTALL}/bin/_start-webapp.sh and edit the JVM_SUPPORT_RECOMMENDED_ARG line to look like this:

```
JVM_SUPPORT_RECOMMENDED_ARGS="-Dhazelcast.prefer.ipv4.stack=false"
```

The line is commented out, so be sure to remove the leading # to make the line take effect.

Using multicast to discover cluster nodes (`hazelcast.network.multicast=true`) is recommended, but requires all your cluster nodes to be accessible to each other via a multicast-enabled network. If your network does not support multicast then you can set `hazelcast.network.multicast=false`, `hazelcast.network.tcpip=true`, and `hazelcast.network.tcpip.members` to a comma-separated list of cluster nodes instead. Only enable ***one*** of `hazelcast.network.tcpip` or `hazelcast.network.multicast`, not both.

Choose a name for `hazelcast.group.name` and `hazelcast.group.password` that uniquely identifies the cluster on your LAN. If you have more than one cluster on the same LAN (for example, other Bitbucket Data Center instances or other products based on similar technology such as Confluence Data Center) then you ***must*** assign each cluster a distinct name, to prevent them from attempting to join together into a "super cluster".

Then start Bitbucket Server. See Starting and stopping Bitbucket Server.

Then go to `http://<bitbucket>:7990/admin/license`, and install your Bitbucket Data Center license. Restart Bitbucket Server for the change to take effect. If you need a Bitbucket Data Center license, you can purchase one that fits your needs, or, get an evaluation license.

Install and configure your load balancer

Step 1. Configure protocols and health checks on your load balancer

Your load balancer must proxy three protocols:

Protocol	Typical port on the load balancer	Typical port on the Bitbucket cluster nodes	Notes
HTTP	80	7990	HTTP mode. Session affinity ("sticky sessions") should be enabled using the 52-character `BITBUCKETSESSIONID` cookie.

955

HTTPS	443	7990	HTTP mode. Terminating SSL at the load balancer and running plain HTTP to the Bitbucket cluster nodes is highly recommended.
SSH	7999	7999	TCP mode.

Your load balancer must support session affinity ("sticky sessions") using the `BITBUCKETSESSIONID` cookie. Bitbucket Data Center assumes that your load balancer always directs each user's requests to the same cluster node. If it does not, users may be unexpectedly logged out or lose other information that may be stored in their HTTP session.

When choosing a load balancer, it must support the HTTP, HTTPS, and TCP protocols. Note that:

- Apache does ***not*** support TCP mode load balancing.
- HAProxy versions older than 1.5.0 do ***not*** support HTTPS.

If your load balancer supports health checks of the cluster nodes, configure it to perform a periodic HTTP GET of `http:// <bitbucket>:7990/status`, where `<bitbucket>` is the cluster node's name or IP address. This returns one of two HTTP status codes:

- 200 OK
- 500 Internal Server Error

If a cluster node does not return 200 OK within a reasonable amount of time, the load balancer should not direct any traffic to it.

You should then be able to navigate to `http://<load-balancer>/`, where `<load-balancer>` is your load balancer's name or IP address. This should take you to your Bitbucket Server front page.

Example: HAProxy load balancer

If you don't have a particular preference or policy for load balancers, you can use HAProxy which is a popular Open Source software load balancer.

If you choose HAProxy, you ***must*** use a minimum version of 1.5.0. Earlier versions of HAProxy do not support HTTPS.

To check which version of HAProxy you use, run the following command:

haproxy --version

Here is an example `haproxy.cfg` configuration file (typically found in the location `/etc/haproxy/haproxy.cfg`). This assumes:

- Your Bitbucket cluster node is at address 192.168.0.1, listening on the default ports 7990 (HTTP) and 7999 (SSH).
- You have a valid SSL certificate at `/etc/cert.pem`.

haproxy.cfg

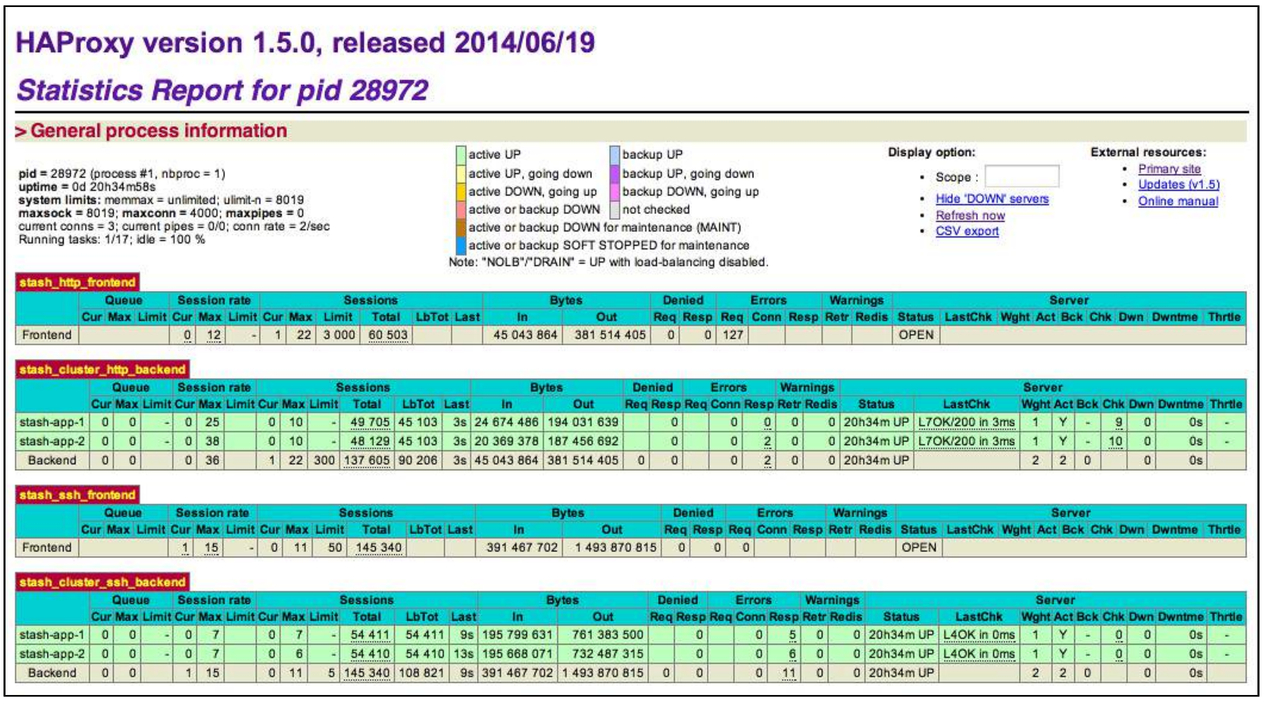
```
global
    pidfile     /var/run/haproxy.pid
    maxconn     4000
    user        haproxy
    group       haproxy
    daemon
    tune.ssl.default-dh-param 1024
defaults
    log                     global
    option                  dontlognull
    option                  redispatch
    retries                 3
    timeout http-request    10s
    timeout queue           1m
    timeout connect         10s
    timeout client          1m
    timeout server          1m
    timeout http-keep-alive 10s
    timeout check           10s
    maxconn                 3000
    errorfile               408 /dev/null        # Workaround for Chrome 35-36 bug.  See http://blog.
haproxy.com/2014/05/26/haproxy-and-http-errors-408-in-chrome/

frontend bitbucket_http_frontend
    bind *:80
    bind *:443 ssl crt /etc/cert.pem ciphers RC4-SHA:AES128-SHA:AES256-SHA
    default_backend bitbucket_http_backend

backend bitbucket_http_backend
    mode http
    option httplog
    option httpchk GET /status
    option forwardfor
    option http-server-close
        #Uncomment the following line for HAProxy 1.5.
    #appsession BITBUCKETSESSIONID len 52 timeout 1h
    balance roundrobin
    cookie BITBUCKETSESSIONID prefix
        # The following 3 lines are for HAProxy 1.6+. If you're on 1.5, uncomment them.
    stick-table type string len 52 size 5M expire 30m
    stick store-response set-cookie(BITBUCKETSESSIONID)
    stick on cookie(BITBUCKETSESSIONID)
    server bitbucket01 192.168.0.1:7990 check inter 10000 rise 2 fall 5
    #server bitbucket02 192.168.0.2:7990 check inter 10000 rise 2 fall 5
    # The following "backup" servers are just here to show the startup page when all nodes are
starting up
    server backup01 192.168.0.1:7990 backup
    #server backup02 192.168.0.2:7990 backup

frontend bitbucket_ssh_frontend
    bind *:7999
    default_backend bitbucket_ssh_backend
    timeout client 15m
    maxconn 50

backend bitbucket_ssh_backend
    mode tcp
    balance roundrobin
    server bitbucket01 192.168.0.1:7999 check port 7999
    #server bitbucket02 192.168.0.2:7999 check port 7999
    timeout server 15m

listen admin
    mode http
    bind *:8090
    stats enable
    stats uri /
```

Review the contents of the `haproxy.cfg` file carefully, and customize it for your environment. See http://www.haproxy.org/ for more information about installing and configuring `haproxy`.

Once you have configured the `haproxy.cfg` file, start the `haproxy` service.

```
sudo service haproxy start
```

You can also monitor the health of your cluster by navigating to HAProxy's statistics page at `http://<load-balancer>:8090/`. You should see a page similar to this:



HAProxy version 1.5.0, released 2014/06/19

Statistics Report for pid 28972

> General process information

pid = 28972 (process #1, nbproc = 1)
uptime = 0d 20h34m58s
system limits: memmax = unlimited; ulimit-n = 8019
maxsock = 8019; **maxconn** = 4000; **maxpipes** = 0
current conns = 3; current pipes = 0/0; conn rate = 2/sec
Running tasks: 1/17; idle = 100 %

🟩 active UP	🟦 backup UP
🟨 active UP, going down	🟪 backup UP, going down
🟧 active DOWN, going up	🟪 backup DOWN, going up
🟥 active or backup DOWN	⬜ not checked
🟫 active or backup DOWN for maintenance (MAINT)	
🟦 active or backup SOFT STOPPED for maintenance	

Note: "NOLB"/"DRAIN" = UP with load-balancing disabled.

Display option:

- Scope :
- Hide 'DOWN' servers
- Refresh now
- CSV export

External resources:

- Primary site
- Updates (v1.5)
- Online manual

stash_http_frontend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
Frontend				0	12	-	1	22	3 000	60 503			45 043 864	381 514 405	0	0	127					OPEN								

stash_cluster_http_backend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
stash-app-1	0	0	-	0	25		0	10	-	49 705	45 103	3s	24 674 486	194 031 639		0		0	0	0	0	20h34m UP	L7OK/200 in 3ms	1	Y	-	9	0	0s	-
stash-app-2	0	0	-	0	38		0	10	-	48 129	45 103	3s	20 369 378	187 456 692		0		0	2	0	0	20h34m UP	L7OK/200 in 3ms	1	Y	-	10	0	0s	-
Backend	0	0		0	36		1	22	300	137 605	90 206	3s	45 043 864	381 514 405	0	0		0	2	0	0	20h34m UP		2	2	0		0	0s	

stash_ssh_frontend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
Frontend				1	15	-	0	11	50	145 340			391 467 702	1 493 870 815	0	0	0					OPEN								

stash_cluster_ssh_backend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
stash-app-1	0	0	-	0	7		0	7	-	54 411	54 411	9s	195 799 631	761 383 500		0		0	5	0	0	20h34m UP	L4OK in 0ms	1	Y	-	0	0	0s	-
stash-app-2	0	0	-	0	7		0	6	-	54 410	54 410	13s	195 668 071	732 487 315		0		0	6	0	0	20h34m UP	L4OK in 0ms	1	Y	-	0	0	0s	-
Backend	0	0		1	15		0	11	5	145 340	108 821	9s	391 467 702	1 493 870 815	0	0		0	11	0	0	20h34m UP		2	2	0		0	0s	

Step 2. Configure Bitbucket for your load balancer

If you're using HAProxy, Bitbucket needs to be configured to work with it. For example:

<Bitbucket home directory>/shared/bitbucket.properties

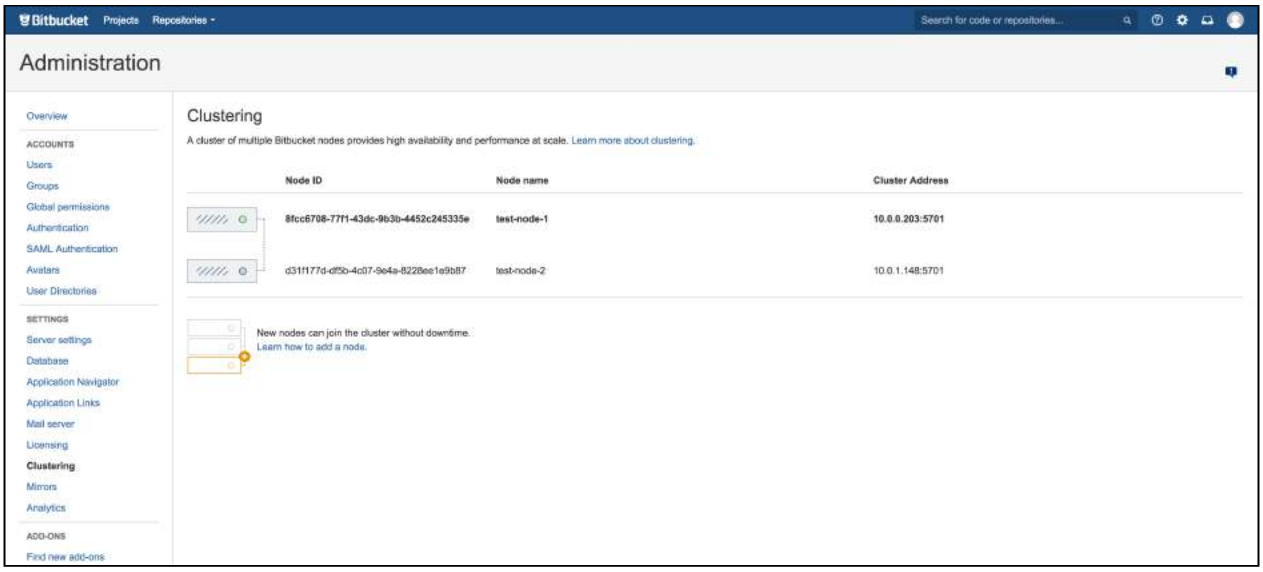
```
server.proxy-name=bitbucket.company.com
server.proxy-port=443
server.secure=true
server.require-ssl=true
```

Read Securing Bitbucket behind HAProxy using SSL for more details.

Step 3. Add a new Bitbucket application node to the cluster

Go to a new cluster node, and start Bitbucket Server. See Start and stop Bitbucket.

Once Bitbucket Server has started, go to `https://<load-balancer>/admin/clustering`. You should see a page similar to this:



Clustering

A cluster of multiple Bitbucket nodes provides high availability and performance at scale. Learn more about clustering.

Node ID	Node name	Cluster Address
8fcc6708-77f1-43dc-9b3b-4452c245335e	**test-node-1**	**10.0.0.203:5701**
d31f177d-df5b-4c07-9e4a-8228ee1e9b87	test-node-2	10.0.1.148:5701

New nodes can join the cluster without downtime.
Learn how to add a node.

Verify that the new node you have started up has successfully joined the cluster. If it does not, please check your network configuration and the `${BITBUCKET_HOME}/log/atlassian-bitbucket.log` files on all nodes. If you are unable to find a reason for the node failing to join successfully, please contact Atlassian Support .

Step 4. Connect the new Bitbucket cluster node to the load balancer

If you are using your own hardware or software load balancer, consult your vendor's documentation on how to add the new Bitbucket cluster node to the load balancer.

If you are using HAProxy, uncomment these lines

```
server bitbucket02 192.168.0.2:7990 check inter 10000 rise 2 fall 5
```

```
server bitbucket02 192.168.0.2:7999 check port 7999
```

in your `haproxy.cfg` file and restart `haproxy`:

```
sudo service haproxy restart
```

Verify that the new node is in the cluster and receiving requests by checking the logs on each node to ensure both are receiving traffic and also check that updates done on one node are visible on the other.

Running Bitbucket Data Center on a Kubernetes cluster

If you're running self-managed environments and looking to adopt modern infrastructure, you can deploy your Atlassian Data Center products on Kubernetes clusters. By leveraging Kubernetes, you can drive greater agility amongst your teams and enjoy a simplified administrative experience at scale without compromising your organization’s regulatory requirements.

What is Kubernetes?

Kubernetes (K8s) is a high-availability rapid deployment and container orchestration framework that allows you to easily manage and automate your deployments in one place. Because it makes heavy use of containers, your applications stay up-to-date with no downtime and always have safe and reliable access to the dependencies they require. Learn more on the official Kubernetes website

How does it work?

Kubernetes automates the management of containerized applications. It provides a centralized control plane to manage containers and the underlying infrastructure, automate scaling, rollouts and rollbacks, and more. The platform abstracts away the underlying infrastructure and provides a unified way of managing containers and applications, making it easier for developers to build, deploy, and run applications at scale.

Why Kubernetes?

Kubernetes is a powerful platform that comes with a number of benefits, including:

- Improved agility
- Simplified administration
- Deployment automation
- Automated operations for containers
- Security enhancements
- Accelerated upgrades and rollbacks
- Better scalability and resiliency

On top of that, the ability to manage your infrastructure as code by using simple YAML files helps you reduce unnecessary resource consumption.

How does Atlassian integrate with Kubernetes?

Manage Kubernetes with Helm charts

To help you deploy our products, we’ve created Data Center Helm charts—customizable templates that can be configured to meet the unique needs of your business. You can even choose how to run them: either on your own hardware or on a cloud provider’s infrastructure. This allows you to stay in control of your data and meet your compliance needs while still using a more modern infrastructure. Helm charts have their own lifecycle, so updates contain certain features and are upgraded automatically.

Helm charts provide the essential building blocks needed to deploy Atlassian Data Center products (Jira, Confluence, Bitbucket, Bamboo, and Crowd) in Kubernetes clusters and give you the capability to integrate with your operation and automation tools. Learn more about Helm charts

Use Docker images for improved agility

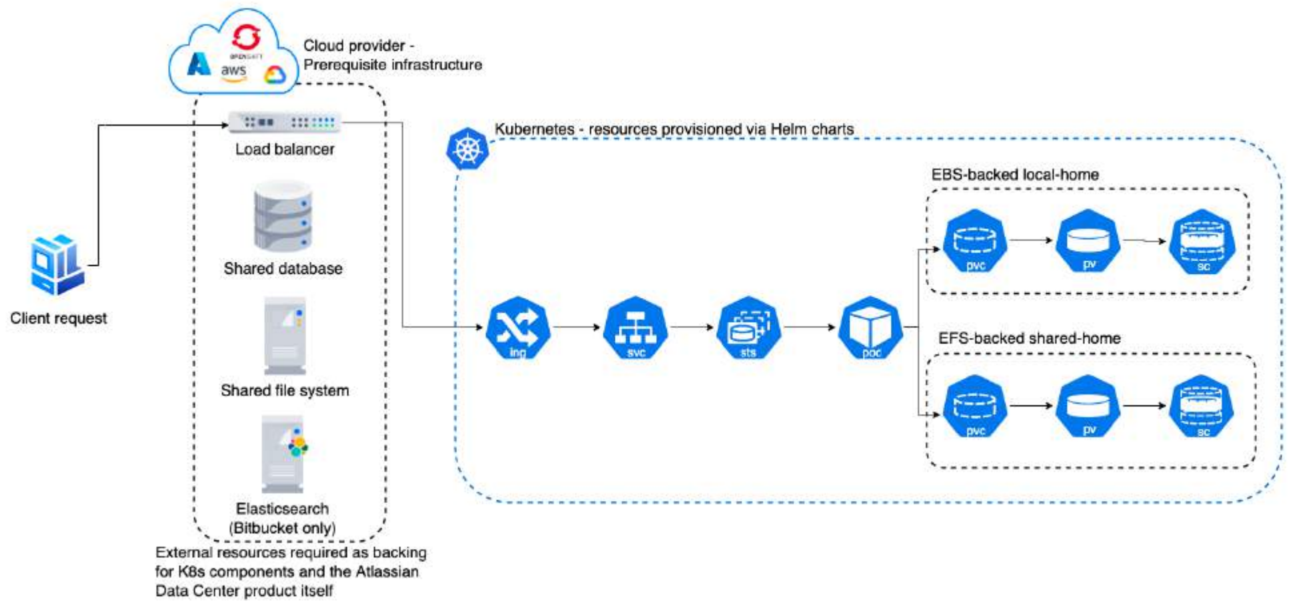
To speed up development, you can take advantage of Data Center’s hardened Docker container images. Using our Docker container images as part of your Data Center deployment allows you to cut significant time by streamlining and automating workflows.

After defining your required configuration once, you can instantly deploy exact replicas of your environment from the command line at every stage of your deployment lifecycle, giving you the agility needed to keep valuable work moving forward, and the flexibility to accommodate your organization’s evolving development strategy over time.

Learn Kubernetes deployment architecture

The Kubernetes cluster can be a managed environment, such as Amazon EKS, Azure Kubernetes Service, Google Kubernetes Engine, or a custom on-premise system. We strongly recommend you set up user management, central logging storage, a backup strategy, and monitoring just as you would for a Data Center installation running on your own hardware.

Here's an architectural overview of what you'll get when deploying your Data Center application on a Kubernetes cluster using the Helm charts:


Cloud provider - Prerequisite infrastructure
aws
Load balancer
Shared database
Shared file system
Elasticsearch (Bitbucket only)
External resources required as backing for K8s components and the Atlassian Data Center product itself
Client request
Kubernetes - resources provisioned via Helm charts
ing
svc
sts
pod
EBS-backed local-home
EFS-backed shared-home
pvc
pv
sc

The following Kubernetes entities are required for product deployment:

- **Ingress and Ingress controller** (ing)—the Ingress defines the rules for traffic routing, which indicate where a request will go in the Kubernetes cluster. The Ingress controller is the component responsible for fulfilling those rules.
- **Service** (svc)—provides a single address for a set of pods to enable load-balancing between application nodes.
- **Pod**—a group of one or more containers, with shared storage and network resources, and a specification for how to run the containers. Pods are the smallest deployable units of computing that you can create and manage in Kubernetes.
- **StatefulSets** (sts)—manages the deployment and scaling of a set of pods requiring persistent state.
- **PersistentVolume** (pv)—a "physical" volume on the host machine that stores your persistent data.
- **PersistentVolumeClaim** (pvc)—reserves the Persistent Volume (PV) to be used by a pod or potentially multiple pods.
- **StorageClass** (sc)—provides a way for administrators to describe the "classes" of storage they offer.

Install your Data Center application on a Kubernetes cluster

To install and operate your Data Center application on a Kubernetes cluster using our Helm charts:

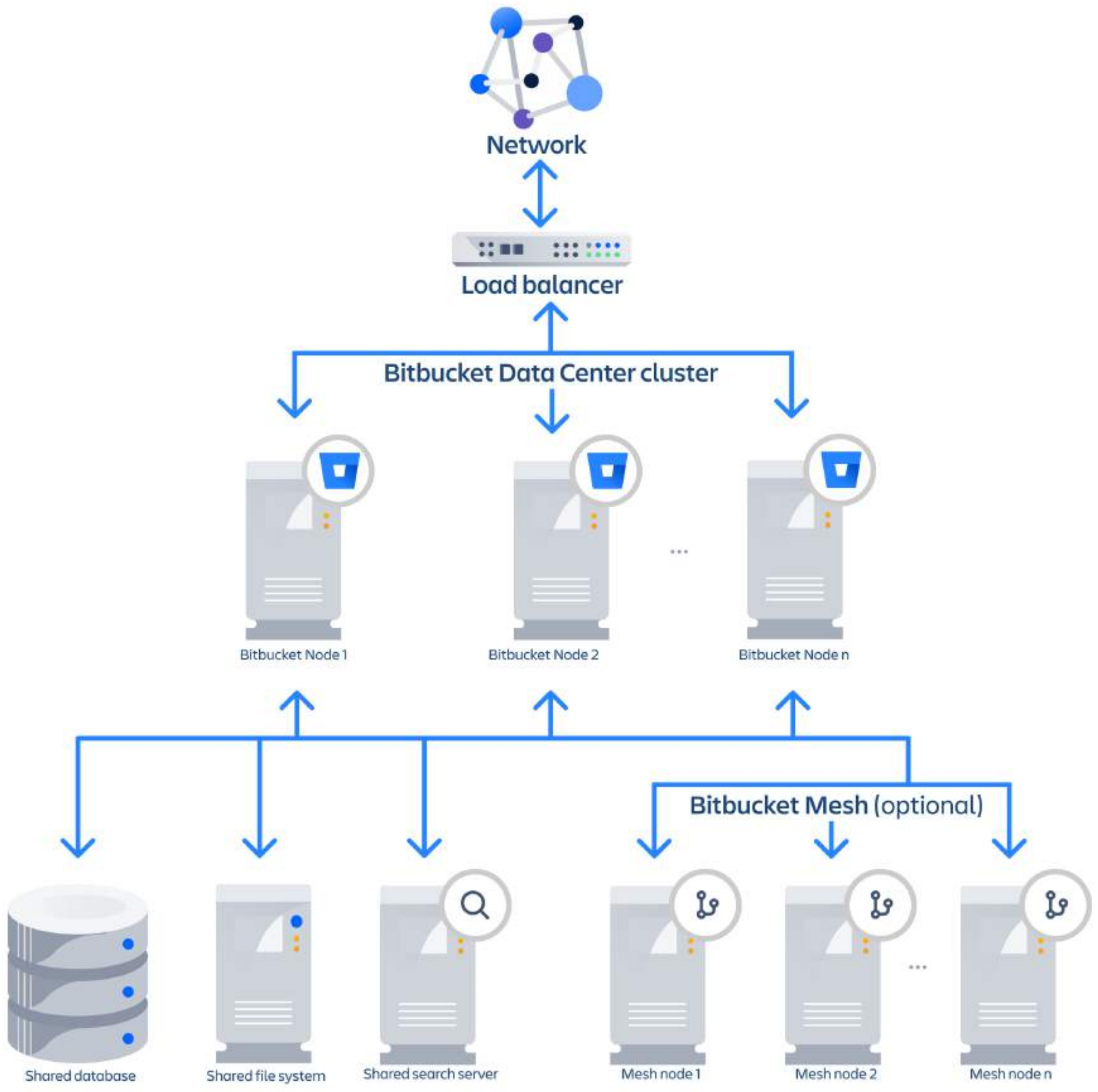
1. Follow the requirements and set up your environment according to the Prerequisites guide.
2. Perform the installation steps described in the Installation guide.
3. Learn how to upgrade applications, scale your cluster, and update resources using the Operation guide.

Bitbucket Data Center requirements

This page describes the requirements for running a production instance of Bitbucket Data Center. If you're ready to get started installing Bitbucket Data Center, see Install Bitbucket Data Center for detailed instructions.

Component overview

A Bitbucket Data Center instance consists of a cluster of components, each on a dedicated machine, and connected over a high-speed LAN connection. This diagram depicts a typical Bitbucket Data Center instance with a load balancer, three application nodes, three Mesh nodes, and a shared search server with a single node.



Component requirements

Each component has specific requirements, but only the load balancer needs to have a publicly accessible URL. The URL of the Bitbucket Data Center instance will be the URL of the load balancer, so this is the machine that you will need to assign the name of your Bitbucket Server instance in the DNS.

The remaining machines (Bitbucket cluster nodes, shared database, shared file system, and shared search server) do not need to be publicly accessible to your users.

Bitbucket application nodes

The Bitbucket cluster nodes all run the Bitbucket Data Center web application.

- Each Bitbucket cluster node must be a dedicated machine.
- The machines may be physical or virtual.
- The cluster nodes must be connected in a high speed LAN (that is, high bandwidth and low latency).
- The usual Bitbucket Server supported platforms requirements, including those for Java and Git, apply to each cluster node.
- The cluster nodes do not all need to be absolutely identical, but for consistent performance we recommend they should be as similar as possible.
- All cluster nodes must run the same version of Bitbucket Data Center.
- All cluster nodes must have synchronized clocks (for example, using NTP) and be configured with the identical timezone.
- Ensure that only permit cluster nodes are allowed to connect to a Bitbucket cluster node's Hazelcast port, which by default is port 5701, through the use of a firewall and/or network segregation.

Load balancer

You can use the load balancer of your choice. Bitbucket Data Center does ***not*** bundle a load balancer.

- Your load balancer should run on a dedicated machine.
- Your load balancer must have a high-speed LAN connection to the Bitbucket cluster nodes (that is, high bandwidth and low latency).
- Your load balancer must support ***both*** HTTP mode (for web traffic) ***and*** TCP mode (for SSH traffic).
- Terminating SSL (HTTPS) at your load balancer and running plain HTTP from the load balancer to Bitbucket Server is highly recommended for performance.
- Your load balancer should support "session affinity" (also known as "sticky sessions").
- If you don't have a preference for your load balancer, we provide instructions for `haproxy`, a popular Open Source software load balancer.

Shared database

You must run Bitbucket Data Center on an external database. You can ***not*** use Bitbucket Server's internal HSQL or H2 database with Bitbucket Data Center.

- The shared database must run on a dedicated machine.
- The shared database must be available to all cluster nodes via a high-speed LAN (it must be in the same physical data center).
- All the usual database vendors in Bitbucket Server's supported platforms are supported by Bitbucket Data Center, with one exception: we do ***not*** recommend MySQL at this time due to inherent deadlocks that can occur in this database engine at high load.

Shared file system

Bitbucket Data Center requires a high performance shared file system such as a SAN, NAS, RAID server, or high-performance file server optimized for I/O.

- The shared file system must run on a dedicated machine.
- The file system must be available to all cluster nodes via a high-speed LAN (it must be in the same physical data center).
- The shared file system should be accessible via NFS as a single mount point.

Stored on the shared file system	Stored locally on each application node
• configuration files • data directory, which includes: ◦ repositories ◦ attachments ◦ avatars • plugins	• caches • logs • temporary files

For more information on setting up Bitbucket Data Center's shared file server, see Step 2. Provision your shared file system (in Install Bitbucket Data Center). This section contains the requirements and recommendations for setting up NFS for Bitbucket Data Center.

Mesh

- Consider allocating at least 4 CPUs or vCPUs
  - Mesh scales many of its limits based on the number of CPUs available
  - Many aspects of Mesh are heavily threaded, as are some parts of Git’s processing
- Allocate at least 8GB of RAM, and ideally, more
  - The more repository data can be kept in the page cache, the faster **all** operations will be
  - The fastest Solid State Drives (SSD) are still nowhere near as fast as main memory
  - At a minimum, the system should have 2GB of RAM baseline, for the Java virtual machine (JVM), plus an additional GB for **each** CPU
    - For example, for a 4 CPU setup, this means it should have at least 6GB of RAM
- Use a filesystem that works well with large numbers of small files
  - XFS, for example, is likely to be a better choice than EXT4
  - Consider the number of available inodes, not just the available disk space, because garbage collection (GC) can write a lot of loose objects
- Use the fastest storage available if possible, and focus on things like random read and write performance
- Use 10GbE (or better if you can) for the network between Bitbucket Data Center and Mesh nodes (and between Mesh nodes)
  - If possible, putting the Mesh nodes connectivity on a separate backplane network from the interfaces user requests are serviced on by Bitbucket Data Center nodes can help ensure traffic on either **side** of the Bitbucket nodes doesn’t starve out the other side (for example, that heavy user traffic doesn’t interfere with Mesh traffic, or vice versa)

Bitbucket Mesh is designed for horizontal scaling; however, you should not underestimate the value of vertical scaling. A smaller number of well-provisioned Bitbucket Mesh nodes will likely outperform a larger number of Mesh nodes with smaller resources.

Shared search server

You must run Bitbucket Data Center with a remote search server. You can ***not*** use the search server bundled with Bitbucket Server (which is not installed for Bitbucket Data Center).

- For details on supported search server versions, see the Supported platforms page.
- Bitbucket Data Center can have only one remote connection to the shared search server for your cluster.
- This may be a standalone search server installation or a clustered installation behind a load balancer.

Get started with Bitbucket Data Center

Purchase a Bitbucket Data Center license, or, obtain an evaluation license.

See Install Bitbucket Data Center for detailed information about setting up Bitbucket Data Center.

The Bitbucket Data Center FAQ answers the questions you might have when starting with Bitbucket Data Center.

Install Bitbucket Data Center

Starting from 8.15.x, new releases of Bitbucket will be available only to Data Center customers. If you have a Server license, learn more about your options.

These instructions are applicable for installing Bitbucket Data Center on your own hardware.

This guide covers installing for the first time, with no existing data, or migrating your Bitbucket Server to a Data Center instance.

Other ways to install Bitbucket Data Center:

- Kubernetes - installation on a Kubernetes cluster using our Helm charts.
- AWS - hassle-free deployment in AWS using our Quick Start
- Azure - reference templates for Microsoft Azure deployment

Install Bitbucket Data Center on a single node

If your organization doesn't need high availability or disaster recovery capabilities right now, you can install Bitbucket Data Center without setting up a cluster.

To install Bitbucket Data Center, without setting up a cluster, follow the instructions for Bitbucket Server:

- Bitbucket installation guide

The process is almost identical to an ordinary Jira Server installation, just be sure to enter your Data Center license.

Install Bitbucket Data Center in a cluster

If your organization requires continuous uptime, scalability, and performance under heavy load, you'll want to run Bitbucket Data Center in a cluster.

See Clustering with Bitbucket for a complete overview of hardware and infrastructure considerations.

Before you begin
See our Supported platforms page for information on the database, Java, and operating systems you'll be able to use. These requirements are the same for Server and Data Center deployments.
You can see a component diagram of a typical Bitbucket Data Center instance, and read about detailed requirements of each component on the page Bitbucket Data Center requirements and on the Supported platforms page.

A Bitbucket Data Center instance consists of a cluster of components, each running on a dedicated machine:

- A **cluster of Bitbucket application nodes** all running the same version of Bitbucket Data Center web application. These can be virtual or physical machines, have synchronized clocks (for example, using NTP) and be configured with the identical timezone, and are allowed to connect to a Bitbucket cluster node's Hazelcast port, which by default is port 5701.
- A **load balancer** that supports *both* HTTP mode (for web traffic) *and* TCP mode (for SSH traffic), and support session affinity ("sticky sessions").
- A **supported external database**, shared and available to all all cluster nodes.
- A **shared file system** that is physically located in the same data center, available to all clusters nodes, and accessible by NFS as a single mount point.

- A **remote Elasticsearch instance** with only one remote connection to Bitbucket. The instance may be a standalone Elasticsearch installation or a clustered installation behind a load balancer. For help installing and configuring a remote Elasticsearch instance see our how to guide.

In this guide we'll use the following terminology:

- **Installation directory**: The directory where you installed Bitbucket.
- **Local home directory**: The home or data directory stored locally on each cluster node (if Bitbucket is not running in a cluster, this is simply known as the home directory).
- **Shared home directory**: The directory you created that is accessible to all nodes in the cluster via the same path.

Install Bitbucket Data Center on the first application node

First, you'll need to install Bitbucket Data Center one node:

1. Download the latest installer - www.atlassian.com/software/bitbucket/download.
2. Make the installer executable.

   Change to the directory where you downloaded the installer, then execute this command:

   chmod +x atlassian-bitbucket-x.x.x-x64.bin

   Where `x.x.x` is the version you downloaded.
3. Run the installer – we recommend using `sudo` to run the installer as this will create a dedicated account to run Bitbucket and allow you to run Bitbucket as a service.

   To use `sudo` to run the installer execute this command:

   ```
   $ sudo ./atlassian-bitbucket-x.x.x-x64.bin
   ```

   You can also run the installer with root user privileges.Where `x.x.x` is the version you downloaded.
4. Follow the prompts to install Bitbucket. You'll be asked for the following info:
   a. **Type of Bitbucket instance** - the type of installation, for these instructions select **Data Center**.
   b. **Installation directory** - where Bitbucket will be installed.
   c. **Home directory** - where Bitbucket application data will be stored.
   d. **TCP ports** - the HTTP connector port and control port Bitbucket will run on.

Provision the shared database, filesystem, and search server

Once you've installed the first Bitbucket application node, you now need to provision the share database, shared filesystem and shared search server to use with Bitbucket Data Center.

Step 1. Provision your shared database

Set up your shared database server.

- Connect Bitbucket to PostgreSQL
- Connect Bitbucket to SQL Server
- Connect Bitbucket to Oracle

Ensure your database is configured to allow enough concurrent connections. Bitbucket Server by default uses up to 80 connections ***per cluster node***, which can exceed the default connection limit of some databases. For example, in PostgreSQL the default limit is usually 100 connections. If you use PostgreSQL, you may need to edit your `postgresql.conf` file, to increase the value of `max_connections`, and restart Postgres.

See Connect Bitbucket to an external database for more information, and note that clustered databases are not supported.

We do ***not*** support MySQL for Bitbucket Data Center at this time due to inherent deadlocks that can occur in this database engine at high load. If you currently use MySQL, you should migrate your data to another supported database (such as PostgreSQL) before upgrading your Bitbucket Server instance to Bitbucket Data Center. You can migrate databases (on a standalone Bitbucket Server instance) using the Migrate database feature in Bitbucket Server's Administration pages.

Step 2. Provision your shared file system

A properly resourced and configured NFS server can perform well even under very heavy load. We've created some recommendations for setting up and configuring your file server for optimal performance.

Bitbucket Data Center requires a high performance shared file system, such as a storage area network (SAN), network-attached storage (NAS), RAID server, or high-performance file server optimized for input /output.

If you aren't using Bitbucket Mesh or haven't migrated all Git repositories to it, the file system must:

- run on a dedicated machine; avoid hosting other services on your NFS server
- be in the same physical data center
- be available to all Bitbucket nodes via a high-speed LAN (such as 10GB ethernet or Fibre Channel)
- be accessible via NFS as a single mount point
- have the NFS lock service enabled

For reference, our AWS Quick Start for Bitbucket Data Center deploys NFS and the Bitbucket cluster nodes on the same VPC, availability zone, and subnet.

If you're using Bitbucket Mesh and have migrated all Git repositories to it, you can use the following file system options for the shared home directory:

- NFSv4
- Amazon Elastic File System (EFS)
- Amazon FSx for NetApp ONTAP NFS
- Amazon FSx for OpenZFS
- Amazon FSx for Lustre

You need to create a user account named bitbucket on the shared file system server. This user account should have read/write permissions to the shared subdirectory of the Bitbucket Server home directory.

To ensure this:

- set bitbucket to own all files and folders in the shared subdirectory
- create bitbucket with the user umask 0027
- assign the same UID to bitbucket on all NFS Server and Bitbucket cluster nodes

Where possible, enable the SCM Cache plugin (already bundled in Bitbucket Data Center) with as much disk or SSD space on your cluster nodes as you can.

An effective SCM Cache can greatly reduce load on your shared file server. Note that the drive or partition used by the SCM Cache is local to each cluster node, not NFS mounted.

See Scaling Bitbucket Server for Continuous Integration performance for more information.
On your file server, ensure that NFS is configured with enough server processes. For example, some versions of Red Hat Enterprise Linux and CentOS have a default of 8 server processes. If you use either distribution, you may need to edit your /etc/sysconfig/nfs file, increase the value of RPCNFSDCOUNT, and restart the nfs service.

For the file server and cluster nodes, avoid kernel and NFS version combinations that are unstable or have known NFS bugs. We recommend avoiding Linux kernel versions 3.2 to 3.8.
When you provision your application cluster nodes later, we recommend using the following NFS mount options:

```
rw,nfsvers=3,lookupcache=pos,noatime,intr,rsize=32768,wsize=32768,_netdev
```

Step 3. Migrating from an existing Bitbucket Server instance (optional)

The `shared` subdirectory of the Bitbucket Server home directory contains all the GIT repositories, configuration data, and other important files. When migrating from an existing Bitbucket Server instance, back up shared and restore it on the new Bitbucket Data Center's NFS file system.

The remaining subdirectories (`bin`, `caches`, `export`, `lib`, `log`, `plugins`, and `tmp`) contain only caches and temporary files. You don't need to restore them.

Step 4. Provision your search server

To set up your search server, you will

1. Install the search server on a remote machine.
2. Configure the search server to work with Bitbucket Data Center.
3. Secure the search server with a username and password that Bitbucket will use to access the search server, with a minimum of HTTP restricted access.
4. Connect the search server to Bitbucket.

There are detailed instructions on the pages Install and configure a remote Elasticsearch server and Install and configure a remote OpenSearch server to help you provision your remote search server.

Provision application cluster nodes

Provision cluster node infrastructure. You can automate this using a configuration management tool such as Chef, Puppet, or Vagrant, and/or by spinning up identical virtual machine snapshots.

Step 1. Configure file share mounts

NFSv3 is supported. If you're using Bitbucket Mesh and have migrated all Git repositories to it, you can use NFSv4 for the shared home directory.

On each cluster node, mount the shared home directory as `${BITBUCKET_HOME}/shared`. Note that ***only*** the `${BITBUCKET_HOME}/shared` directory should be shared between cluster nodes. All other directories, including `${BITBUCKET_HOME}`, should be node-local (that is, private to each node).

Example

For example, suppose your Bitbucket home directory is `/var/atlassian/application-data/bitbucket` , and your shared home directory is available as an NFS export called `bitbucket-san:/bitbucket-shared`. To configure the mount on each cluster node:

1. Add the following line to `/etc/fstab` on each cluster node.
   /etc/fstab

   ```
   bitbucket-san:/bitbucket-shared /var/atlassian/application-data/bitbucket/shared nfs
   rw,nfsvers=3,lookupcache=pos,noatime,intr,rsize=32768,wsize=32768,_netdev 0 0
   ```

2. Mount the share on each node:

   ```
   mkdir -p /var/atlassian/application-data/bitbucket/shared
   sudo mount -a
   ```

Step 2. Synchronize system clocks

Ensure all your cluster nodes have synchronized clocks and identical timezone configuration. Here are some examples for how to do this:

```
sudo yum install ntp
sudo service ntpd start
sudo tzselect
```

```
sudo apt-get install ntp
sudo service ntp start
sudo dpkg-reconfigure tzdata
```

Step 3. Install Bitbucket Data Center on each node

On each cluster node, perform the same steps from Install Bitbucket Data Center on the first application node section.

Step 4. Start the first cluster node

Edit the file `${BITBUCKET_HOME}/shared/bitbucket.properties` and add the following lines:

```
# Use multicast to discover cluster nodes (recommended).
hazelcast.network.multicast=true

# If your network does not support multicast, you may uncomment the following lines and substitute
# the IP addresses of some or all of your cluster nodes. (Not all of the cluster nodes have to be
# listed here but at least one of them has to be active when a new node joins.)
#hazelcast.network.tcpip=true
#hazelcast.network.tcpip.members=192.168.0.1:5701,192.168.0.2:5701,192.168.0.3:5701

# The following should uniquely identify your cluster on the LAN.
hazelcast.group.name=your-bitbucket-cluster
hazelcast.group.password=your-bitbucket-cluster
```

If you are installing Bitbucket Server in an IPv6 environment, Hazelcast needs an additional system property to work.

This property is only needed if the nodes are configured to use IPv6 to talk to each other.

Edit the file ${BITBUCKET_INSTALL}/bin/_start-webapp.sh and edit the JVM_SUPPORT_RECOMMENDED_ARG line to look like this:

```
JVM_SUPPORT_RECOMMENDED_ARGS="-Dhazelcast.prefer.ipv4.stack=false"
```

The line is commented out, so be sure to remove the leading # to make the line take effect.

Using multicast to discover cluster nodes (`hazelcast.network.multicast=true`) is recommended, but requires all your cluster nodes to be accessible to each other via a multicast-enabled network. If your network does not support multicast then you can set `hazelcast.network.multicast=false`, `hazelcast.network.tcpip=true`, and `hazelcast.network.tcpip.members` to a comma-separated list of cluster nodes instead. Only enable ***one*** of `hazelcast.network.tcpip` or `hazelcast.network.multicast`, not both.

Choose a name for `hazelcast.group.name` and `hazelcast.group.password` that uniquely identifies the cluster on your LAN. If you have more than one cluster on the same LAN (for example, other Bitbucket Data Center instances or other products based on similar technology such as Confluence Data Center) then you ***must*** assign each cluster a distinct name, to prevent them from attempting to join together into a "super cluster".

Then start Bitbucket Server. See Starting and stopping Bitbucket Server.

Then go to `http://<bitbucket>:7990/admin/license`, and install your Bitbucket Data Center license. Restart Bitbucket Server for the change to take effect. If you need a Bitbucket Data Center license, you can purchase one that fits your needs, or, get an evaluation license.

Install and configure your load balancer

Step 1. Configure protocols and health checks on your load balancer

Your load balancer must proxy three protocols:

Protocol	Typical port on the load balancer	Typical port on the Bitbucket cluster nodes	Notes
HTTP	80	7990	HTTP mode. Session affinity ("sticky sessions") should be enabled using the 52-character `BITBUCKETSESSIONID` cookie.
HTTPS	443	7990	HTTP mode. Terminating SSL at the load balancer and running plain HTTP to the Bitbucket cluster nodes is highly recommended.
SSH	7999	7999	TCP mode.

Your load balancer must support session affinity ("sticky sessions") using the `BITBUCKETSESSIONID` cookie. Bitbucket Data Center assumes that your load balancer always directs each user's requests to the same cluster node. If it does not, users may be unexpectedly logged out or lose other information that may be stored in their HTTP session.

When choosing a load balancer, it must support the HTTP, HTTPS, and TCP protocols. Note that:

- Apache does ***not*** support TCP mode load balancing.
- HAProxy versions older than 1.5.0 do ***not*** support HTTPS.

If your load balancer supports health checks of the cluster nodes, configure it to perform a periodic HTTP GET of `http:// <bitbucket>:7990/status`, where `<bitbucket>` is the cluster node's name or IP address. This returns one of two HTTP status codes:

- 200 OK
- 500 Internal Server Error

If a cluster node does not return 200 OK within a reasonable amount of time, the load balancer should not direct any traffic to it.

You should then be able to navigate to `http://<load-balancer>/`, where `<load-balancer>` is your load balancer's name or IP address. This should take you to your Bitbucket Server front page.

Example: HAProxy load balancer

If you don't have a particular preference or policy for load balancers, you can use HAProxy which is a popular Open Source software load balancer.

If you choose HAProxy, you ***must*** use a minimum version of 1.5.0. Earlier versions of HAProxy do not support HTTPS.

To check which version of HAProxy you use, run the following command:

haproxy --version

Here is an example `haproxy.cfg` configuration file (typically found in the location `/etc/haproxy/haproxy.cfg`). This assumes:

- Your Bitbucket cluster node is at address 192.168.0.1, listening on the default ports 7990 (HTTP) and 7999 (SSH).
- You have a valid SSL certificate at `/etc/cert.pem`.

haproxy.cfg

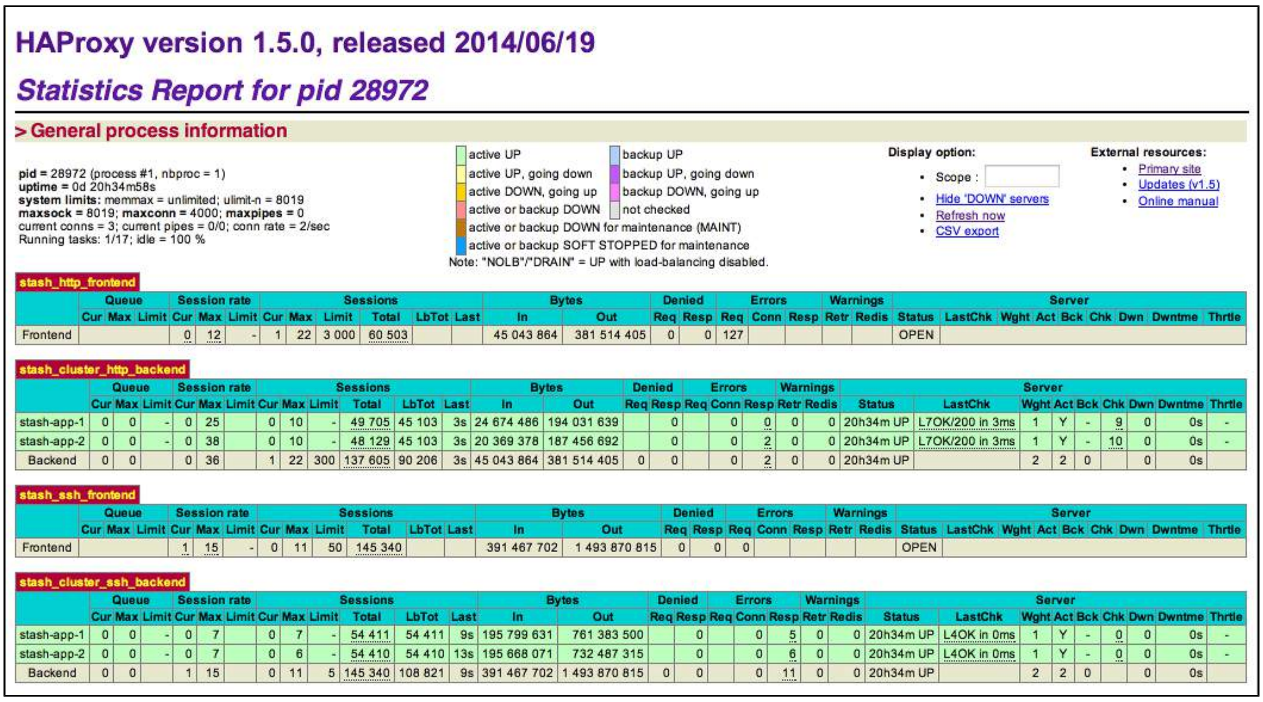
```
global
    pidfile     /var/run/haproxy.pid
    maxconn     4000
    user        haproxy
    group       haproxy
    daemon
    tune.ssl.default-dh-param 1024
defaults
    log                     global
    option                  dontlognull
    option                  redispatch
    retries                 3
    timeout http-request    10s
    timeout queue           1m
    timeout connect         10s
    timeout client          1m
    timeout server          1m
    timeout http-keep-alive 10s
    timeout check           10s
    maxconn                 3000
    errorfile               408 /dev/null        # Workaround for Chrome 35-36 bug.  See http://blog.
haproxy.com/2014/05/26/haproxy-and-http-errors-408-in-chrome/

frontend bitbucket_http_frontend
    bind *:80
    bind *:443 ssl crt /etc/cert.pem ciphers RC4-SHA:AES128-SHA:AES256-SHA
    default_backend bitbucket_http_backend

backend bitbucket_http_backend
    mode http
    option httplog
    option httpchk GET /status
    option forwardfor
    option http-server-close
        #Uncomment the following line for HAProxy 1.5.
    #appsession BITBUCKETSESSIONID len 52 timeout 1h
    balance roundrobin
    cookie BITBUCKETSESSIONID prefix
        # The following 3 lines are for HAProxy 1.6+. If you're on 1.5, uncomment them.
    stick-table type string len 52 size 5M expire 30m
    stick store-response set-cookie(BITBUCKETSESSIONID)
    stick on cookie(BITBUCKETSESSIONID)
    server bitbucket01 192.168.0.1:7990 check inter 10000 rise 2 fall 5
    #server bitbucket02 192.168.0.2:7990 check inter 10000 rise 2 fall 5
    # The following "backup" servers are just here to show the startup page when all nodes are
starting up
    server backup01 192.168.0.1:7990 backup
    #server backup02 192.168.0.2:7990 backup

frontend bitbucket_ssh_frontend
    bind *:7999
    default_backend bitbucket_ssh_backend
    timeout client 15m
    maxconn 50

backend bitbucket_ssh_backend
    mode tcp
    balance roundrobin
    server bitbucket01 192.168.0.1:7999 check port 7999
    #server bitbucket02 192.168.0.2:7999 check port 7999
    timeout server 15m

listen admin
    mode http
    bind *:8090
    stats enable
    stats uri /
```

> Review the contents of the `haproxy.cfg` file carefully, and customize it for your environment. See http://www.haproxy.org/ for more information about installing and configuring `haproxy`.

Once you have configured the `haproxy.cfg` file, start the `haproxy` service.

```
sudo service haproxy start
```

You can also monitor the health of your cluster by navigating to HAProxy's statistics page at `http://<load-balancer>:8090/`. You should see a page similar to this:



HAProxy version 1.5.0, released 2014/06/19

Statistics Report for pid 28972

> General process information

pid = 28972 (process #1, nbproc = 1)
uptime = 0d 20h34m58s
system limits: memmax = unlimited; ulimit-n = 8019
maxsock = 8019; **maxconn** = 4000; **maxpipes** = 0
current conns = 3; current pipes = 0/0; conn rate = 2/sec
Running tasks: 1/17; idle = 100 %

active UP
active UP, going down
active DOWN, going up
active or backup DOWN
active or backup DOWN for maintenance (MAINT)
active or backup SOFT STOPPED for maintenance
backup UP
backup UP, going down
backup DOWN, going up
not checked
Note: "NOLB"/"DRAIN" = UP with load-balancing disabled.

Display option:
- Scope :
- Hide 'DOWN' servers
- Refresh now
- CSV export

External resources:
- Primary site
- Updates (v1.5)
- Online manual

stash_http_frontend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
Frontend				0	12	-	1	22	3 000	60 503			45 043 864	381 514 405	0	0	127					OPEN								

stash_cluster_http_backend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
stash-app-1	0	0	-	0	25		0	10	-	49 705	45 103	3s	24 674 486	194 031 639		0		0	0	0	0	20h34m UP	L7OK/200 in 3ms	1	Y	-	9	0	0s	-
stash-app-2	0	0	-	0	38		0	10	-	48 129	45 103	3s	20 369 378	187 456 692		0		0	2	0	0	20h34m UP	L7OK/200 in 3ms	1	Y	-	10	0	0s	-
Backend	0	0		0	36		1	22	300	137 605	90 206	3s	45 043 864	381 514 405	0	0		0	2	0	0	20h34m UP		2	2	0		0	0s	

stash_ssh_frontend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
Frontend				1	15	-	0	11	50	145 340			391 467 702	1 493 870 815	0	0	0					OPEN								

stash_cluster_ssh_backend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
stash-app-1	0	0	-	0	7		0	7	-	54 411	54 411	9s	195 799 631	761 383 500		0		0	5	0	0	20h34m UP	L4OK in 0ms	1	Y	-	0	0	0s	-
stash-app-2	0	0	-	0	7		0	6	-	54 410	54 410	13s	195 668 071	732 487 315		0		0	6	0	0	20h34m UP	L4OK in 0ms	1	Y	-	0	0	0s	-
Backend	0	0		1	15		0	11	5	145 340	108 821	9s	391 467 702	1 493 870 815	0	0		0	11	0	0	20h34m UP		2	2	0		0	0s	

Step 2. Configure Bitbucket for your load balancer

If you're using HAProxy, Bitbucket needs to be configured to work with it. For example:

<Bitbucket home directory>/shared/bitbucket.properties

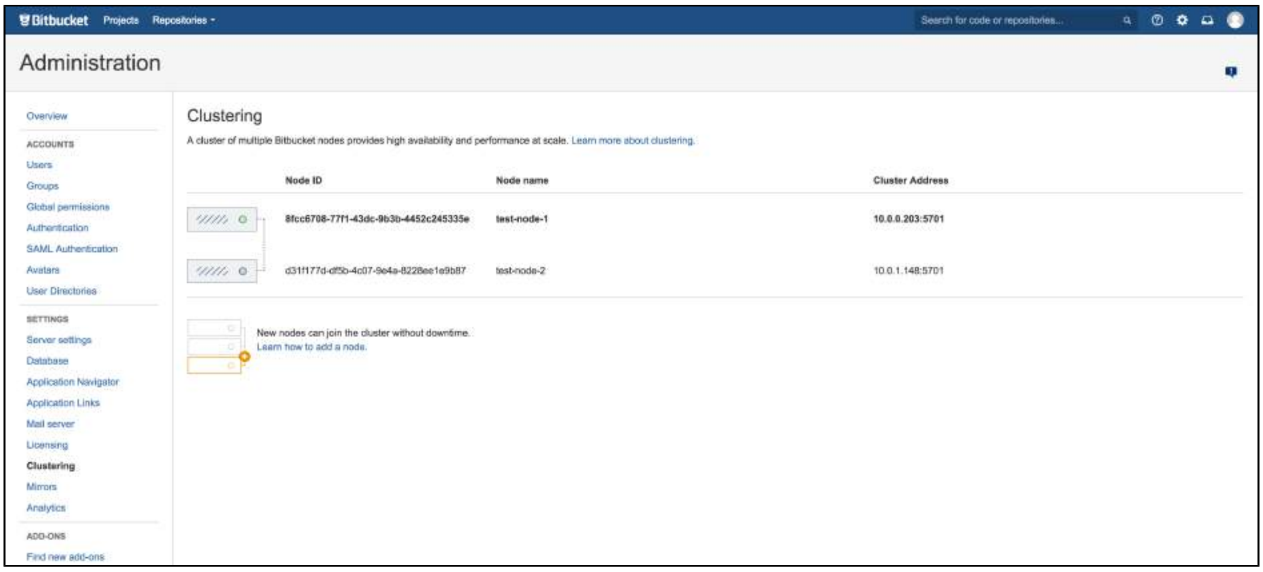
```
server.proxy-name=bitbucket.company.com
server.proxy-port=443
server.secure=true
server.require-ssl=true
```

Read Securing Bitbucket behind HAProxy using SSL for more details.

Step 3. Add a new Bitbucket application node to the cluster

Go to a new cluster node, and start Bitbucket Server. See Start and stop Bitbucket.

Once Bitbucket Server has started, go to `https://<load-balancer>/admin/clustering`. You should see a page similar to this:



Clustering

A cluster of multiple Bitbucket nodes provides high availability and performance at scale. Learn more about clustering.

Node ID	Node name	Cluster Address
8fcc6708-77f1-43dc-9b3b-4452c245335e	**test-node-1**	**10.0.0.203:5701**
d31f177d-df5b-4c07-9e4a-8228ee1e9b87	test-node-2	10.0.1.148:5701

New nodes can join the cluster without downtime.
Learn how to add a node.

Verify that the new node you have started up has successfully joined the cluster. If it does not, please check your network configuration and the `${BITBUCKET_HOME}/log/atlassian-bitbucket.log` files on all nodes. If you are unable to find a reason for the node failing to join successfully, please contact Atlassian Support .

Step 4. Connect the new Bitbucket cluster node to the load balancer

If you are using your own hardware or software load balancer, consult your vendor's documentation on how to add the new Bitbucket cluster node to the load balancer.

If you are using HAProxy, uncomment these lines

```
server bitbucket02 192.168.0.2:7990 check inter 10000 rise 2 fall 5
```

```
server bitbucket02 192.168.0.2:7999 check port 7999
```

in your `haproxy.cfg` file and restart `haproxy`:

```
sudo service haproxy restart
```

Verify that the new node is in the cluster and receiving requests by checking the logs on each node to ensure both are receiving traffic and also check that updates done on one node are visible on the other.

Congratulations!

That's it! Bitbucket Data Center is accessible from a URL like this: http://<load_balancer_IP_address>:<port>

What's next?

When setting up Bitbucket in a production environment, we recommend that you configure these aspects next:

- Connect Bitbucket Server to a user directory - manage users/groups stored in an external directory.
- Run Bitbucket Server as a dedicated user - run Bitbucket Server from a user account with restricted privileges.
- Secure the Bitbucket home directory - secure the home directory against unauthorized access.
- Proxy and secure Bitbucket Server - run Bitbucket Server behind a reverse proxy and enable HTTPS access.
- Establish a data recovery plan - backup the home directory and database of your instance.

Read more about setting up Bitbucket Server for an enterprise here: Use Bitbucket in the enterprise.

Deploy Bitbucket Data Center in Azure

> The Azure Resource Manager template as a method of deployment is no longer supported or maintained by Atlassian. You can still customize it for your own usage to deploy Data Center products on Azure though.
>
> We recommend deploying your Data Center products on a Kubernetes cluster using our Helm charts for a more efficient and robust infrastructure and operational setup. Learn more about deploying on Kubernetes

If you decide to deploy your Data Center instance in a clustered environment, consider using Microsoft Azure. This platform allows you to scale your deployment elastically by resizing and quickly launching additional nodes and provides a number of managed services that work out of the box with Data Center products. These services make it easier to configure, manage, and maintain your deployment's clustered infrastructure.

We recommend deploying your Data Center instance on a Kubernetes cluster using our Helm charts. This allows you to stay in control of your data and meet your compliance needs while still using a modern infrastructure. Learn more about running Data Center products on Kubernetes

> Interested in learning more about what Data Center provides? Check out the Data Center overview

Non-clustered VS clustered environment

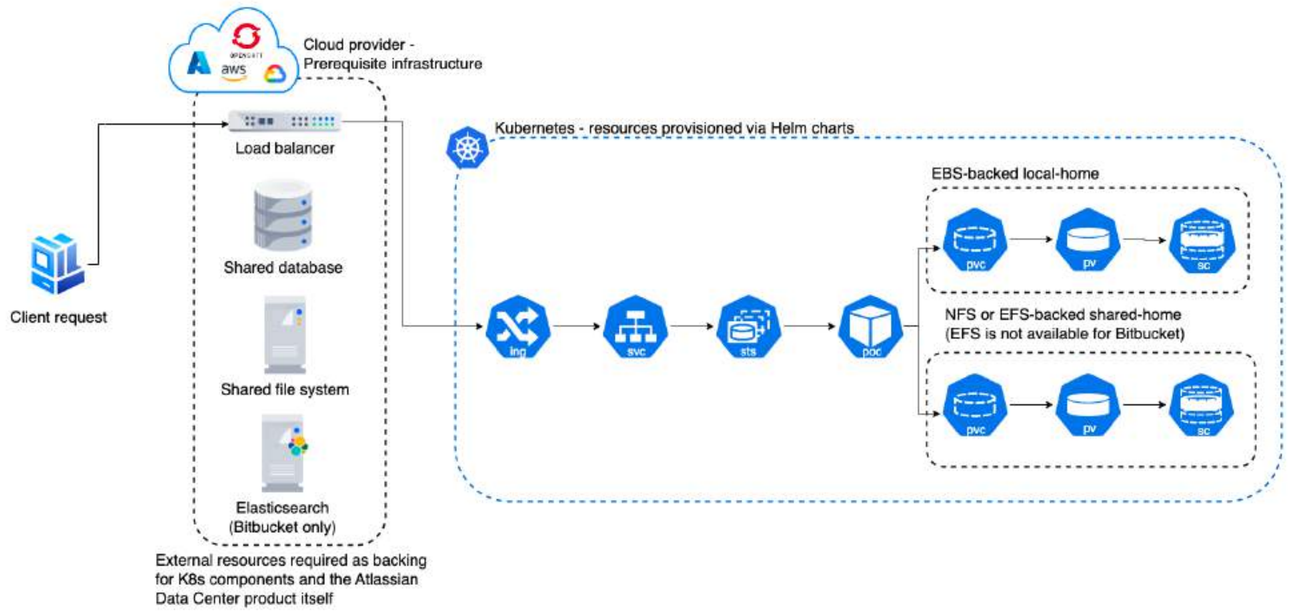
A single node is adequate for most small or medium size deployments, unless you need high availability or zero-downtime upgrades.

If you have an existing Server installation, you can still use its infrastructure when you upgrade to Data Center. Many features exclusive to Data Center (like SAML single sign-on, self-protection via rate limiting, and CDN support) don't require clustered infrastructure. You can start using these Data Center features by simply upgrading your Server installation’s license.

For more information on whether clustering is right for you, check out Atlassian Data Center architecture and infrastructure options.

How it works

Here's an architectural overview of what you'll get when deploying Data Center products with Azure:


Cloud provider - Prerequisite infrastructure
aws
Load balancer
Shared database
Shared file system
Elasticsearch (Bitbucket only)
External resources required as backing for K8s components and the Atlassian Data Center product itself
Client request
Kubernetes - resources provisioned via Helm charts
ing
svc
sts
pod
EBS-backed local-home
NFS or EFS-backed shared-home (EFS is not available for Bitbucket)
pvc
pv
sc

Deploy your instance with Azure

Create components

Before you deploy your Data Center product with Azure, you need to create the required infrastructure components. These include a database, a Kubernetes cluster, and shared storage. Learn more about the prerequisites

Take advantage of Helm charts

If you decide to deploy your Data Center instance on Azure with Kubernetes, make sure to use our Helm charts. Learn how to install your Data Center product with Helm charts

Administer Bitbucket Data Center in Azure

The Azure Resource Manager template as a method of deployment is no longer supported or maintained by Atlassian. You can still customize it for your own usage to deploy Data Center products on Azure though.

We recommend deploying your Data Center products on a Kubernetes cluster using our Helm charts for a more efficient and robust infrastructure and operational setup. Learn more about deploying on Kubernetes

Once you've deployed Bitbucket Data Center through the Azure Marketplace template, administering the application is similar to managing an application on your own hardware. The exception being that you'll need to go via the jumpbox to access your nodes, and shared home directory.

To access your jumpbox and nodes you'll need:

- The SSH credentials you provided during setup, and
- The URL of your jumpbox. This is listed as the `BASTIONURL` in your deployment's Outputs tab.

Connecting to your Azure jumpbox and nodes over SSH

You can access the jumpbox via a terminal, or using the command line using:ƒ

```
$ eval $(ssh-agent)
$ ssh-add ~/.ssh/id_rsa
$ ssh -A JUMPBOX_USERNAME@BASTIONURL
```

The `SSHURL` field in your deployment's Outputs tab shows the SSH command you can use to access your deployment.

Once you've accessed the jumpbox, you can jump to any of the nodes in the cluster, using:

```
$ ssh NODE_IP_ADDRESS
```

Accessing your configuration files

For your Azure deployment, you may need to make changes to your bitbucket.properties file, just as you would for a deployment on your own hardware.

your shared bitbucket.properties lives in /var/atlassian/application-data/bitbucket/shared/bitbucket.properties

The *shared home* is mounted on each node under /var/atlassian/application-data/bitbucket/shared.

So from an existing node (when you're logged in through SSH), you can go to /var/atlassian/application-data /bitbucket/shared

Upgrading

Before upgrading to a later version of Bitbucket Data Center:

1. Check if your apps are compatible with that version. Update your apps if needed. For more information about managing apps, see Using the Universal Plugin Manager.
2. Enable integrity checks (if you haven't already).

We strongly recommend that you perform the upgrade first in a *staging* environment before upgrading your production instance. How to establish staging server environments for Bitbucket Server provides helpful tips on doing so.

To upgrade to a later version of Bitbucket in Azure, you must first connect to your instance using SSH, then follow the steps in the Upgrade Bitbucket from an archive file. Note that you cannot use the installer if you're upgrading Bitbucket Server or a single-node Data Center using an Azure template.

Backing up

We recommend you use the Azure native backup facility, which utilizes snapshots to back up your Bitbucket Data Center. The following backup advice assumes that you deployed your Bitbucket instance through the Azure Marketplace template.

Database

We use Azure-managed database instances with high availability. Azure provides several excellent options for backing up your database, so you should take some time to work out which will be the best, and most cost effective option for your needs. See the following Azure documentation for your chosen database:

- SQL Database: Automated backups
- SQL Database: Backup retention
- PostGreSQL: Backup concepts

NFS Server

This node handles the shared NFS file system of the Bitbucket application nodes. The Azure Marketplace template creates a general-purpose Azure storage account, configured with local redundant storage (LRS). Using LRS means there are multiple copies of the data at any one time, providing a basic redundancy strategy for your content.

The template also configures your deployment to back up the NFS server disks into the Azure Recovery Service vault daily. If you need to take point-in-time backups, use snapshots.

Search server

The Elasticsearch cluster takes snapshots of its index every hour. Those snapshots are backed up to Azure Blob Storage.

Application nodes

The application nodes are VMs in an Azure Virtual Machine Scale Set. Each application node has a Bitbucket installation directory and a local home directory containing things like logs and search indexes.

Like the NFS Server, application nodes are configured with local redundant storage. This means there are multiple copies of the data at any one time.

If you've manually customised any configuration files in the installation directory (for example velocity templates), you may also want to manually back these up as a reference.

Bastion host

As this VM acts as a jumpbox, and doesn't store any data it doesn't need to be backed up. If the VM becomes unresponsive it can be restarted from the Azure Portal.

Application gateway

The application gateway is highly available. As with the bastion host, it doesn't need to be backed up.

Migrating your existing instance into Azure

If you want to migrate data from an existing instance into Bitbucket Data Center in Azure, we recommend that you use the Export and import projects and repositories tool. This tool is only available to users with Bitbucket Data Center licenses.

Disaster recovery

See Disaster recovery guide for Bitbucket Data Center for guidance on developing a disaster recovery strategy. See also information in the Azure documentation about recovering from a region-wide failure Azure resiliency technical guidance: recovery from a region-wide service disruption.

Disaster recovery guide for Bitbucket Data Center

This feature is only for customers with an active Bitbucket Data Center resources license.

This page demonstrates how Bitbucket Data Center can be configured to implement and manage a disaster recovery strategy. It doesn't, however, cover the broader business practices, like setting the key objectives (RTO, RPO & RCO [1]), and standard operating procedures.

A disaster recovery strategy is a key part of a business continuity plan. It defines the processes to follow in the event of a disaster to ensure your business can recover and keep operating from a standby system. This means your Bitbucket instance, and more importantly your Bitbucket managed data (source code), is available in the event that your primary system becomes unavailable.

Overview

Bitbucket Data Center 4.8 or later is required to implement the strategy described in this guide.

Before you begin, read these initial subsections to get familiar with the various components and terminology used in this guide, review the requirements that must be met to follow this guide, and introduce the example scripts used to perform actions described in this guide.

Terminology

Cold standby - This guide describes what is generally referred to as a "cold standby" strategy. That means that the standby Bitbucket instance is not continuously running and that some administrative steps need to be taken to start the standby instance in the event of a disaster scenario.

Recovery Point Objective (RPO) - How up-to-date you require your Bitbucket instance to be after a failure.

Recovery Time Objective (RTO) - How quickly you require your standby system to be available after a failure.

Recovery Cost Objective (RCO) - How much you are willing to spend on your disaster recovery solution.

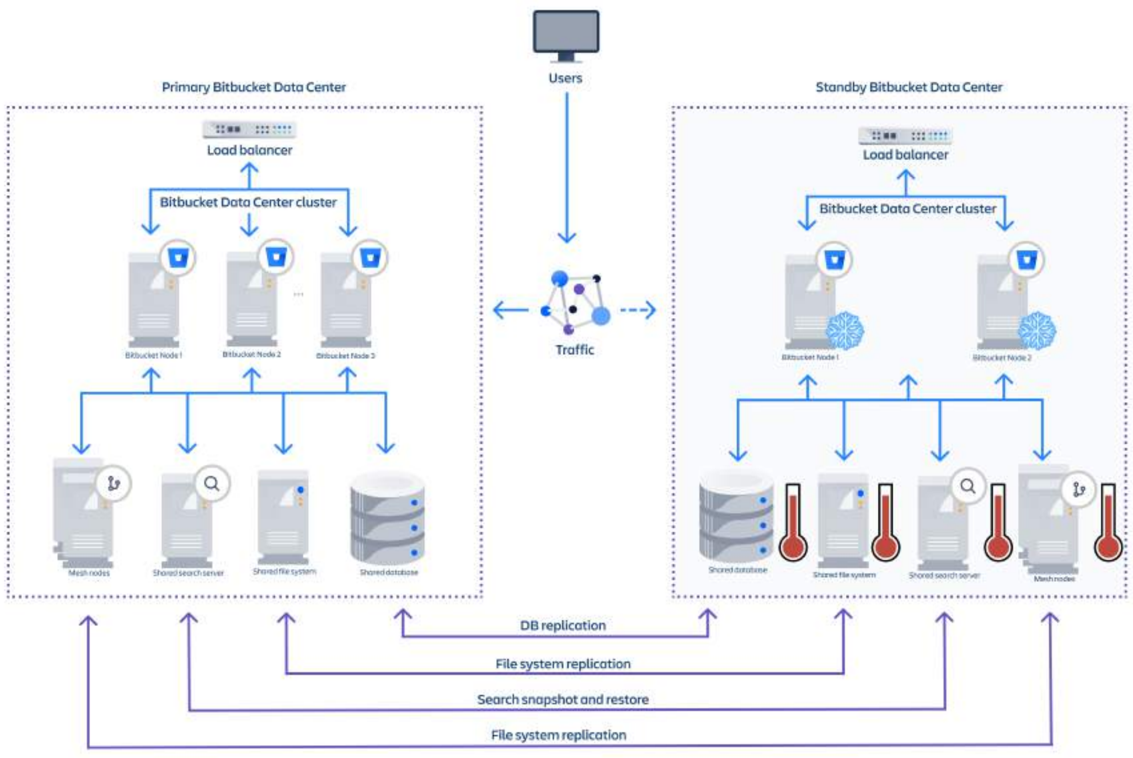
What is the difference between high availability and disaster recovery?

The terms "high availability", "disaster recovery" and "failover" are often confused. To eliminate confusion we define these terms as:

> **High availability** – A strategy to provide a specific level of availability. In Bitbucket's case, access to the application and an acceptable response time. Automated correction and failover (within the same location) are usually part of high-availability planning.
>
> **Disaster recovery** – A strategy to resume operations in an alternate data center (usually in another geographic location), in the event of a disaster whereby the main data center becomes unavailable. Failover (to another location) is a fundamental part of disaster recovery.
>
> **Failover** – is when one machine takes over from another machine, when the aforementioned machines fails. This could be within the same data center or from one data center to another. Failover is usually part of both high availability and disaster recovery planning.

Components

A typical deployment of Bitbucket with a standby for Disaster Recovery is depicted in the following diagram. The standby Bitbucket and Mesh instances are "cold" (i.e., not running) and the shared file server, database and (optionally) search server are "warm" (i.e., running) so that replication can occur.



Example component diagram of a typical DR deployment.

Replication of data sources

Replication of your primary Bitbucket system to a standby system requires:

1. your shared home directory to be on a file system which supports atomic snapshot-level replication to a remote standby, and
2. your database to be capable of replication to a remote standby, and
3. your Mesh home directories to be on a file system that supports atomic snapshot-level replication to a remote standby, if you use Mesh for managing your repositories.

File system

The shared home directory contains your repository data, log files, user-installed plugins, and so on (see Set the home directory for more detail). You need to replicate your shared home directory onto your standby file server. This process needs to be quick, reliable, and incremental to ensure the standby is as up to date as possible.

⚠ **You must choose a file system replication technology that will maintain the data integrity of the Git repositories on disk.** ⚠

For example, a replication technology such as RSync would not meet this requirement, as a repository might change during the transfer, causing corruption.

The best way to achieve the desired level of consistency is to use a file system which supports atomic block level snapshots. All files in the snapshot are effectively frozen at the same point in time regardless of how long the replication to the standby takes. The example scripts implement ZFS as the file system for the Bitbucket shared home, as it allows light weight snapshots which can be transferred and restored on a remote system.

Database

The database contains data about pull requests, comments, users, groups, permissions, and so on. You need to replicate your database and continuously keep it up to date to satisfy your RPO.

See the Supported platforms - Databases section for more details about choosing a supported database technology.

- Oracle: http://www.oracle.com/technetwork/database/features/data-integration/index.html
- PostgreSQL: https://wiki.postgresql.org/wiki/Binary_Replication_Tutorial
- Amazon Relational Database Service (RDS): https://aws.amazon.com/rds/

Mesh nodes

If you use Mesh to manage your Git repositories, you'll also need to create cold standby instances for each of your Mesh nodes. We're exploring support for multi-region deployments of Mesh to ensure each repository is replicated to multiple regions. In such a deployment, Mesh would support hot standby nodes that would be kept in sync by Mesh itself.

For now, you'll need to replicate each Mesh node's home directory to its corresponding standby instance. Similar to the replication of the main cluster's shared home directory, this process needs to be quick, reliable, and incremental to ensure the standby is as up-to-date as possible. In addition, you must use a file system replication technology that supports atomic snapshots to maintain the data integrity of Git repositories on disk.

Search server

This is not technically a key data store as its data derives from a combination of database and repository content. Bitbucket search detects an out of date index and incrementally reconstructs it. However, rebuilding the search index, especially for large installations, can be time consuming, during which search functionality will be impacted.

When the search server is unavailable the core Bitbucket functionality continues to operate normally. Only the search functionality is impacted if the search server is offline or out of date. Bitbucket will serve search queries while its index is being rebuilt, but the search results will not be entirely complete or accurate until the index is completely rebuilt. The search server can be replicated at a lower frequency than the database and file system as Bitbucket only incrementally updates its search index. For example if the search index is a day out of sync, only the changes for the last day need to be indexed. Here are some examples of strategies for search server replication:

- No replication – Bitbucket will rebuild the search index when the standby instance comes online
- Backup and restore (low frequency) – Make regular backups of the search server and restore them on the standby instance. Bitbucket will bring the search index up to date when the standby comes online
- Backup and restore (high frequency) – Snapshot the primary and restore snapshot on the standby at a higher frequency to minimize time to bring the index up to date when the standby comes online

The example scripts implement search server snapshots using either s3 or the shared filesystem as the snapshot repository. These scripts will configure the snapshot repository and take manual snapshots.

These data sources comprise the entire state of your Bitbucket instance. Files added through other means, such as files added by plugins, will require another means of replication. In these cases, contact the plugin vendor for recommendations.

Worked example scripts

Atlassian provides some worked example scripts in the atlassian-bitbucket-diy-backup repository that can optionally be used to automate the Disaster Recovery replication and failover process. Worked examples are currently provided only for the following technologies:

File system and Mesh home directories	Database

• ZFS filesystem	• PostgreSQL Log-Shipping Standby Servers • Amazon RDS Read Replicas

These scripts are meant to serve as a starting point, rather than a fully worked DR solution, and should only be used after first configuring and customizing them for your specific environment.

To get the scripts, clone or pull the latest version of atlassian-bitbucket-diy-backup.

```
git clone git@bitbucket.org:atlassianlabs/atlassian-bitbucket-diy-backup.git
```

The scripts must be configured before use by copying the appropriate `bitbucket.diy-backup.vars.sh.example` to `bitbucket.diy-backup.vars.sh`, and editing to match your environment. Valid configurations for Disaster Recovery are:

```
STANDBY_HOME_TYPE=
                zfs


STANDBY_DATABASE_TYPE=
                  amazon-rds

               or   postgresql
```

You must configure additional variables for these home and database types, and install the same scripts on both the primary and standby systems to use them for Disaster Recovery. Refer to `bitbucket.diy-backup.vars.sh.example` in the atlassian-bitbucket-diy-backup repository for more information on configuring the scripts for Disaster Recovery.

Update to the latest version of the backup scripts

When you create an EBS snapshot, the scripts now tag it with the name of the EBS volume. This 'Device' tag allows the snapshot to be automatically cleaned up, and without it you cannot restore your snapshot.

If you took your snapshot with scripts created before 18 September 2018, it won't have a 'Device' tag and you won't be able to restore it. To fix this, use the AWS console to add a tag to the EBS snapshot with with "Device" as the key and "<device_name>" as the value. <device_name> should be the device name of the EBS volume holding the shared home directory (e.g. "Device" : "/dev /xvdf").

Setting up a standby system

Step 1. Install Bitbucket Data Center 4.8 or later

Install Bitbucket Data Center on the standby instance the same way you would set up a primary instance. The standby instance is effectively an exact replica of the primary instance, and therefore requires all the components deployed in the primary to be deployed in the standby. This includes a single node or clustered data center instance, database, search server and a file server to serve the shared home folder. See Installing Bitbucket Data Center for specific, detailed installation procedures.

DO NOT start Bitbucket on the standby

If you start the Bitbucket service before the failover process, the database and file server replication may fail, preventing the standby from serving as a replica. Starting your standby instance to test your setup is discussed later in the document in the section Disaster recovery testing.

If you use Mesh to manage your repository data, provision a standby Mesh node for each node in your primary instance. Install Mesh on the standby instance the same way you would set up the primary instance, but DO NOT start Mesh on the standby and don’t register the node with Bitbucket.

Step 2. Set up replication to the standby instance

This section contains instructions for setting up replication to your standby instance, so that in the event of a disaster you can failover with minimal data loss.

1. **Set up file server replication** - Set up your standby file server as a replica of your primary. Only the volume containing Bitbucket's shared home directory and any added data stores need to be replicated. Refer to your file server vendor's documentation for more information.

   If using the atlassian-bitbucket-diy-backup worked example scripts, then you can run this command on the *primary* file server:

   ```
   ./setup-disk-replication.sh
   ```

2. **Set up Mesh home directory replication -** For each of your Mesh nodes, set up the standby node as a replica of the primary node. Only the volume containing Mesh's home directory need to be replicated. Refer to your file server vendor's documentation for more information.

   If using the atlassian-bitbucket-diy-backup worked example scripts, then you can run this command on the *primary* Mesh node:

   ```
   ./setup-disk-replication.sh
   ```

3. **Set up database replication** - Set up your standby database as a read replica of your primary database. Refer to your database vendor's documentation for more information.

   If using the atlassian-bitbucket-diy-backup worked example scripts, then you can run this command on the *standby* database:

   ```
   ./setup-db-replication.sh
   ```

4. **Set up search server replication (optional)** - The developers of Elasticsearch, provide detailed instructions on setting up snapshot repositories and how the snapshots contained in these repositories can be transferred to the standby cluster. See their article titled Snapshot And Restore fo r more information. The example scripts will configure the snapshot repository and take manual snapshots using either an s3 or shared filesystem repository.

Step 3. Initiate replication

Once you setup replication, ensure the primary instance is replicating to the standby instance. The method of replication varies depending on the chosen technology. Once set up correctly, most database replication technologies are automatic and do not require ongoing manual steps. File system replication technologies may require the ongoing transfer of snapshots from the primary system to the standby to be automated (for example, via `cron`).

If using the atlassian-bitbucket-diy-backup worked example scripts, then you can manually test file system replication by running this command on the *primary* file server, and each of your *primary* Mesh nodes:

```
./replicate-disk.sh
```

Once file system replication is working, you may add a `crontab` entry for this command on a regular interval (e.g., every minute) as determined by your organization's RPO.

Disaster recovery testing

Practice makes perfect, and this applies to verifying your DR failover process, but there is a serious caveat. As Bitbucket's configuration lives in the shared home folder which is replicated from the primary, the settings in the `bitbucket.properties` file points at production instances, which must be changed before starting the standby instance for testing.

You should exercise extreme care when testing any disaster recovery plan. Simple mistakes could cause your live instance to be corrupted, for example, if testing updates are inserted into a production database. You may detrimentally impact your ability to recover from a real disaster while testing your disaster recovery plan.

It is important to note that your standby instance will be configured as if it was the primary, which can cause issues when testing your disaster recovery plan. When running Bitbucket in disaster recovery mode, the integrity checker may attempt to correct errors it finds when the file server is out of sync with the database. This includes merging, re-opening, and declining pull requests which can cause Jira tickets to update via applinks, and could also send out email notifications.

Before testing your DR deployment

Before testing, isolate your standby instance!

Keep the standby data center as isolated as possible from production systems during testing. You will need to prevent replication from the primary whilst testing your standby instance.

To ensure your standby instance is isolated from your primary instance

1. **Isolate your database -** Temporarily pause all replication to the standby database, then promote the standby database.

   If using the atlassian-bitbucket-diy-backup worked example scripts, you can run this command on the *standby* database:

   ```
   ./promote-db.sh
   ```

2. **Isolate your file system -** Temporarily pause replication to the standby file system, then promote the standby file system.

   If using the atlassian-bitbucket-diy-backup worked example scripts, you can run this command on the *standby* file server:

   ```
   ./promote-home.sh
   ```

3. **Isolate your Mesh nodes -** Temporarily pause replication to each of your standby Mesh nodes' home directory, then promote the standby file system.

   If using the atlassian-bitbucket-diy-backup worked example scripts, you can run this command on each of the *standby* Mesh nodes:

   ```
   ./promote-home.sh
   ```

4. **Edit the `bitbucket.properties` file on the standby -** Update the `bitbucket.properties` file located in the Bitbucket shared home on the standby file server. C hange these properties:
   a. The JDBC connection properties.
   b. The search server connection properties.
   c. Set **`disaster.recovery=true`** .
   d. Update any other settings that point at production instances to use their standby counterpart.

Performing the disaster recovery testing

Once you have isolated your standby instance, you can now test your disaster recovery plan.

To test your DR deployment

1. Ensure that the standby database has been promoted and is writable.
2. Ensure that the new shared home directory is ready.
3. For each of your Mesh nodes, ensure that the new home directory is ready and start Mesh.
4. Ensure your `bitbucket.properties` file is correctly configured.
5. Start Bitbucket.
6. Monitor the Bitbucket log file and check for consistency issues, as described in Running integrity checks in Bitbucket Data Center.

After testing, reset your DR deployment

Resetting your DR deployment involves restoring the standby components into a state whereby replication can occur, and this state differs based on the chosen file server and database replication technology. In many cases it may be easier to setup your standby infrastructure again.

To reset your DR deployment

1. Once validation of the standby instance is complete, stop Bitbucket.
2. Restore the file server to a state in which replication can begin.
3. Restore each of Mesh nodes to a state in which replication can begin.
4. Restore the database to a state in which replication can begin.

Handling a failover

In the event your primary instance is unavailable, you need to failover to your standby system. This section describes how to do this, including instructions on how to check the data in your standby system.

To failover to your standby instance

1. **Promote your standby database** - Ensure the standby database is ready to accept connections and can no longer receive any further updates from the primary. Refer to your database vendor's documentation for more information.

   If using the atlassian-bitbucket-diy-backup worked example scripts, then you can run this command on the *standby* database:

   ```
   ./promote-db.sh
   ```

2. **Promote your standby file server** - Ensure the standby file server can not receive any further updates from the primary. Refer to your file server vendor's documentation for more information.

   If using the atlassian-bitbucket-diy-backup worked example scripts, then you can run this command on the *standby* file server:

   ```
   ./promote-home.sh
   ```

3. **Promote and start your standby Mesh nodes -** For each Mesh node:
   a. Ensure the the standby Mesh node can not receive any further updates from its corresponding primary. Refer to your file system provider’s documentation for more information.

   If using the atlassian-bitbucket-diy-backup worked example scripts, then you can run this command on the *standby* Mesh node:

   ```
   ./promote-home.sh
   ```

   b. Once the Mesh home directory has been promoted, start Mesh.
   c. Connect to the (promoted) standby database and update the Mesh node URL to the (promoted) standby Mesh node instead of the primary.

```
update bb_mesh_node set rpc_url='<standby_url>' where rpc_url='<primary_url>';
```

4. **Edit the `bitbucket.properties` file on the standby** - Update the `bitbucket.properties` file located in the Bitbucket shared home on the standby file server. Set **`disaster.recovery=true`** , and ensure all the properties are appropriate for the standby environment. At a minimum, check that these properties are defined:

    ```
    disaster.recovery=true

    jdbc.url=<the URL of your standby database>

    plugin.search.config.baseurl=<the URL of your standby search server>

    hazelcast.network.tcpip.members=<the IP addresses of your standby cluster nodes>
    ```

    Note that during normal replication, `bitbucket.properties` on the standby is identical to the primary system. During failover, it is important to ensure the configuration of your `bitbucket.properties` file matches the *standby* system's configuration before you start Bitbucket on the standby, or the standby may not start or attempt to connect to services in the primary's environment.

5. Start Bitbucket on one node in the standby instance.
6. Monitor the Bitbucket log file and check for consistency issues, as described in Running integrity checks in Bitbucket Data Center.
7. If required, start the other Bitbucket nodes.
8. Update your DNS, HTTP Proxy, or other front end devices to route traffic to your standby server.
9. Update the mail server configuration if the mail server differs from the production mail server.
10. If you're using Mesh, continue to monitor the Bitbucket logs and check for failing pushes; they may be an indication of inconsistent repository replicas. For any such repository, try to push a new branch or tag to the repository to trigger repairs.

Returning to the primary instance

In most cases, you'll want to return to using your primary instance after you've resolved the problems that caused the disaster. There are basically two approaches for this:

1. Schedule a reasonably-sized outage window. Take a full backup of the standby system's home directory and database (for example, with the tools described in Data recovery and backups), and restore it on the primary system.
2. Take a full backup of each Mesh node's home directory and restore it on the primary system.
3. Run the replication and failover steps in reverse, where the standby system now takes the role of the primary, and the original primary system acts as a standby until you cut over.

Other resources

Troubleshooting

If you encounter problems after failing over to your standby instance, check these FAQs for guidance:

If your database doesn't have the data available that it should, then you'll need to restore the database from a backup.

Application links are stored in the database. If the database replica is up to date, then the application links will be preserved.

You do, however, also need to consider how each end of the link knows the address of the other:

- If you use host names to address the partners in the link and the backup Bitbucket server has the same hostname, via updates to the DNS or similar, then the links should remain intact and working.
- If the application links were built using IP addresses and these aren't the same, then the application links will need to be re-established.
- If you use IP addresses that are valid on the internal company network but your backup system is remote and outside the original firewall, you'll need to re-establish your application links.

Adding and removing Data Center nodes

You can rapidly scale the capacity of Bitbucket Data Center, with no downtime, by provisioning extra cluster nodes. This page describes how to add another cluster node to an *existing* instance of Bitbucket Data Center.

If you are *moving to Bitbucket Data Center from a single instance of Bitbucket Server*, go straight to Installing Bitbucket Data Center, instead.

If you are *new to Bitbucket Data Center*, we suggest you take a look at Clustering with Bitbucket.

If you're looking to improve Git performance and availability of repositories, we suggest you take a look at Bitbucket Mesh and Mirrors.

Things to consider before provisioning a cluster node

We highly recommend provisioning cluster nodes using an automated configuration management tool such as Chef, Puppet, or Vagrant, or by spinning up identical virtual machine snapshots.

Minimum requirements for cluster nodes

Each Bitbucket cluster node runs the Bitbucket Data Center web application, and each should meet these minimum requirements:

- Each Bitbucket cluster node must be a dedicated machine, although machines may be physical or virtual.
- Cluster nodes must be connected in a high speed LAN (that is, they must be physically in the same data center).
- Bitbucket Server supported platforms requirements, including those for Java and Git, apply to each cluster node.
- For consistent performance, each cluster node should be nearly identical, or as similar as possible.
- All cluster nodes must run the same version of Bitbucket Data Center.
- All cluster nodes must have synchronized clocks (for example, using NTP) and be configured with the identical timezone.

Adding a node

1. Mount the shared home directory on the node

Bitbucket Data Center makes use of a shared file system that lives on a dedicated machine and is accessible using NFS. See Installing Bitbucket Data Center for more information.

Mount the shared home directory as `${BITBUCKET_HOME}/shared`. For example, suppose your Bitbucket home directory is `/var/atlassian/application-data/bitbucket`, and your shared home directory is available as an NFS export called `bitbucket-san:/bitbucket-shared`. Add the following line to `/etc/fstab` on the cluster node:

/etc/fstab

```
bitbucket-san:/bitbucket-shared /var/atlassian/application-data/bitbucket/shared nfs nfsvers=3,
lookupcache=pos,noatime,intr,rsize=32768,wsize=32768 0 0
```

Then mount it:

```
mkdir -p /var/atlassian/application-data/bitbucket/shared
sudo mount -a
```

2. Install Bitbucket Data Center on the node

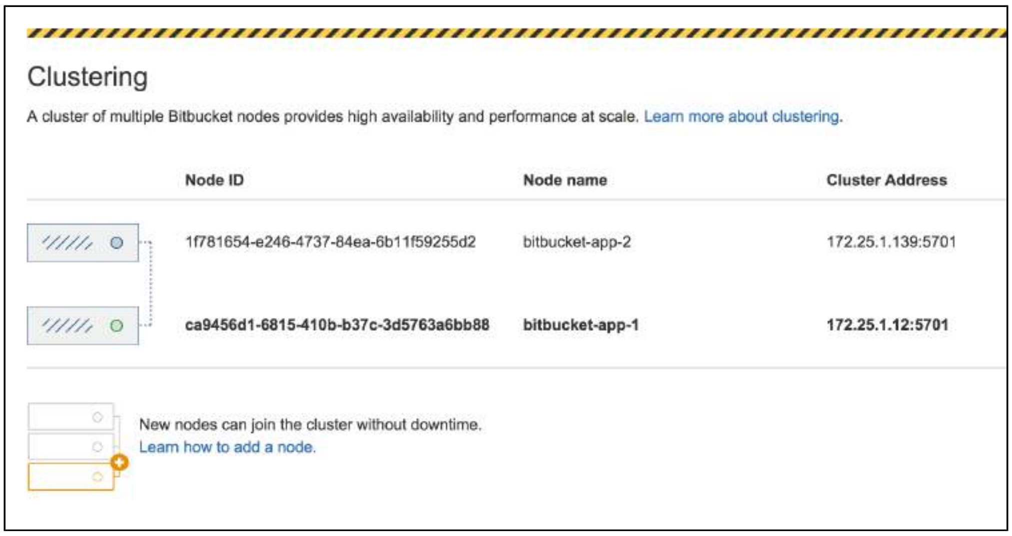
Download the latest Bitbucket Data Center distribution from https://www.atlassian.com/software/bitbucket/download, and install Bitbucket Server on the cluster node by either using the installer or by installing the application manually from an archive file.

3. Add the node to the cluster

Start Bitbucket Server on the new node. See Start and stop Bitbucket. You can optionally give the node a persistent, human readable name by setting a `node.name` system property under `JVM_SUPPORT_RECOMMENDED_ARGS` in _start-webapp.sh For example:

```
-Dcluster.node.name=bitbucket-1
```

Once Bitbucket Server starts, go to `http://<load-balancer>/admin/clustering`. You should see the new node listed, which would look similar to this:



Clustering

A cluster of multiple Bitbucket nodes provides high availability and performance at scale. Learn more about clustering.

Node ID	Node name	Cluster Address
1f781654-e246-4737-84ea-6b11f59255d2	bitbucket-app-2	172.25.1.139:5701
ca9456d1-6815-410b-b37c-3d5763a6bb88	**bitbucket-app-1**	**172.25.1.12:5701**

New nodes can join the cluster without downtime.
Learn how to add a node.

Verify that the new node you have started up has successfully joined the cluster. If it does not, check your network configuration and the `${BITBUCKET_HOME}/log/atlassian-bitbucket.log` files on all nodes. If you are unable to find a reason for the node failing to join successfully, contact Atlassian Support .

4. Connect the node to the load balancer

Bitbucket Data Center makes use of a load balancer to distribute requests from your users to the cluster nodes. If a cluster node goes down, the load balancer immediately detects the failure and automatically directs requests to the other nodes within seconds. See Installing Bitbucket Data Center for more information.

If you are using a hardware or software load balancer other than HAProxy, consult your vendor's documentation on how to add the new Bitbucket cluster node to the load balancer.

If you are using HAProxy, simply add the following lines to your `haproxy.cfg` file:

```
# In the backend bitbucket_http_backend section, add:
server bitbucket<xx> 192.168.0.<x>:7990 check inter 10000 rise 2 fall 5
```

```
# In the backend bitbucket_ssh_backend section, add:
server bitbucket<xx> 192.168.0.<x>:7999 check port 7999
```

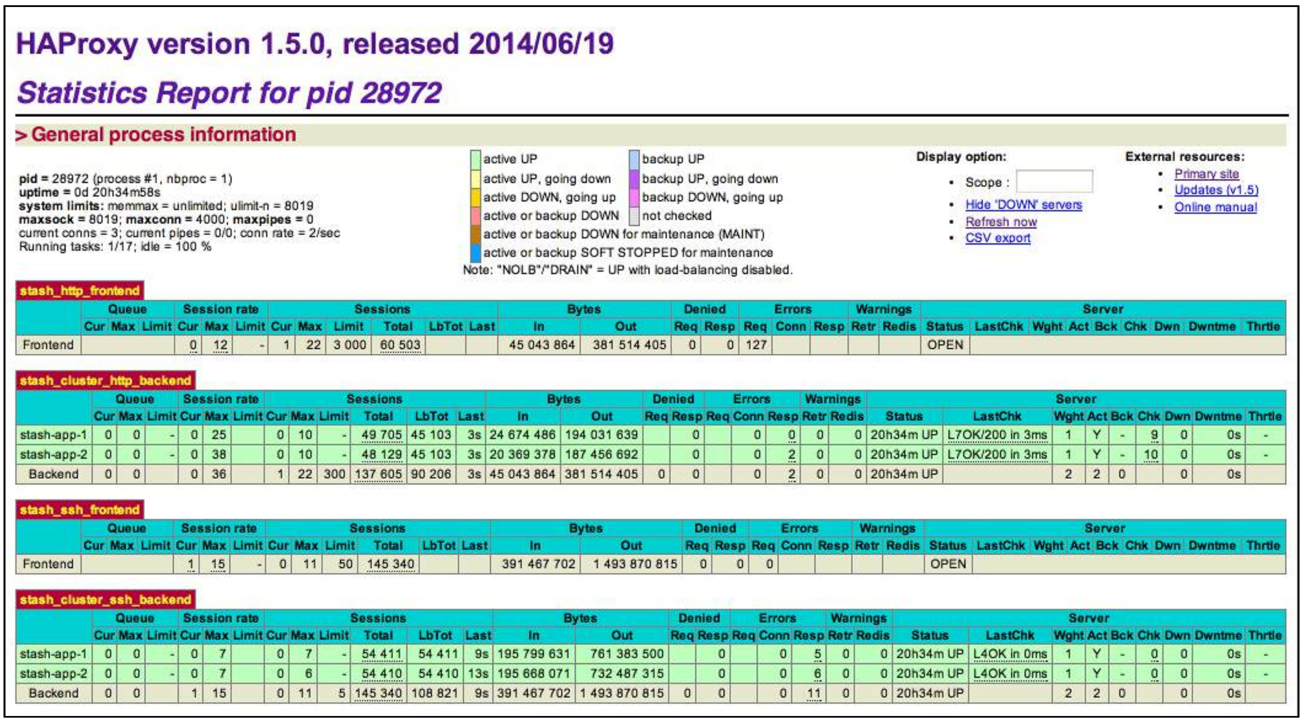
where the values for <x> and <xx> don't conflict with an existing node.

Now restart HAProxy :

```
sudo service haproxy restart
```

Verify that the new node is in the cluster and receiving requests by checking the logs on each node to ensure that all are receiving traffic. Also check that updates done on one node are visible on the other nodes.

You can monitor the health of your cluster by navigating to HAProxy's statistics page at `http://<load-balancer>:8090/`. You should see a page similar to this:



HAProxy version 1.5.0, released 2014/06/19

Statistics Report for pid 28972

> General process information

pid = 28972 (process #1, nbproc = 1)
uptime = 0d 20h34m58s
system limits: memmax = unlimited; ulimit-n = 8019
maxsock = 8019; **maxconn** = 4000; **maxpipes** = 0
current conns = 3; current pipes = 0/0; conn rate = 2/sec
Running tasks: 1/17; idle = 100 %

active UP	backup UP
active UP, going down	backup UP, going down
active DOWN, going up	backup DOWN, going up
active or backup DOWN	not checked
active or backup DOWN for maintenance (MAINT)	
active or backup SOFT STOPPED for maintenance	

Note: "NOLB"/"DRAIN" = UP with load-balancing disabled.

Display option:
- Scope :
- Hide 'DOWN' servers
- Refresh now
- CSV export

External resources:
- Primary site
- Updates (v1.5)
- Online manual

stash_http_frontend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
Frontend				0	12	-	1	22	3 000	60 503			45 043 864	381 514 405	0	0	127					OPEN								

stash_cluster_http_backend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
stash-app-1	0	0	-	0	25		0	10	-	49 705	45 103	3s	24 674 486	194 031 639		0		0	0	0	0	20h34m UP	L7OK/200 in 3ms	1	Y	-	9	0	0s	-
stash-app-2	0	0	-	0	38		0	10	-	48 129	45 103	3s	20 369 378	187 456 692		0		0	2	0	0	20h34m UP	L7OK/200 in 3ms	1	Y	-	10	0	0s	-
Backend	0	0		0	36		1	22	300	137 605	90 206	3s	45 043 864	381 514 405	0	0		0	2	0	0	20h34m UP		2	2	0		0	0s	

stash_ssh_frontend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
Frontend				1	15	-	0	11	50	145 340			391 467 702	1 493 870 815	0	0	0					OPEN								

stash_cluster_ssh_backend

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle
stash-app-1	0	0	-	0	7		0	7	-	54 411	54 411	9s	195 799 631	761 383 500		0		0	5	0	0	20h34m UP	L4OK in 0ms	1	Y	-	0	0	0s	-
stash-app-2	0	0	-	0	7		0	6	-	54 410	54 410	13s	195 668 071	732 487 315		0		0	6	0	0	20h34m UP	L4OK in 0ms	1	Y	-	0	0	0s	-
Backend	0	0		1	15		0	11	5	145 340	108 821	9s	391 467 702	1 493 870 815	0	0		0	11	0	0	20h34m UP		2	2	0		0	0s	

Removing a node

To remove a node, stop Bitbucket on that node. You can then remove the installation and local home directory as required.

To see the number of nodes remaining, go to **Administration** > **Clustering**.

Scaling up and down in AWS and Azure

If you deployed Bitbucket Data Center on AWS or Azure, your Bitbucket nodes will be in scaling groups. You will add and remove nodes either by changing the minimum and maximum size of each group or using a scaling plan. See the following resources for more info:

- Getting started with Bitbucket Data Center on AWS
- Administering Bitbucket Data Center in Azure

Moving to a non-clustered Data Center

If you no longer need clustering, but still want access to Data Center features, you can go back to a non-clustered (single node) Data Center installation. In these instructions we'll assume that you'll use one of your existing cluster nodes as your new, standalone installation. You'll also need to make some infrastructure changes as part of the switch.

What about the features?

After moving to a single node Data Center, you will lose capabilities that are based on clustering, such as instant scalability or performance and scale. For the complete list of features, see Server and Data Center feature comparison.

Before you begin

We recommend completing this process in a staging environment, and running a set of functional tests, integration tests, and performance tests, before making these changes in production.

1. Shut down Bitbucket

Stop all cluster nodes before you proceed.

2. Configure your load balancer

Configure your load balancer to redirect traffic away from all Bitbucket nodes, except the node you plan to use for your standalone installation.

If you no longer need your load balancer, you can remove it at this step.

3. Move items in the cluster shared home back to local home

1. Unmount the `<shared home>` directory and copy its contents to the `<local home>/shared` directory.

Make sure that the path to the shared subdirectory remains the same, as Git repositories are using absolute paths to other repositories and will break if the path changes.

4. Start Bitbucket

Restart Bitbucket.

To confirm you're now running a standalone installation, go to **Administration** > **Clustering**, which will show you the number of nodes in your cluster.

Deploy Bitbucket Data Center in AWS

The AWS Quick Start template as a method of deployment is nearing its end-of-support date on Februar y 29, 2024. You can still use the template after this date but we won't maintain or update it. Learn more about the AWS deployment template

We recommend deploying your Data Center products on a Kubernetes cluster using our Helm charts for a more efficient and robust infrastructure and operational setup. Learn more about deploying on Kubernetes

AWS now recommends switching launch configurations, which our AWS Quick Start template uses, to la unch templates. We won’t do this switch, since we’re ending our support for the AWS Quick Start template. You’ll still be able to create launch configurations until December 31, 2023.

If you decide to deploy your Data Center instance in a clustered environment, consider using Amazon Web Services (AWS). AWS allows you to scale your deployment elastically by resizing and quickly launching additional nodes, and provides a number of managed services that work with Data Center products. These services make it easier to configure, manage, and maintain your deployment's clustered infrastructure.

We recommend deploying your Data Center instance on a Kubernetes cluster using our Helm charts. This allows you to stay in control of your data and meet your compliance needs while still using a modern infrastructure. Learn more about running Data Center products on Kubernetes

Interested in learning more about what Data Center provides? Check out the Data Center overview

Non-clustered VS clustered environment

A single node is adequate for most Small or Medium size deployments, unless you need high availability or zero-downtime upgrades.

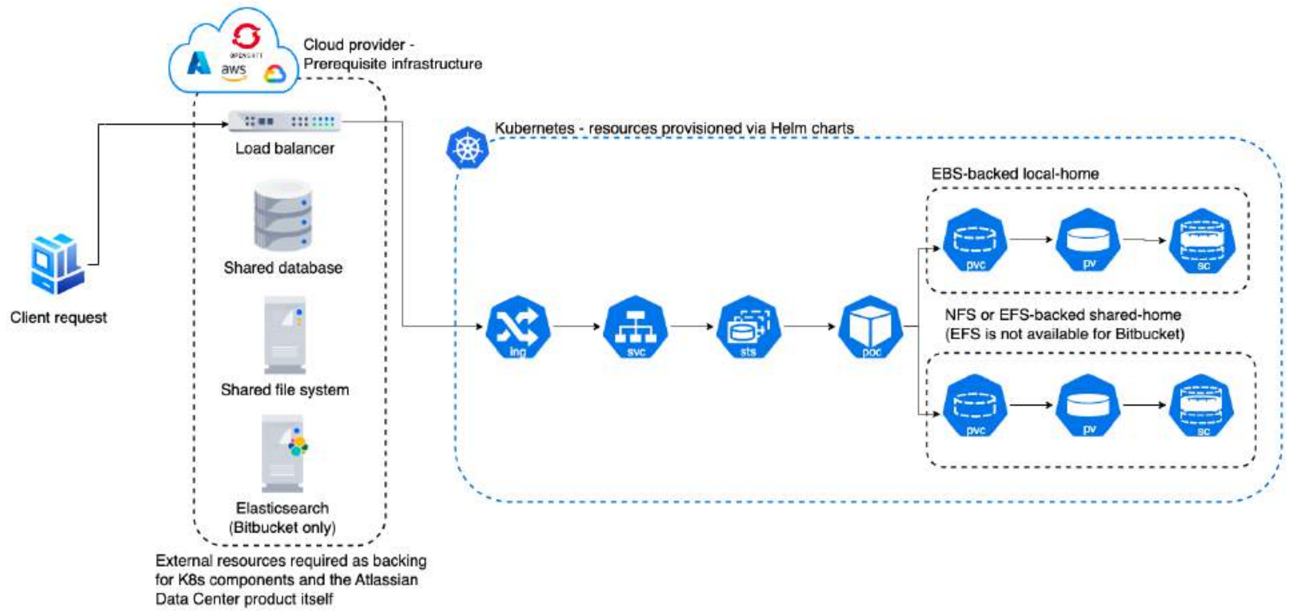
If you have an existing Server installation, you can still use its infrastructure when you upgrade to Data Center. Many features exclusive to Data Center (like SAML single sign-on, self-protection via rate limiting, and CDN support) don't require clustered infrastructure. You can start using these Data Center features by simply upgrading your Server installation’s license.

For more information on whether clustering is right for you, check out Atlassian Data Center architecture and infrastructure options

Deploying Data Center products in a cluster using the AWS EKS

You can deploy your Data Center instance using a managed Kubernetes cluster service. Learn how to prepare a Kubernetes cluster using Amazon EKS

Here's an overview of the architecture for a Data Center instance running in Kubernetes:


Cloud provider - Prerequisite infrastructure
Client request
Load balancer
Shared database
Shared file system
Elasticsearch (Bitbucket only)
External resources required as backing for K8s components and the Atlassian Data Center product itself
Kubernetes - resources provisioned via Helm charts
ing
svc
sts
pod
EBS-backed local-home
NFS or EFS-backed shared-home (EFS is not available for Bitbucket)
pvc
pv
sc

For more information, see Atlassian products on AWS.

⚠ Even though you can deploy our Data Center products on AWS GovCloud, we don't test or verify our Helm charts on the AWS GovCloud environment and can't provide any support.

Deploy your instance with AWS

Create components

Before you deploy your Data Center product with AWS, you need to create the required infrastructure components. These include a database, a Kubernetes cluster, and shared storage. Learn more about the prerequisites

Take advantage of Helm charts

If you decide to deploy your Data Center instance on AWS with Kubernetes, make sure to use our Helm charts. Learn how to install your Data Center product with Helm charts

Administer Bitbucket Data Center in AWS

The AWS Quick Start template as a method of deployment is nearing its end-of-support date on February 29, 2024. You can still use the template after this date but we won't maintain or update it. Learn more about the AWS deployment template

We recommend deploying your Data Center products on a Kubernetes cluster using our Helm charts for a more efficient and robust infrastructure and operational setup. Learn more about deploying on Kubernetes

AWS now recommends switching launch configurations, which our AWS Quick Start template uses, to launch templates. We won’t do this switch, since we’re ending our support for the AWS Quick Start template. You’ll still be able to create launch configurations until December 31, 2023.

While working with Bitbucket on AWS, you can expand your environment by adding additional nodes, upgrade the existing nodes, or connect to them over SSH.

Connecting to your instance using SSH

You can perform node-level configuration or maintenance tasks on your deployment through the AWS Systems Manager Sessions Manager. This browser-based terminal lets you access your nodes without any SSH Keys or a Bastion host. For more information, see Getting started with Session Manager.

Access via Bastion host

You can also access your nodes via a Bastion host (if you deployed one). To do this, you'll need your SSH private key file (the PEM file you specified for the **Key Name** parameter). Remember, this key can access all nodes in your deployment, so keep this key in a safe place.

The Bastion host acts as your "jump box" to any instance in your deployment's internal subnets. That is, access the Bastion host first, and from there access any instance in your deployment.

The Bastion host's public IP is the `BastionPubIp` output of your deployment's `ATL-BastionStack` stack. This stack is nested in your deployment's Atlassian Standard Infrastructure (ASI). To access the Bastion host, use `ec2-user` as the user name, for example:

```
ssh -i keyfile.pem ec2-user@<BastionPubIp>
```

The `ec2-user` has `sudo` access. SSH access is by `root` is not allowed.

Configure SSL to enable HTTPS

To enhance Bitbucket's security, you should use a proper SSL certificate obtained from a reputable Certificate Authority (CA). See Securing Bitbucket in AWS for instructions on how to do this.

Backing up your instance

The Atlassian Bitbucket Server AMI includes a complete set of Bitbucket Server DIY Backup scripts which has been built specifically for AWS. For instructions on how to backup and restore your instance please refer to Using Bitbucket Server DIY Backup in AWS.

Upgrading

Before upgrading to a later version of Bitbucket Data Center:

1. Check if your apps are compatible with that version. Update your apps if needed. For more information about managing apps, see Using the Universal Plugin Manager.
2. Enable integrity checks (if you haven't already).

We strongly recommend that you perform the upgrade first in a *staging* environment before upgrading your production instance. How to establish staging server environments for Bitbucket Server provides helpful tips on doing so.

Upgrading a Bitbucket Data Center on AWS involves three steps:

Step 1: Terminate all running Bitbucket Data Center application nodes

Set the number of application nodes used by the Bitbucket Data Center stack to 0. Then, update the stack.

1. In the AWS console, go to **Services > CloudFormation**. Select your deployment’s stack to view its Stack Details.
2. In the Stack Details screen, click **Update Stack**.
3. From the **Select Template** screen, select **Use current template** and click **Next**.
4. You’ll need to terminate all running nodes. To do that, set the following parameters to 0:
    a. **Maximum number of cluster nodes**
    b. **Minimum number of cluster nodes**
5. Click **Next**. Click through the next pages, and then to apply the change using the **Update** button.
6. Once the update is complete, check that all application nodes have been terminated.

Step 2: Update the version used by your Bitbucket Data Center stack

Set the number of application nodes used by Bitbucket Data Center to 1. Configure it to use the version you want. Then, update the stack again.

1. From your deployment’s Stack Details screen, click **Update Stack** again.
2. From the **Select Template** screen, select **Use current template** and click **Next**.
3. Set the **Version** parameter to the version you’re updating to.
4. Configure your stack to use one node. To do that, set the following parameters to 1:
    a. **Maximum number of cluster nodes**
    b. **Minimum number of cluster nodes**
5. Click **Next**. Click through the next pages, and then to apply the change using the **Update** button.

Step 3: Scale up the number of application nodes

You can now scale up your deployment to your original number of application nodes. For detailed instructions on how do to this, see Scaling up and down.

Stopping and starting your EC2 instance

An EC2 instance launched from the Atlassian Bitbucket Server AMI can be stopped and started just as any machine can be powered off and on again.

When stopping your EC2 instance, it is important to first

1. Stop the `atlbitbucket`, `atlbitbucket_search`, and `postgresql93` services.
2. Unmount the `/media/atl` filesystem.

If your EC2 instance becomes unavailable after stopping and restarting

When starting your EC2 instance back up again, if you rely on Amazon's automatically assigned public IP address (rather than a fixed private IP address or Elastic IP address) to access your instance, your IP address may have changed. When this happens, your instance can become inaccessible and display a "The host name for your Atlassian instance has changed" page. To fix this you need to update the hostname for your Bitbucket Server instance.

To update the hostname for your Bitbucket Server instance

1. Restart the Bitbucket service on all application nodes by running this command, which will update the hostname

```
sudo service atlbitbucket restart
```

2. Wait for Bitbucket Server to restart.
3. If you have also set up Bitbucket Server's Base URL to be the public DNS name or IP address be sure to also update Bitbucket Server's base URL in the administration screen to reflect the change.

Migrating your existing Bitbucket Server or Bitbucket Data Center instance into AWS

Migrating an existing instance to AWS involves moving consistent backups of your `${BITBUCKET_HOME}` a nd your database to the AWS instance.

To migrate your existing instance into AWS

1. Check for any known migration issues in the Bitbucket Data Center and Server Knowledge Base.
2. Alert users to the forthcoming service outage.
3. Create a user in the Bitbucket Server Internal User Directory with `SYSADMIN` permissions to the instance so you don't get locked out if the new server is unable to connect to your User Directory.
4. Take a backup of your instance with either the Bitbucket Server Backup Client (Bitbucket Server only) or the Bitbucket Server DIY Backup (Bitbucket Server or Data Center).
5. Launch Bitbucket Server in AWS using the Quick Start instructions, which uses a CloudFormation template.
6. Connect to your AWS EC2 instance with SSH and upload the backup file.
7. Restore the backup with the same tool used to generate it.
8. If necessary, update the JDBC configuration in the `${BITBUCKET_HOME}/shared/bitbucket.properties` file.

Resizing the data volume in your Bitbucket Server instance

By default, the application data volume in an instance launched from the Atlassian Bitbucket Server AMI is a standard Linux ext4 filesystem, and can be resized using the standard Linux command line tools.

To resize the data volume in your Bitbucket Server instance

1. Stop the `atlbitbucket`, `atlbitbucket_search`, and `postgresql93` services.
2. Unmount the `/media/atl` filesystem.
3. Create a snapshot of the volume to resize.
4. Create a new volume from the snapshot with the desired size, in the same availability zone as your EC2 instance.
5. Detach the old volume and attach the newly resized volume as `/dev/sdf`.
6. Resize `/dev/sdf` using `resize2fs`, verify that its size has changed, and remount it on `/media/atl` .
7. Start the `atlbitbucket`, `atlbitbucket_search`, and `postgresql93` services.

For more information, see Expanding the Storage Space of an EBS Volume on Linux, Expanding a Linux Partition, and the Linux manual pages for `resize2fs` and related commands.

Moving your Bitbucket Server data volume between instances

Occasionally, you may need to move your Bitbucket Server data volume to another instance–for example, when setting up staging or production instances, or when moving to an instance to a different availability zone.

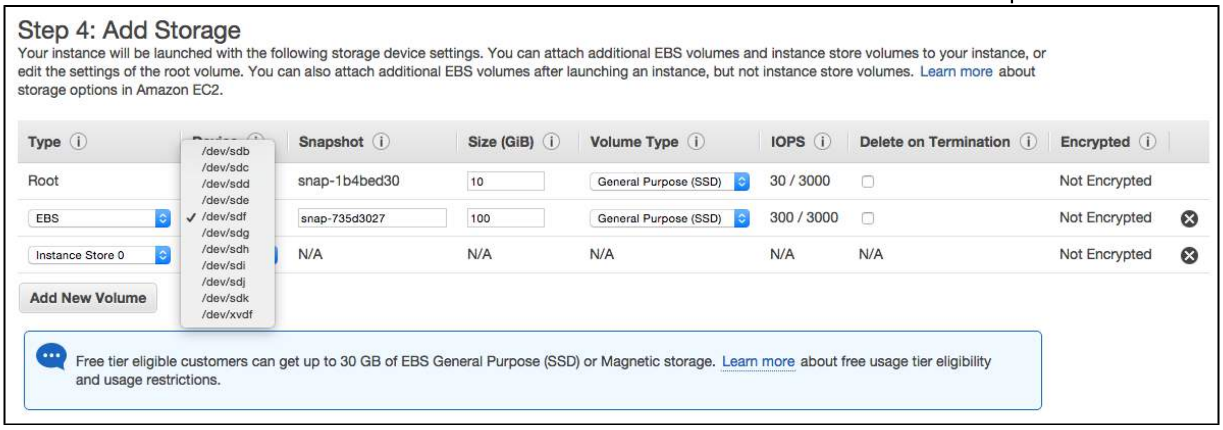
There are two approaches to move your Bitbucket Server data volume to another instance

1. Take a backup of your data volume with Bitbucket Server DIY Backup, and restore it on your new instance. See Using Bitbucket Server DIY Backup in AWS for this option.
2. Launch a new instance from the Atlassian Bitbucket Server AMI with a snapshot of your existing data volume.

> A Bitbucket Server data volume may only be moved to a Bitbucket Server instance of the same or higher version than the original.

To launch a new instance from the Bitbucket Server AMI using a snapshot of your existing Bitbucket Server data volume

1. Stop the `atlbitbucket`, `atlbitbucket_search`, and `postgresql93` services on your existing Bitbucket Server instance.
2. Unmount the `/media/atl` filesystem.
3. Create a snapshot of the Bitbucket Server data volume (the one attached to the instance as `/dev/sdf`).
4. Once the snapshot generation has completed, launch a new instance from the Atlassian Bitbucket Server AMI as described in Launch Bitbucket in AWS manually. When adding storage, change the EBS volume device to `/dev/sdf` as seen below and enter the id of the created snapshot.



Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. Learn more about storage options in Amazon EC2.

Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Delete on Termination	Encrypted
Root		snap-1b4bed30	10	General Purpose (SSD)	30 / 3000	☐	Not Encrypted
EBS	✓ /dev/sdf	snap-735d3027	100	General Purpose (SSD)	300 / 3000	☐	Not Encrypted
Instance Store 0		N/A	N/A	N/A	N/A	N/A	Not Encrypted

Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. Learn more about free usage tier eligibility and usage restrictions.

5. If the host name (private or public) that users use to reach your Bitbucket Server instance has changed as a result of moving availability zones (or as a result of stopping an instance and starting a new one) you will need to SSH in and run
   `sudo /opt/atlassian/bin/atl-update-host-name.sh` <*newhostname*>
   where <*newhostname*> is the new host name.
6. Once Bitbucket Server has restarted your new instance should be fully available.
7. If the host name has changed you should also update the JDBC URL configuration in the `bitbucket.properties` file (typically located in `/var/atlassian/application-data/bitbucket/shared/`), as well as Bitbucket Server's base URL in the administration screen to reflect this.

Scaling up and down

To increase or decrease the number of application nodes:

1. Sign in to the AWS Management Console, use the region selector in the navigation bar to choose the AWS Region for your deployment, and open the AWS CloudFormation console at https://console.aws.amazon.com/cloudformation/.

2. Click the **Stack name** of your deployment. This will display your deployment's **Stack info**. From there, click **Update**.
3. On the **Select Template** page, leave **Use current template** selected, and then choose **Next**.
4. On the **Specify Details** page, go to the **Cluster nodes** section of **Parameters**. From there, set your desired number of application nodes in the following parameters:
    a. **Minimum number of cluster nodes**
    b. **Maximum number of cluster nodes**
5. Click through to update the stack.

Disabled Auto Scaling

Since your cluster has the same minimum and maximum number of nodes, Auto Scaling is effectively disabled.

Setting different values for the minimum and maximum number of cluster nodes enables Auto Scaling. This dynamically scale the size of your cluster based on system load.

However, we recommend that you keep Auto Scaling disabled. At present, Auto Scaling can't effectively address sudden spikes in your deployment's system load. This means that you'll have to manually re-scale your cluster depending on the load.

Vertical VS horizontal scaling

Adding new cluster nodes, especially automatically in response to load spikes, is a great way to increase capacity of a cluster temporarily. Beyond a certain point, adding very large numbers of cluster nodes will bring diminishing returns. In general, increasing the size of each node (i.e., "vertical" scaling) will be able to handle a greater sustained capacity than increasing the number of nodes (i.e., "horizontal" scaling), especially if the nodes themselves are small. See Recommendations for running Bitbucket in AWS for more information.

Recommendations for running Bitbucket Data Center in AWS

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We recommend deploying your Data Center products on a Kubernetes cluster using our Helm charts for a more efficient and robust infrastructure and operational setup. Learn more about deploying on Kubernetes

AWS now recommends switching launch configurations, which our AWS Quick Start template uses, to la unch templates. We won't do this switch, since we're ending our support for the AWS Quick Start template. You'll still be able to create launch configurations until December 31, 2023.

Knowing your load profile is useful for planning your instance's growth, looking for inflated metrics, or simply keeping it at a reasonable size. In Bitbucket Data Center load profiles, we showed you some simple guidelines for finding out if your instance was *Small*, *Medium*, *Large*, or *XLarge*. We based these size profiles on Server and Data Center case studies, covering varying infrastructure sizes and configurations.

A single node can be adequate for most Small or Medium size deployments, especially if you don't require high availability. If you have an existing Server installation, you can still use its infrastructure when you upgrade to Data Center. Many features exclusive to Data Center (like SAML single sign-on, self-protection via rate limiting, and CDN support) don't require clustered infrastructure. You can start using these Data Center features by simply upgrading your Server installation's license.

For more information on whether clustering is right for you, check out Atlassian Data Center architecture and infrastructure options.

As your load grows closer to Large or XLarge, you should routinely evaluate your infrastructure. Once your environment starts to experience performance or stability issues, consider migrating to a clustered (or cluster-ready) infrastructure. When you do, keep in mind that it may not be always clear how to do that effectively – for example, adding more application nodes to a growing Medium-sized instance doesn't always improve performance (in fact, the opposite might happen).

To help you plan your infrastructure set-up or growth, we ran a series of performance tests on typical Medium, Large, and XLarge instances. We designed these tests to get useful, data-driven recommendations for your clustered deployment's application and database nodes. These recommendations can help you plan a suitable clustered environment, one that is adequate for the size of your projected content and traffic.

Note that large repositories might influence performance.

We advise that you monitor performance on a regular basis.

Approach

We ran all tests in AWS. This allowed us to easily define and automate multiple tests, giving us a large (and fairly reliable) sample.

Each part of our test infrastructure was provisioned from a standard AWS component available to all AWS users. This allows for easy deployment of recommended configurations. You can also use AWS Quick Starts for deploying Bitbucket Data Center.

It also means you can look up specifications in AWS documentation. This helps you find equivalent components and configurations if your organization prefers a different cloud platform or bespoke clustered solution.

Some things to consider

To effectively benchmark Bitbucket on a wide range of configurations, we designed tests that could be easily set up and replicated. Accordingly, when referencing our benchmarks for your production environment, consider:

- We didn't install apps on our test instances, as we focused on finding the right configurations for the *core* product. When designing your infrastructure, you need to account for the impact of apps you want to install.
- We used RDS with default settings across all tests. This allowed us to get consistent results with minimal setup and tuning.
- Our test environment used dedicated AWS infrastructure hosted on the same subnet. This helped minimize network latency.
- We used an internal testing tool called Trikit to simulate the influx of git packets. This gave us the ability to measure git request speeds without having to measure client-side git performance. It also meant our tests didn’t unpack git refs, as the tool only receives and decrypts git data.
- The performance (response times) of git operations will be affected largely by repository size. Our test repositories averaged 14.2MB in size. We presume that bigger repositories might require stronger hardware.
- Due to limitations in AWS, we initialized EBS volumes (storage blocks) on the NFS servers before starting the test. Without disk initializations, there is a significant increase in disk latency, and test infrastructure slows for several hours.

  We enabled **analytics** on each test instance to collect usage data. For more information, see Change data collection settings.

Methodology

Each test involved applying the same amount of traffic to a Bitbucket data set, but on a different AWS environment. We ran three series of tests, each designed to find optimal configurations for the following components:

- Bitbucket application node
- Database node
- NFS node

To help ensure benchmark reliability, we initialized the EBS volumes and tested each configuration for three hours. We observed stable response times throughout each test. Large instance tests used **Bitbucket Data Center 5.16** while XLarge used **Bitbucket Data Center 6.4.** We used a custom library (Trikit) running v1 protocol to simulate Git traffic.

Data sets

We created a Large-sized Bitbucket Data Center instance with the following dimensions:

Metric	Value (approximate)
Repositories	52,000
Active users	25,000
Pull requests	850,000
Traffic (git operations per hour)	40,000

Content and traffic profiles are based on Bitbucket Data Center load profiles, which put the instance’s overall load profile at the highest level *of Large* profile. We believe these metrics represent a majority of real-life, Large-sized Bitbucket Data Center instances.

Metric	Value (approximate)
Users	25,000
Groups	50,000
Projects (including personal)	16,700

Comments on pull requests	3,500,000

Metric	Total	Component	Value (approximate)
Total repositories	52,000	Regular repositories	26,000
		Public forks	9,000
		Private repositories	17,000
Total pull requests	859,000	Pull requests open	8,500
		Pull requests merged	850,000
Traffic (git operations per hour)	40,000	Clones	16,000
		Fetches	14,000
		Pushes	10,000

We created an XLarge-sized Bitbucket Data Center instance with the following dimensions:

Metric	Value (approximate)
Repositories	110,000
Active users	50,000
Pull requests	1,790,000
Traffic (git operations per hour)	65,000

Content and traffic profiles are based on Bitbucket Data Center load profiles, which put the instance's overall load profile at the *XLarge* profile. We believe these metrics represent a majority of real-life, XLarge-sized Bitbucket Data Center instances.

Metric	Value (approximate)
Users	25,000
Groups	3,000
Projects (including personal)	52,000
Comments on pull requests	8,700,000

Metric	Total	Component	Value (approximate)
Total repositories	105,000	Regular repositories	52,000
		Public forks	17,000
		Private repositories	35,000
Total pull requests	1,790,000	Pull requests open	130,000
		Pull requests merged	1,660,000
Traffic (git operations per hour)	70,000	Clones	18,700
		Fetches	25,300
		Pushes	26,000

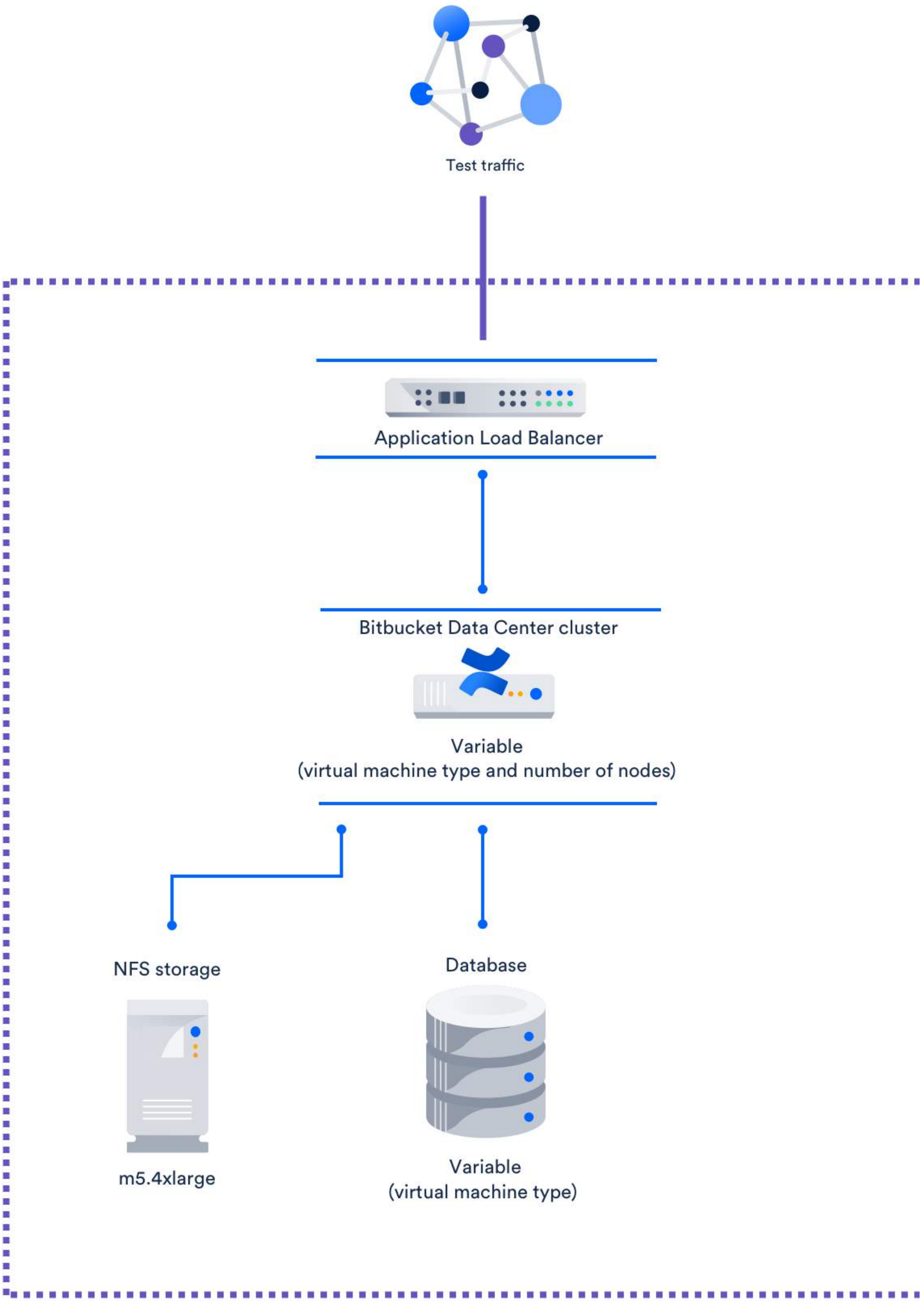
Benchmark

We used the following benchmark metrics for our tests.

Benchmark metric	Threshold	Reason
Git throughput, or the number of git hosting operations (fetch/clone/push) per hour	**32,700 (Minimum) for Large** and **65,400 (Minimum) for XLarge,** the higher the better	These thresholds are the upper limits of traffic defined in Bitbucket Data Center load profiles. We chose them due to the spiky nature of git traffic.
Average CPU utilization (for application nodes)	**75% (Maximum)**, the lower the better	When the application nodes reach an average of CPU usage of 75% and above, Bitbucket's adaptive throttling starts queuing Git hosting operations to ensure the responsiveness of the application for interactive users. This slows down Git operations.
Stability	No nodes go offline	When the infrastructure is inadequate in handling the load it may lead to node crashes.

The test traffic had fixed sleep times to modulate the volume of git hosting operations. This means the benchmarked git throughput doesn't represent the maximum each configuration can handle.

Architecture


Test traffic
Application Load Balancer
Bitbucket Data Center cluster
Variable
(virtual machine type and number of nodes)
NFS storage
m5.4xlarge
Database
Variable
(virtual machine type)

We tested each configuration on a freshly-deployed Bitbucket Data Center instance on AWS. Every configuration followed the same structure:

Function	Number of nodes	Virtual machine type	Notes
Application node	Variable	m5.xlarge m5.2xlarge m5.4xlarge m5.12xlarge m5.24xlarge	When testing m5.xlarge (16GB of RAM), we used 8GB for JVM heap. For all others, we used 12GB for JVM heap. Minimum heap (Xms) was set to 1G for all the tests. We've observed that using a smaller JVM heap (2-3GB) is enough for most instances. Also note that Git operations are expensive in terms of memory consumption and are executed outside of the Java virtual machine. See more on Scaling Bitbucket Data Center. Each Bitbucket application used 30GB General Purpose SSD (gp2) for local storage. This disk had an attached EBS volume with a baseline of 100 IOPS, burstable to 3,000 IOPS.
Database	1	m5.xlarge m5.2xlarge m5.4xlarge	We used Amazon RDS Postgresql version 9.4.15, with default settings. Each test only featured one node.
NFS storage	1	m5.4xlarge m5.2xlarge m5.xlarge	Our NFS server used a 900GB General Purpose SSD (gp2) for storage. This disk had an attached EBS volume with a baseline of 2700 IOPS, burstable to 3,000 IOPS. As mentioned, we initialized this volume at the start of each test. For more information on setting up Bitbucket Data Center's shared file server, see Step 2. Provision your shared file system (in Install Bitbucket Data Center). This section contains the requirements and recommendations for setting up NFS for Bitbucket Data Center.
Load balancer	1	AWS Application Load Balancer (ELB)	We used AWS Elastic Load Balancer. Application Load Balancer at the time of performance testing doesn't handle SSH traffic.

We ran several case studies of real-life Large and XLarge Bitbucket Data Center instances to find optimal configurations for each component. In particular, we found many used m5 series virtual machine types (General Purpose Instances). As such, for the application node, we focused on benchmarking different series' configurations.

Refer to the AWS documentation on Instance Types (specifically, General Purpose Instances) for details on each virtual machine type used in our tests.

Recommendations for Large-sized instances

We analyzed our benchmarks and came up with the following optimal configuration:

Best-performing and most cost-effective configuration

Component	Recommendation

Application nodes	m5.4xlarge nodes x 4
Database node	m5.2xlarge
NFS node	m5.2xlarge

Performance of this configuration

- Git throughput: 45,844 per hour
- Cost per hour [1]: $4.168
- Average CPU utilization: 45%

[1] In our recommendations for Large-sized profiles, we quoted a *cost per hour* for each configuration. We provide this information to help inform you about the comparative price of each configuration. This cost only calculates the price of the nodes used for the Bitbucket application, database, and NFS nodes. It does not include the cost of using other components of the application like shared home and application load balancer.

These figures are in USD, and were correct as of July 2019.

We measured performance stability in terms of how far the instance’s average CPU utilization is from the 75% threshold. As mentioned, once we hit this threshold, git operations start to slow down. The further below the instance is from 75%, the less prone it is to slow due to sudden traffic spikes.

However, there are no disadvantages in using larger-size hardware (m5.12xlarge, for example), which will provide better performance.

Low-cost configuration

We also found a low-cost configuration with acceptable performance at **$2.84** per hour:

Component	Recommendation
Application nodes	m5.4xlarge x 3
Database node	m5.xlarge
NFS node	m5.xlarge

This low-cost configuration offered a lower Git throughput of 43,099 git hosting calls per hour than the optimal configuration. However, this is still above our minimum threshold of 32,700 git hosting calls per hour. The trade-off for the price is fault tolerance. If the instance loses one application node, CPU usage spikes to 85%, which is above our maximum threshold. The instance will survive, but performance will suffer.

The following table shows all test configurations that passed our threshold, that is, above 32,500 git hosting operations per hour and below 75% CPU utilization, with no node crashes. We sorted each configuration by descending throughput.

Application nodes	Database node	NFS node	Git throughput	Cost per hour
m5.4xlarge x 6	m5.4xlarge	m5.4xlarge	46,833	6.800
m5.12xlarge x 2	m5.4xlarge	m5.4xlarge	45,848	6.792
m5.4xlarge x 4	**m5.4xlarge**	**m5.4xlarge**	**45,844**	**5.264**
m5.2xlarge x 8	**m5.4xlarge**	**m5.4xlarge**	**45,626**	**5.264**
m5.4xlarge x 3	m5.4xlarge	m5.4xlarge	44,378	4.496

m5.4xlarge x 3	m5.2xlarge	m5.4xlarge	43,936	3.784
m5.2xlarge x 6	m5.4xlarge	m5.4xlarge	43,401	4.496
m5.4xlarge x 3	**m5.xlarge**	**m5.xlarge**	**43,099**	**2.840**
m5.4xlarge x 3	m5.xlarge	m5.4xlarge	43,085	3.428

As you can see, the configuration m5.4xlarge x 4 nodes for the application doesn't provide the highest git throughput. However, configurations with higher throughput cost more and provide only marginal performance gains.

Recommendations for XLarge instances

We analyzed our benchmarks and came up with the following optimal configuration:

Best-performing configuration

Component	Recommendation
Application nodes	m5.12xlarge x 4
Database node	m5.2xlarge
NFS node	m5.2xlarge

Performance of this configuration

- Git throughput: 75,860 per hour
- Cost per hour [1]: $10.312
- Average CPU utilization: 65%

We measured performance stability in terms of how far the instance's average CPU utilization is from the 75% threshold. As mentioned, once we hit this threshold, git operations start to slow down. The further below the instance is from 75%, the less prone it is to slow due to sudden traffic spikes.

[1] In our recommendations for Extra Large-sized profiles, we quoted a *cost per hour* for each configuration. We provide this information to help inform you about the comparative price of each configuration. This cost only calculates the price of the nodes used for the Bitbucket application, database, and NFS nodes. It does not include the cost of using other components of the application like shared homeand application load balancer.

These figures are in USD, and were correct as of July 2019.

Low-cost configuration

We also found a low-cost configuration with good performance at **$7.02** per hour:

Component	Recommendation
Application nodes	m5.8xlarge x 4
Database node	m5.2xlarge
NFS node	m5.xlarge

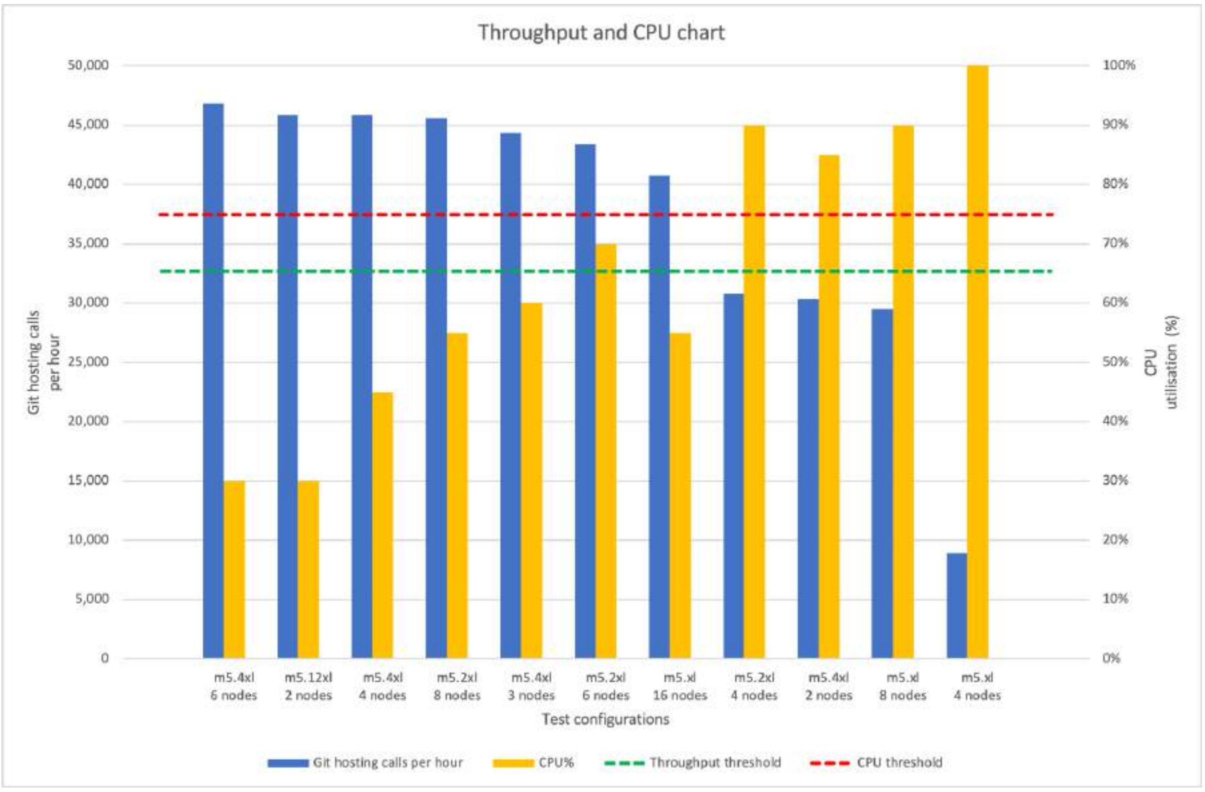
This low-cost configuration offered a lower Git throughput of 74,275 git hosting calls per hour than the optimal configuration.However, this is still well above the defined threshold of 65,400 git hosting calls per hour. The trade-off for the price is fault tolerance. There were timeouts and errors observed on the m5. 8xlarge x 3 nodes, so performance degradation may be encountered if the an application node goes down.

The following table shows all test configurations that passed our threshold, that is, above 32,500 git hosting operations per hour and below 75% CPU utilization, with no node crashes. We sorted each configuration by descending throughput.

Application nodes	Database node	NFS node	Git throughput	Cost per hour
m5.12xlarge x 4	**m5.2xlarge**	**m5.2xlarge**	**75,860**	**$ 10.31**
m5.4xlarge x 8	m5.2xlarge	m5.2xlarge	73,374	$ 7.24
m5.8xlarge x 4	**m5.2xlarge**	**m5.xlarge**	**74,275**	**$ 7.02**
m5.4xlarge x 6	m5.2xlarge	m5.2xlarge	71,872	$ 5.70
m5.12xlarge x 3	m5.2xlarge	m5.2xlarge	66,660	$ 8.01

Application node test results
Our first test series focused on finding out which AWS virtual machine types to use (and how many) for the application node. For these tests, we used a single **m4.4xlarge** node for the database and single **m4. 4xlarge** node for the NFS server.

Benchmarks show the best git throughput came from using m5.4xlarge (16 CPUs) and m5.12xlarge nodes (46 CPUs). You will need at **least three nodes for m5.4xlarge and two nodes for m5.12xlarge.**



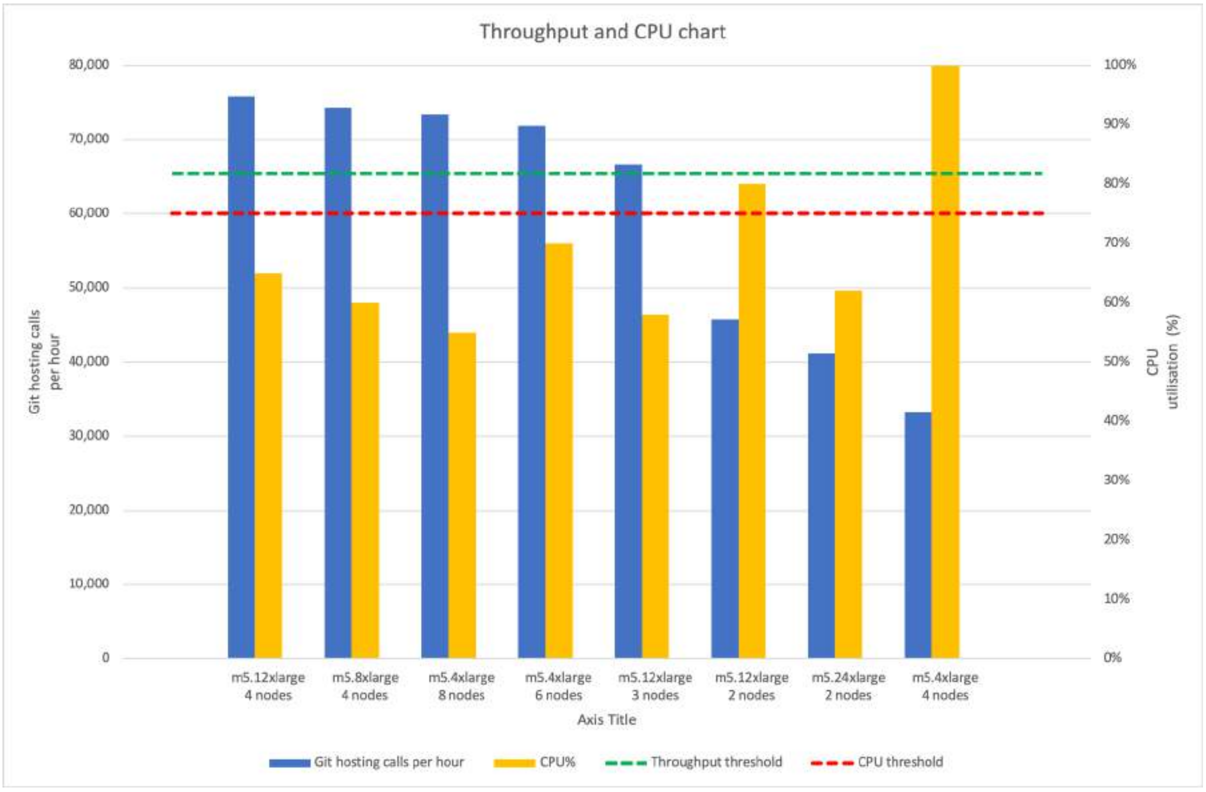
CPU is underutilized at 30% for the following application node configurations:

- m5.4xlarge x 6
- m5.12xlarge x 2

This demonstrates both configurations are overprovisioned. It would be more cost-effective to use **three or four m5.4xlarge nodes** for the application**.**

However, on the three-node m5.4xlarge set-up, the CPU usage would be at ~85% if one of the nodes failed. For this reason, we recommend the **four-node m5.4xlarge** set-up for better fault tolerance.
Our first test series focused on finding out which AWS virtual machine types to use (and how many) for the application node. For these tests, we used a single **m4.2xlarge** node for the database and single **m4. 2xlarge** node for the NFS server.

Benchmarks show the best git throughput came from using **m5.12xlarge (48 CPUs) and m5.8xlarge nodes (32 CPUs)**. You will need four nodes for both instance types.

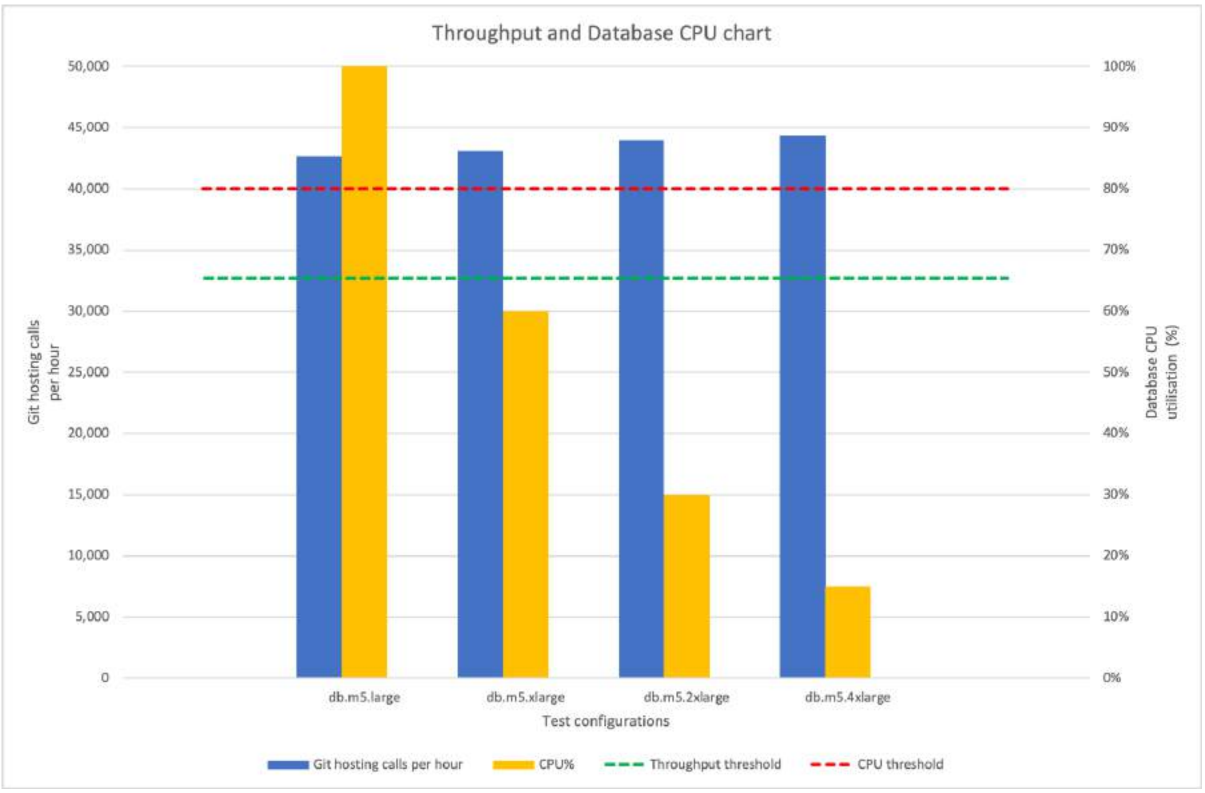


We have also carried out performance testing on 2 nodes (96 CPUs), but this resulted in poor performance, not meeting the threshold. Test results showed that 2 node deploys are not suitable for xlarge load. During the 2 node tests, the time spent on kernel was very high, which was not evident on 4+ nodes.

Database node test results

- From the application node test series, we found using **three m5.4xlarge** nodes for the application yielded optimal performance (even if it wasn't the most fault tolerant). For our second test series, we tested this configuration against the following virtual machine types for the database:
    - m4.large
    - m4.xlarge
    - m4.2xlarge
    - m4.4xlarge

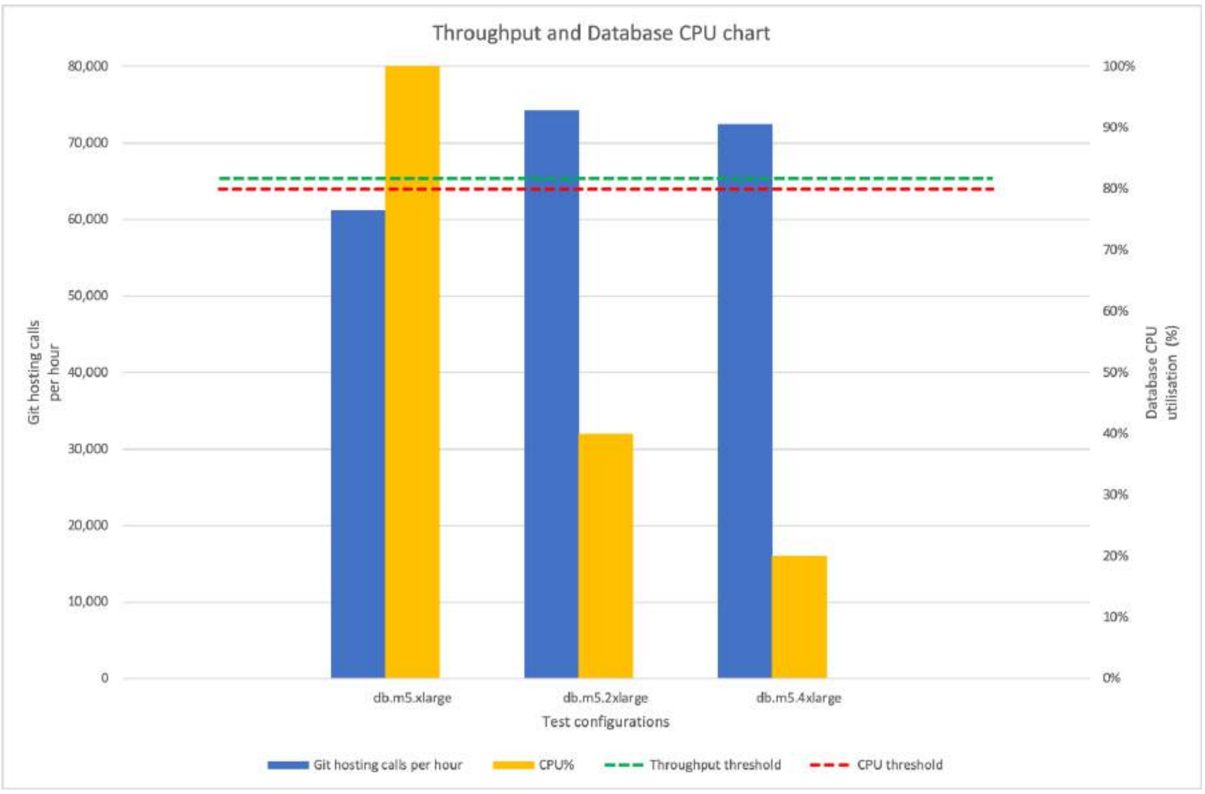
As expected, the more powerful virtual machine used, the better the performance. We saw the biggest gains in CPU utilization. Git throughput also improved, but only marginally.



Only **m5.large** failed the CPU utilization threshold. All other tested virtual machine types are acceptable, although, **m5.xlarge** is pretty close to our CPU utilization threshold at 60%.
From the application node test series, we found using **four m5.12xlarge** nodes for the application yielded optimal performance. For our second test series, we tested this configuration against the following virtual machine types for the database:

- m4.xlarge
- m4.2xlarge
- m4.4xlarge

The m4.xlarge was saturated on CPU at 100%, and db.m4.4xlarge did not result in improvements in performance. For this reason, m4.2xlarge remains the recommended instance type for the extra-large load. The CPU utilisation was at ~ 40% on m4.2xlarge.



NFS node test results
In previous tests (where we benchmarked different application and database node configurations), we used **m5.4xlarge** for the NFS node (NFS protocol v3). During each of those tests, NFS node CPU remained highly underutilized at under 18%. We ran further tests to see if we could downgrade the NFS server (and, by extension, find more cost-effective recommendations). Results showed identical git throughput, using the downsized m5.xlarge NFS node. This led to our low-cost recommendation.

Component	Recommendation
Application nodes	m5.4xlarge x 3
Database node	m5.xlarge
NFS node	m5.xlarge

As mentioned, this recommendation costs $3.044 per hour but offers lower fault tolerance.

Based on other test results, we recommend that, for the NFS node, use at least **m5.xlarge** with **IOPs higher than 1500**.
Benchmarks for the extra-large tests all used **m5.2xlarge** for the NFS instance. During each of those tests, the NFS node CPU remained highly underutilized at 25%. We ran further tests to see if we could downgrade the NFS server (and, by extension, find more cost-effective recommendations). Results show ed identical git throughput, using the downsized **m5.xlarge** NFS node with CPU utilisation at 60%.

This led to our low-cost recommendation.

Component	Recommendation
Application nodes	m5.8xlarge x 4
Database node	m5.2xlarge

NFS node	m5.xlarge

Disk I/O

Disk I/O performance is often a limiting factor, so we also paid attention to disk utilization. Our tests revealed the disk specifications we used for the NFS node were appropriate to our traffic:

- 900GB General Purpose SSD (gp2) for storage
- IOPS:
    - Baseline of 2700 IOPS
    - Burstable to 3,000 IOPS.

As mentioned, we initialized this volume at the start of each test.

Please be aware this information is only a guideline, as IOP requirements will depend on usage patterns.

The table below shows the I/O impact of our tests on the NFS node's disk:

Metric	Value
Total throughput (Read + Write throughput)	1,250 IOPS
Read throughput	700 IOPS
Write throughput	550 IOPS
Read bandwidth	100 MB/s
Write bandwidth	10 MB/s
Average queue length	1.3
Average read latency	1.5 ms/op
Average write latency	0.6 ms/op
Disk utilization	45%

Disk I/O performance is often a limiting factor, so we also paid attention to disk utilization. Our tests revealed the disk specifications we used for the NFS node were appropriate to our traffic:

- 1800GB General Purpose SSD (gp2) for storage
- IOPS: baseline of 4500 IOPS

As mentioned, we initialized this volume at the start of each test.

Please be aware this information is only a guideline, as IOP requirements will depend on usage patterns.

Metric	Value
Total throughput (Read + Write throughput)	9,00 IOPS
Read throughput	2,700 IOPS
Write throughput	IOPS
Read bandwidth	113 MB/s

Write bandwidth	15 MB/s
Average queue length	3.5
Average read latency	1.0 ms/op
Average write latency	0.70 ms/op
Disk utilization	80 %

Although the average disk utilisation is high at 80%, the read and write latency was low at < 1ms/op. It is recommended that the NFS server disk to have 4500 IOPs or more to ensure that it does not become the bottleneck.

Bitbucket Data Center and Server feature comparison

If you manage your own Bitbucket site (it's not hosted by Atlassian), you'll have either a **Bitbucket Server** or **Bit bucket Data Center** license.

Starting from Bitbucket 8.15.x, the comparison of Server and Data Center features will not be updated and supported any longer.

Bitbucket 8.15.x is the first **Data Center-only** release and does not support Server licenses. If you have a Server license, learn more about your options.

Bitbucket Server 8.14.x release will continue to support Server licenses until February 15, 2024.

Your Bitbucket license determines which features and infrastructure choices are available.

We want all teams to get the most out of Bitbucket, so all the core features are available for everyone - including projects, repositories, pull requests, and workflows.

Feature comparison

Here's a summary of what you get with each license.

Code and collaboration	**Server license**	**Data Center license**
Code owners Define code owners who will be added as a reviewer to a pull request to review changes in specific files and directories. Learn more about code owners	✓	✓
Pull requests Review and discuss your code with your team before merging changes. Learn more about collaboration via pull requests Draft multiple comments on files and code during a review process. Learn more about the new code review workflow	✓	✓
Branch permissions Control what users can do on a single branch, branch type, or branch pattern within a repository or project. Learn more about branch permissions	✓	✓
Flexible workflows Use centralized, forking, gitflow or forking workflows. Learn more about flexible workflows	✓	✓
Reviewer groups Reviewer groups help quickly add the right reviewers in bulk for code reviews. Learn more about reviewer groups	✗	✓ 7.13+
Default tasks Create consistent requirements when pull requests are opened with default tasks. Lear n more about default tasks	✓ 8.4+	✓ 8.4+

Jira Software Server and Data Center integration Connect Jira Server and Data Center and Bitbucket to automatically link issues and track progress simultaneously across both platforms. Learn more about integrating with Jira Software	✓	✓
Jira Software Cloud integration Connect Jira Cloud and Bitbucket to automatically link issues and track progress simultaneously across both platforms. Learn more about integrating with Jira Software	✓ 7.17+	✓ 7.14+
CI/CD integrations Seamlessly integrate Bitbucket with the world's leading CI/CD vendors to streamline the path to production. Learn more about our CI/CD integrations	✓ 7.4+	✓ 7.4+
Code insights Get reports, annotations, and metrics to help you and your team improve code quality in pull requests throughout the code review process. Learn more about code insights	✓	✓
APIs and 3rd party integrations Use the Bitbucket API and 3rd party integrations to automate simple tasks, embed data into your own site, and customize your workflow. Learn more about APIs and 3rd party integrations	✓	✓
Project-level webhooks Create webhooks at the project level instead of creating webhooks for each repository. Learn more about webhooks	✓ 8.8+	✓ 8.8+
High availability and performance at scale		
Clustering Run Bitbucket on multiple nodes for high availability. Learn more about clustering	✗	✓
Smart mirroring Improve Git clone speeds for distributed teams working with large repositories. Learn more about Smart Mirroring	✗	✓
Distributed Git storage Increase performance and high availability of repositories. Learn more about Bitbucket Mesh	✗	✓ 8.0 +
Git LFS (Large File Storage) Store large files without the need for an external object store. Learn more about Git LFS	✓	✓
Disaster recovery Keep your teams online and source code data available in the event that your primary system becomes unavailable. Learn more about disaster recovery	✗	✓ 6.8+
Search server Connect Bitbucket to a remote search server for improved scalability (required for Data Center sites). Learn more about using a remote search server	✓	✓

Content Delivery Network (CDN) support Improve geo-performance for distributed teams. Learn more about CDN	✗	✓ 6.8+
Security and compliance		
(Enforced) merge checks Stop pull requests from being merged until they meet the requirements that you've set. Learn more about merge checks	✓	✓
Advanced auditing Get more insight into what is happening in your Bitbucket instance. Advanced auditing gives you the ability to track and log actions in your instance developing a security-relevant chronological record that can be exported and stored in third-party monitoring tools. Learn more about advanced auditing	✗	✓ 7.0+
HTTP access tokens Create access tokens that aren't fixed to individual user accounts, for teams working on specific projects and repositories. Learn more about HTTP access tokens	✗	✓ 7.18+
OAuth 2.0 Configure Bitbucket as an OAuth 2.0 provider, allowing external applications to access Bitbucket. Learn more about incoming links	✗	✓ 7.20 +
Secret scanning Get notified of secrets added in new commits and revoke secrets to prevent exposure. Learn more about secret scanning	✗	✓ 8.3 +
Stricter control on repository settings Tighter control on repository settings to help you meet your security and compliance needs and create consistent settings across all repositories in your project. Learn more about how to restrict repository-level changes	✗	✓ 8.8 +
User management		
External user directories Store users in Active Directory, Crowd, Jira or another LDAP directory. Learn more about external user directories	✓	✓
Multiple identity providers Use more than one IdP, and disable login methods you don't want to use (such as basic authentication). Learn more about using multiple IdPs	✗	✓ 7.12+
Single sign-on Use a SAML or OpenID Connect identity provider for authentication and single sign-on. Learn more about SSO	✗	✓ 6.8+
Just-in-time provisioning Just-in-time user provisioning (JIT provisioning) allows users to be created and updated automatically when they log in through SAML SSO or OpenID Connect (OIDC) SSO to Atlassian Data Center applications such as Jira, Confluence, or Bitbucket. Learn more about just-in-time provisioning	✗	✓ 7.5+
Infrastructure and Control		

Rate limiting Control how many external REST API requests users and automations can make. Learn more about rate limiting	✗	✓ 6.6+
Advanced repository management Manage all of your repositories from global repositories page. Find repositories that are active, and identify which inactive ones are taking up space. Learn more about Advanced repository management	✗	✓ 7.13+
Repository archiving Archive unused repositories to declutter your Bitbucket instance. Learn more about archiving and unarchiving repositories	✗	✓ 8.0+
Rolling upgrades Upgrade to the latest bug fix update of the same feature release with no downtime. Learn more about rolling upgrades	✗	✓ 7.9+
Integrity tests for zero-downtime backup Find and resolve any inconsistencies between the database and home directory, for example after restoring a backup. Learn more about Integrity tests for zero-downtime backup	✗	✓
App diagnostics Get an overview of the health of your site, including potential performance issues relating to third-party apps. Learn more about app diagnostics	✓	✓
Business intelligence and monitoring		
Data pipeline Export all Bitbucket data for analysis in your preferred business intelligence platform. Learn more about the data pipeline	✗	✓ 7.13+
Deployment options		
Your own hardware Run Bitbucket on your own physical servers, virtualized servers, or in the data center of your choice.	✓	✓
Kubernetes Run Bitbucket in Kubernetes cluster on Amazon EKS, Azure Kubernetes Service, Google Kubernetes Engine or on-premises. Learn more about Kubernetes support	✗	✓
AWS Quick Start and Cloud Formation Templates Use our Cloud Formation Templates to deploy Bitbucket on AWS. Learn more about AWS Quick Start and Cloud Formation Templates	✗	✓

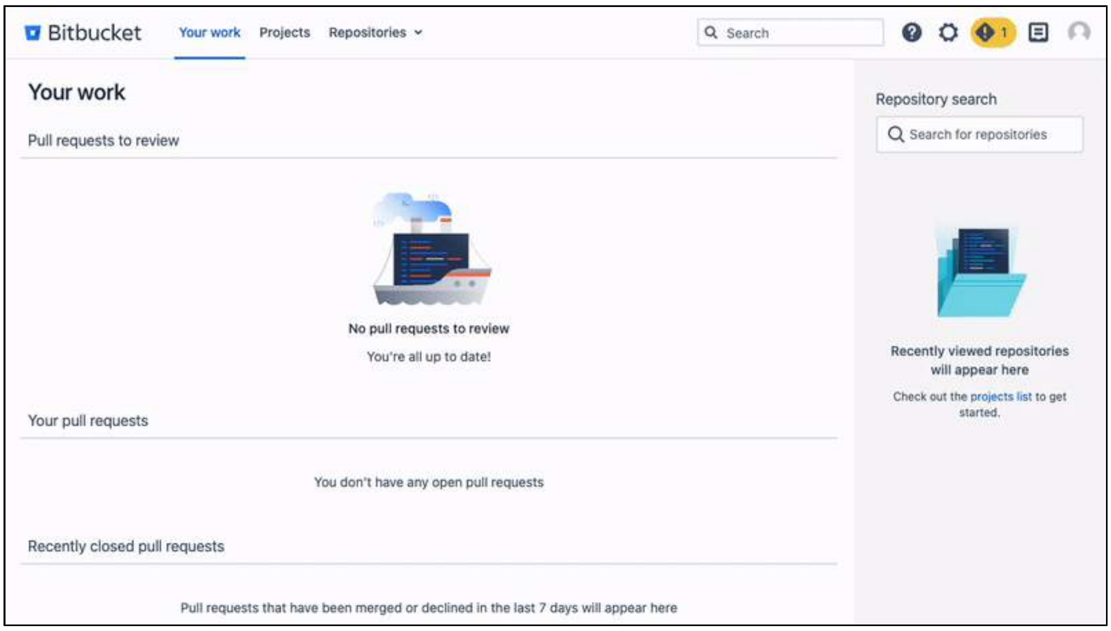
Set up dark theme in your profile

In Bitbucket Data Center, every user has the option to select dark theme for their profile. Dark theme will provide consistency in your experience of switching between multiple tools within your work environment, reduce eye strain, and enhance the readability of text, images, and code.

Turning on dark theme in Bitbucket

To enable dark theme, select your avatar in the top right corner of the screen. Then, select **Theme** and **Dark**.

Alternatively, if you're already using dark theme across your device, you can select **Match system** and Bitbucket will automatically adjust to dark theme as well.


Bitbucket
Your work
Projects
Repositories
Search
Your work
Pull requests to review
No pull requests to review
You're all up to date!
Your pull requests
You don't have any open pull requests
Recently closed pull requests
Pull requests that have been merged or declined in the last 7 days will appear here
Repository search
Search for repositories
Recently viewed repositories will appear here
Check out the projects list to get started.

Original theme vs. light theme

The theme options also include **Original** and **Light**. Although they both represent the usual "white" user interface and don't have many visual differences, they are technically unique.

Bitbucket 8.16 has light theme set up by default. It's the direct "white" alternative to dark theme. Both dark and light themes use the same design tokens — name and value pairings for repeatable design, such as color or font style.

Original theme still presents the classic look of Bitbucket and uses the same color scheme as was in place before Bitbucket 8.16. If you decide to switch from dark theme back to "white" theme, using original theme will ease this transition and provide smooth adaptation to the updated design.

The Bitbucket team will remove original theme after dark theme has been adopted successfully by customers and Marketplace partners.