My Project

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Contents

Chapter 1

Namespace Index

1.1 Namespace List

Here is a list of all namespaces with brief descriptions:

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 4

File Index

4.1 File List

Here is a list of all files with brief descriptions:

Chapter 5

Namespace Documentation

5.1 nobsrule Namespace Reference

Functions

- def requires_upcxx_backend (cxt, src)

5.1.1 Detailed Description

```
This is a nobs rule-file. See nobs/nobs/ruletree.py for documentation
on the structure and interpretation of a rule-file.
```

5.1.2 Function Documentation

5.1.2.1 requires_upcxx_backend()

```
def nobsrule.requires_upcxx_backend (
              cxt,
              src )
```

Definition at line 7 of file nobsrule.py.

5.2 std Namespace Reference

Classes

- struct greater< upcxx::global_ptr< T > >
- struct greater_equal< upcxx::global_ptr< T > >
- struct hash< upcxx::digest >
- struct hash< upcxx::dist_id< T > >
- struct hash< upcxx::global_ptr< T > >
- struct less< upcxx::global_ptr< T > >
- struct less_equal< upcxx::global_ptr< T > >

5.3 upcxx Namespace Reference

Namespaces

- backend
- detail

Classes

- struct add_lref_if_nonref
- struct add_lref_if_nonref< T & >
- struct add_lref_if_nonref< T && >
- struct binding
- struct binding< dist_object< T > & >
- struct binding< dist_object< T > && >
- struct binding< T & >
- struct binding< T && >
- struct binding< T const >
- struct binding< T volatile >
- struct binding_is_trivial
- struct binding_is_trivial< T, std::integral_constant< bool, binding< T >::is_trivial > >
- struct bound_function
- struct commanding
- struct completions
- struct constant_function
- struct decay_tupled
- struct decay_tupled< std::tuple< T... > >
- struct digest
- struct dist_id
- class dist_object
- struct fast_hasher
- struct fast_hashing
- class function_ref
- class function_ref< Ret(Arg...)>
- struct future1
- struct future_cx
- struct future_is_trivially_ready
- struct future_is_trivially_ready< future1< detail::future_kind_mapped< Arg, Fn >, T... > >
- struct future_is_trivially_ready< future1< detail::future_kind_result, T... > >
- struct future_is_trivially_ready< future1< detail::future_kind_shref< HeaderOps >, T... > >
- struct future_is_trivially_ready< future1< detail::future_kind_when_all< Arg... >, T... > >
- class global_ptr
- struct hasher_reflector
- struct index_sequence
- struct integer_golden_ratio
- struct integer_golden_ratio_bits
- struct integer_golden_ratio_bits< 32 >
- struct integer_golden_ratio_bits< 64 >
- struct mod2n_hashing
- struct nil_cx
- struct nop_function
- struct nop_function< Ret(Arg...)>
- struct nop_function< void(Arg...)>

- struct packing
- struct packing< bound_function< Fn, B... > >
- struct packing< std::array< T, n > >
- struct packing< std::pair< A, B > >
- struct packing< std::string >
- struct packing< std::tuple< T... > >
- struct packing< std::unordered_map< K, V > >
- struct packing< std::unordered_set< T > >
- struct packing< std::vector< T > >
- struct packing< T & >
- struct packing< T && >
- struct packing< T const >
- struct packing< T volatile >
- struct packing_empty
- struct packing_empty< T, false >
- struct packing_empty< T, true >
- struct packing_function_pointer
- struct packing_is_trivial
- struct packing_is_trivial< T, std::integral_constant< bool, false &packing< T >::is_trivial > >
- struct packing_not_supported
- struct packing_opaque
- struct packing_opaque< T, false, false >
- struct packing_opaque< T, false, true >
- struct packing_opaque< T, true, is_trivially_copyable >
- struct packing_pack_reflector
- struct packing_reflected
- struct packing_reflected< T, false >
- struct packing_reflected< T, true >
- struct packing_specializer
- struct packing_specializer< T, false, false, false >
- struct packing_specializer< T, false, false, true >
- struct packing_specializer< T, false, true, is_scalar >
- struct packing_specializer< T, true, is_funptr, is_scalar >
- struct packing_trivial
- struct packing_ubound_reflector
- struct packing_unpack_reflector
- struct packing_unpack_reflector< false >
- struct packing_unpack_reflector< true >
- class parcel_layout
- class parcel_reader
- struct parcel_writer
- struct print_proxy
- struct print_reflector
- class promise
- struct promise_cx
- struct reflection
- struct reflection< std::array< T, n > >
- struct reflection< std::pair< A, B > >
- struct reflection< std::tuple< Ts... > >
- struct reflection_tuple
- struct reflection_tuple< Tup, n, n >
- struct rpc_cx
- struct trait_all
- struct trait_all< Tr0, Trs... >
- struct trait_all<>

- struct trait_any
- struct trait_any< Tr0, Trs... >
- struct trait_any<>
- struct trait_forall
- struct trait_forall< Test >
- struct trait_forall< Test, T, Ts... >
- struct trait_forall_tupled
- struct trait_forall_tupled< Test, std::tuple< T... > >
- struct tuple_types_into
- struct tuple_types_into< std::tuple< T... >, Into >

Typedefs

- typedef int intrank_t
- typedef unsigned int uintrank_t
- template<typename ... T>
  using future = future1< detail::future_kind_shref< detail::future_header_ops_general >, T... >
- template<typename Tuple , template< typename... > class Into>
  using tuple_types_into_t = typename tuple_types_into< Tuple, Into >::type
- template<int n>
  using make_index_sequence = typename detail::make_index_sequence< n >::type

Enumerations

- enum progress_level { progress_level::internal, progress_level::user }

Functions

- template<typename T , std::size_t alignment = alignof(T)>
  global_ptr< T > allocate (std::size_t n=1)
- template<typename T >
  void deallocate (global_ptr< T > gptr)
- template<typename T , typename ... Args>
  global_ptr< T > new_ (Args &&...args)
- template<typename T , typename ... Args>
  global_ptr< T > new_ (const std::nothrow_t &tag, Args &&...args)
- template<typename T >
  global_ptr< T > new_array (std::size_t n)
- template<typename T >
  global_ptr< T > new_array (std::size_t n, const std::nothrow_t &tag)
- template<typename T >
  void delete_ (global_ptr< T > gptr)
- template<typename T >
  void delete_array (global_ptr< T > gptr)
- template<typename T1 , typename BinaryOp , typename T = typename std::decay<T1>::type>
  future< T > allreduce (T1 &&value, BinaryOp op)
- template<typename T >
  future< T > atomic_get (global_ptr< T > p, std::memory_order order)
- template<typename T >
  future atomic_put (global_ptr< T > p, T val, std::memory_order order)
- template<typename T >
  future< T > atomic_fetch_add (global_ptr< T > p, T val, std::memory_order order)
- void init ()

- void finalize ()
- intrank_t rank_n ()
- intrank_t rank_me ()
- void * allocate (std::size_t size, std::size_t alignment=alignof(std::max_align_t))
- void deallocate (void *p)
- void progress (progress_level lev=progress_level::user)
- void barrier ()
- template<typename Fn , typename ... B>
  auto bind (Fn &&fn, B &&...b) -> decltype(detail::bind< typename std::decay< Fn >::type >()(std::forward< Fn >(fn), std::forward< B >(b)...))
- template<typename Fn >
  Fn && bind (Fn &&fn)
- template<typename ... P>
  auto bind_last (P &&...parm) -> decltype(detail::bind_last(std::tuple< P &&... >
- template<typename Fn >
  Fn && bind_last (Fn &&fn)
- template<typename T1 , typename T = typename std::decay<T1>::type>
  future< T > broadcast (T1 &&value, intrank_t root)
- template<typename Fn >
  void command_size_ubound (parcel_layout &ub, Fn &&fn)
- template<typename Fn >
  void command_pack (parcel_writer &w, std::size_t size_ub, Fn &&fn)
- future command_execute (parcel_reader &r)
- template<typename Fn1 >
  void command_size_ubound (parcel_layout &ub, Fn1 &&fn)
- template<typename Fn1 >
  void command_pack (parcel_writer &w, std::size_t size_ub, Fn1 &&fn)
- template<typename AS , typename AR , typename AO , typename BS , typename BR , typename BO >
  completions< typename detail::disjoin_cx< AS, BS, completions< AS, AR, AO >::future_n >::type, typename detail::disjoin_cx< AR, BR, completions< AS, AR, AO >::future_n >::type, typename detail::disjoin_cx< AO, BO, completions< AS, AR, AO >::future_n >::type > operator| (completions< AS, AR, AO > a, completions< BS, BR, BO > b)
- template<typename ... T>
  completions< promise_cx< T... >, nil_cx, nil_cx > source_cx_as_promise (promise< T... > &pro)
- template<typename ... T>
  completions< nil_cx, nil_cx, promise_cx< T... > > operxn_cx_as_promise (promise< T... > &pro)
- template<typename Fn , typename ... Args>
  auto remote_cx_as_rpc (Fn &&fn, Args &&...args) -> completions< nil_cx, rpc_cx< decltype(upcxx::bind(std::forward< Fn >(fn), std::forward< Args >(args)...))>, nil_cx >
- void dbgbrk ()
- void assert_failed (const char *file, int line, const char *msg=nullptr)
- std::ostream & operator<< (std::ostream &o, digest x)
- template<typename T >
  std::ostream & operator<< (std::ostream &o, dist_id< T > x)
- template<typename Fn , typename ArgTup >
  auto apply_tupled_as_future (Fn &&fn, ArgTup &&argtup) -> decltype(detail::apply_tupled_as_future< Fn, ArgTup >()(std::forward< Fn >(fn), std::forward< ArgTup >(argtup)))
- template<typename ... T>
  auto make_future (T ...values) -> decltype(detail::make_future< T... >()(std::declval< T >()...))
- template<typename T >
  auto to_future (T x) -> decltype(make_future(std::forward< T >(x)))
- template<typename Kind , typename ... T>
  future1< Kind, T... > to_future (future1< Kind, T... > x)
- template<typename ArgKind , typename Fn1 , typename ... ArgT>
  auto operator>> (future1< ArgKind, ArgT... > arg, Fn1 &&fn) -> decltype(detail::future_then< future1< ArgKind, ArgT... >, typename std::decay< Fn1 >::type >()(std::move(arg), std::forward< Fn1 >(fn)))

- template<typename Fn1 , typename ... ArgT>
  future< ArgT... > & operator>>= (future< ArgT... > &arg, Fn1 &&fn)
- template<typename ... Arg>
  detail::when_all_return_t< Arg... > when_all (Arg ...args)
- bool is_memory_shared_with (intrank_t r)
- void * pshm_remote_addr2local (intrank_t r, void *addr)
- void * pshm_local_addr2remote (void *addr, intrank_t &rank_out)
- template<typename T >
  global_ptr< T > operator+ (std::ptrdiff_t diff, global_ptr< T > ptr)
- template<typename T , typename U >
  global_ptr< T > reinterpret_pointer_cast (global_ptr< U > ptr)
- template<typename T >
  std::ostream & operator<< (std::ostream &os, global_ptr< T > ptr)
- template<class T >
  T os_env (const std::string &name)
- template<class T >
  T os_env (const std::string &name, const T &otherwise)
- template<typename Reflector , typename Subject >
  void reflect_upon (Reflector &re, Subject &&subj)
- template<typename T >
  std::size_t fast_hash (const T &x, std::size_t salt=0)
- template<typename T >
  std::size_t mod2n_hash (const T &x, int bits)
- template<typename T >
  print_proxy< T > print (T const &subject)
- template<typename T , typename R = nil_cx, typename O = future_cx<0>>
  detail::rget_futures_of< detail::rget_byval< T >, R, O >::return_type rget (global_ptr< T > gp_s, completions< nil_cx, R, O > cxs=completions< nil_cx, R, O >{})
- template<typename T , typename R = nil_cx, typename O = future_cx<0>>
  detail::rget_futures_of< detail::rget_byref, R, O >::return_type rget (global_ptr< T > gp_s, T *buf_d, std::size_t n, completions< nil_cx, R, O > cxs=completions< nil_cx, R, O >{})
- template<typename Fn , typename ... Args>
  void rpc_ff (intrank_t recipient, Fn &&fn, Args &&...args)
- template<typename Fn , typename ... Args>
  auto rpc (intrank_t recipient, Fn &&fn, Args &&...args) -> typename detail::rpc_return< decltype(fn(args...)), Fn, Args... >::type
- template<typename Fn , typename ... T, typename ... Args>
  void rpc (intrank_t recipient, promise< T... > &prom, Fn &&fn, Args &&...args)
- template<typename T , typename S = nil_cx, typename R = nil_cx, typename O = future_cx<0>>
  detail::rput_futures_of< S, R, O >::return_type rput (T value_s, global_ptr< T > gp_d, completions< S, R, O > cxs=completions< S, R, O >{})
- template<typename T , typename S = nil_cx, typename R = nil_cx, typename O = future_cx<0>>
  detail::rput_futures_of< S, R, O >::return_type rput (T const *buf_s, std::size_t n, global_ptr< T > gp_d, completions< S, R, O > cxs=completions< S, R, O >{})
- template<typename Sig >
  nop_function< Sig > nop ()
- template<typename T >
  constant_function< T > constant (T value)
- template<int i, typename Tup >
  auto get_or_void (Tup &&tup) -> decltype(detail::tuple_get_or_void< i, Tup >()(std::forward< Tup >(tup)))
- template<typename Tup >
  auto tuple_rvals (Tup &&tup) -> decltype(detail::tuple_rvals(std::forward< Tup >(tup), make_index_sequence< std::tuple_size< typename std::decay< Tup >::type >::value >()))
- template<typename Fn , typename Tup >
  auto apply_tupled (Fn &&fn, Tup &&args) -> decltype(detail::apply_tupled(std::forward< Fn >(fn), std::forward< Tup >(args), make_index_sequence< std::tuple_size< Tup >::value >()))
- template<typename Kind , typename ... T>
  auto wait (future1< Kind, T... > const &f) -> decltype(f.result())

Variables

- constexpr completions< future_cx< 0 >, nil_cx, nil_cx > source_cx_as_future = {}
- constexpr completions< nil_cx, nil_cx, future_cx< 0 > > operxn_cx_as_future = {}
- bool dbgbrk_spin_init = false
- bool dbgbrk_spin = true

5.3.1 Detailed Description

allocate.hpp

atomic.hpp

global_ptr.hpp

5.3.2 Typedef Documentation

5.3.2.1 future

```
template<typename ...  T>
using upcxx::future = typedef future1< detail::future_kind_shref<detail::future_header_ops_↩
general>, T...  >
```

Definition at line 83 of file core.hpp.

5.3.2.2 intrank_t

```
typedef int upcxx::intrank_t
```

Definition at line 18 of file backend.hpp.

5.3.2.3 make_index_sequence

```
template<int n>
upcxx::make_index_sequence< sizeof...(P) -1 >
```

Definition at line 203 of file utility.hpp.

5.3.2.4 tuple_types_into_t

```
template<typename Tuple , template< typename...  > class Into>
using upcxx::tuple_types_into_t = typedef typename tuple_types_into<Tuple,Into>::type
```

Definition at line 183 of file utility.hpp.

5.3.2.5 uintrank_t

```
typedef unsigned int upcxx::uintrank_t
```

Definition at line 19 of file backend.hpp.

5.3.3 Enumeration Type Documentation

5.3.3.1 progress_level

```
enum upcxx::progress_level  [strong]
```

Enumerator

internal	
user	

Definition at line 21 of file backend.hpp.

5.3.4 Function Documentation

5.3.4.1 allocate() [1/2]

```
void* upcxx::allocate (
            std::size_t size,
            std::size_t alignment = alignof(std::max_align_t) )
```

5.3.4.2 allocate() [2/2]

```
template<typename T , std::size_t alignment = alignof(T)>
global_ptr<T> upcxx::allocate (
            std::size_t n = 1 )
```

Definition at line 33 of file allocate.hpp.

5.3.4.3 allreduce()

```
template<typename T1 , typename BinaryOp , typename T = typename std::decay<T1>::type>
future<T> upcxx::allreduce (
            T1 && value,
            BinaryOp op )
```

Definition at line 31 of file allreduce.hpp.

5.3.4.4 apply_tupled()

```
template<typename Fn , typename Tup >
auto upcxx::apply_tupled (
            Fn && fn,
            Tup && args ) -> decltype( detail::apply_tupled( std::forward<Fn>(fn), std↩
::forward<Tup>(args), make_index_sequence<std::tuple_size<Tup>::value>() ) )   [inline]
```

Definition at line 436 of file utility.hpp.

5.3.4.5 apply_tupled_as_future()

```
template<typename Fn , typename ArgTup >
auto upcxx::apply_tupled_as_future (
            Fn && fn,
            ArgTup && argtup ) -> decltype( detail::apply_tupled_as_future<Fn,ArgTup>()(
std::forward<Fn>(fn), std::forward<ArgTup>(argtup) ) )
```

Definition at line 102 of file apply.hpp.

5.3.4.6 assert_failed()

```
void upcxx::assert_failed (
            const char * file,
            int line,
            const char * msg = nullptr )
```

Definition at line 42 of file diagnostic.cpp.

5.3.4.7 atomic_fetch_add()

```
template<typename T >
future<T> upcxx::atomic_fetch_add (
            global_ptr< T > p,
            T val,
            std::memory_order order )
```

Definition at line 26 of file atomic.hpp.

5.3.4.8 atomic_get()

```
template<typename T >
future<T> upcxx::atomic_get (
            global_ptr< T > p,
            std::memory_order order )
```

Definition at line 16 of file atomic.hpp.

5.3.4.9 atomic_put()

```
template<typename T >
future upcxx::atomic_put (
            global_ptr< T > p,
            T val,
            std::memory_order order )
```

Definition at line 21 of file atomic.hpp.

5.3.4.10 barrier()

```
void upcxx::barrier ( )
```

Definition at line 169 of file backend.cpp.

5.3.4.11 bind() [1/2]

```
template<typename Fn , typename ...  B>
auto upcxx::bind (
            Fn && fn,
            B &&...  b ) -> decltype( detail::bind<typename std::decay<Fn>::type>()( std↩
::forward<Fn>(fn), std::forward<B>(b)...  )  )
```

Definition at line 292 of file bind.hpp.

5.3.4.12 bind() [2/2]

```
template<typename Fn >
Fn&& upcxx::bind (
             Fn && fn )
```

Definition at line 304 of file bind.hpp.

5.3.4.13 bind_last() [1/2]

```
template<typename ...  P>
auto upcxx::bind_last (
             P &&...  parm ) -> decltype( detail::bind_last( std::tuple<P&&...>
```

Definition at line 335 of file bind.hpp.

5.3.4.14 bind_last() [2/2]

```
template<typename Fn >
Fn&& upcxx::bind_last (
             Fn && fn )
```

Definition at line 351 of file bind.hpp.

5.3.4.15 broadcast()

```
template<typename T1 , typename T = typename std::decay<T1>::type>
future<T> upcxx::broadcast (
             T1 && value,
             intrank_t root )
```

Definition at line 58 of file broadcast.hpp.

5.3.4.16 command_execute()

```
future upcxx::command_execute (
             parcel_reader & r )  [inline]
```

Definition at line 74 of file command.hpp.

5.3.4.17 command_pack() [1/2]

```
template<typename Fn >
void upcxx::command_pack (
             parcel_writer & w,
             std::size_t size_ub,
             Fn && fn )
```

5.3.4.18 command_pack() [2/2]

```
template<typename Fn1 >
void upcxx::command_pack (
             parcel_writer & w,
             std::size_t size_ub,
             Fn1 && fn )  [inline]
```

Definition at line 90 of file command.hpp.

5.3.4.19 command_size_ubound() [1/2]

```
template<typename Fn >
void upcxx::command_size_ubound (
             parcel_layout & ub,
             Fn && fn )
```

5.3.4.20 command_size_ubound() [2/2]

```
template<typename Fn1 >
void upcxx::command_size_ubound (
             parcel_layout & ub,
             Fn1 && fn )  [inline]
```

Definition at line 80 of file command.hpp.

5.3.4.21 constant()

```
template<typename T >
constant_function<T> upcxx::constant (
             T value )  [inline]
```

Definition at line 55 of file utility.hpp.

5.3.4.22 dbgbrk()

```
void upcxx::dbgbrk ( )
```

Definition at line 15 of file diagnostic.cpp.

5.3.4.23 deallocate() [1/2]

```
void upcxx::deallocate (
            void * p )
```

Definition at line 186 of file backend.cpp.

5.3.4.24 deallocate() [2/2]

```
template<typename T >
void upcxx::deallocate (
            global_ptr< T > gptr )
```

Definition at line 45 of file allocate.hpp.

5.3.4.25 delete_()

```
template<typename T >
void upcxx::delete_ (
            global_ptr< T > gptr )
```

Definition at line 152 of file allocate.hpp.

5.3.4.26 delete_array()

```
template<typename T >
void upcxx::delete_array (
            global_ptr< T > gptr )
```

Definition at line 169 of file allocate.hpp.

5.3.4.27 fast_hash()

```
template<typename T >
std::size_t upcxx::fast_hash (
            const T & x,
            std::size_t salt = 0 )  [inline]
```

Definition at line 133 of file reflection.hpp.

5.3.4.28 finalize()

```
void upcxx::finalize ( )
```

Definition at line 162 of file backend.cpp.

5.3.4.29 get_or_void()

```
template<int i, typename Tup >
auto upcxx::get_or_void (
            Tup && tup ) -> decltype( detail::tuple_get_or_void<i,Tup>()(std::forward<Tup>(tup))
)
```

Definition at line 251 of file utility.hpp.

5.3.4.30 init()

```
void upcxx::init ( )
```

Definition at line 107 of file backend.cpp.

5.3.4.31 is_memory_shared_with()

```
bool upcxx::is_memory_shared_with (
            intrank_t r )  [inline]
```

Definition at line 22 of file global_ptr.hpp.

5.3.4.32 make_future()

```
template<typename ...  T>
auto upcxx::make_future (
            T ...  values ) -> decltype(detail::make_future<T...>()(std::declval<T>()...))
```

Definition at line 59 of file make_future.hpp.

5.3.4.33 mod2n_hash()

```
template<typename T >
std::size_t upcxx::mod2n_hash (
            const T & x,
            int bits )  [inline]
```

Definition at line 172 of file reflection.hpp.

5.3.4.34 new_() [1/2]

```
template<typename T , typename ...  Args>
global_ptr<T> upcxx::new_ (
            Args &&...  args )
```

Definition at line 85 of file allocate.hpp.

5.3.4.35 new_() [2/2]

```
template<typename T , typename ...  Args>
global_ptr<T> upcxx::new_ (
            const std::nothrow_t & tag,
            Args &&...  args )
```

Definition at line 90 of file allocate.hpp.

5.3.4.36 new_array() [1/2]

```
template<typename T >
global_ptr<T> upcxx::new_array (
            std::size_t n )
```

Definition at line 142 of file allocate.hpp.

5.3.4.37 new_array() [2/2]

```
template<typename T >
global_ptr<T> upcxx::new_array (
             std::size_t n,
             const std::nothrow_t & tag )
```

Definition at line 147 of file allocate.hpp.

5.3.4.38 nop()

```
template<typename Sig >
nop_function<Sig> upcxx::nop ( )
```

Definition at line 36 of file utility.hpp.

5.3.4.39 operator+()

```
template<typename T >
global_ptr<T> upcxx::operator+ (
             std::ptrdiff_t diff,
             global_ptr< T > ptr )
```

Definition at line 171 of file global_ptr.hpp.

5.3.4.40 operator<<() [1/3]

```
std::ostream& upcxx::operator<< (
             std::ostream & o,
             digest x )  [inline]
```

Definition at line 31 of file digest.hpp.

5.3.4.41 operator<<() [2/3]

```
template<typename T >
std::ostream& upcxx::operator<< (
             std::ostream & o,
             dist_id< T > x )
```

Definition at line 78 of file dist_object.hpp.

5.3.4.42 operator<<() [3/3]

```
template<typename T >
std::ostream& upcxx::operator<< (
            std::ostream & os,
            global_ptr< T > ptr )
```

Definition at line 182 of file global_ptr.hpp.

5.3.4.43 operator>>()

```
template<typename ArgKind , typename Fn1 , typename ...  ArgT>
auto upcxx::operator>> (
            future1< ArgKind, ArgT...  > arg,
            Fn1 && fn ) -> decltype( detail::future_then< future1<ArgKind,ArgT...>, typename
std::decay<Fn1>::type >()( std::move(arg), std::forward<Fn1>(fn) ) )   [inline]
```

Definition at line 179 of file then.hpp.

5.3.4.44 operator>>=()

```
template<typename Fn1 , typename ...  ArgT>
future<ArgT...>& upcxx::operator>>= (
            future< ArgT...  > & arg,
            Fn1 && fn )  [inline]
```

Definition at line 199 of file then.hpp.

5.3.4.45 operator"" | ()

```
template<typename AS , typename AR , typename AO , typename BS , typename BR , typename BO >
completions< typename detail::disjoin_cx<AS, BS, completions<AS, AR, AO>::future_n>::type,
typename detail::disjoin_cx<AR, BR, completions<AS, AR, AO>::future_n>::type, typename detail↩
::disjoin_cx<AO, BO, completions<AS, AR, AO>::future_n>::type > upcxx::operator| (
            completions< AS, AR, AO > a,
            completions< BS, BR, BO > b )
```

Definition at line 89 of file completion.hpp.

5.3.4.46 operxn_cx_as_promise()

```
template<typename ...  T>
completions<nil_cx, nil_cx, promise_cx<T...> > upcxx::operxn_cx_as_promise (
            promise< T...  > & pro )
```

Definition at line 118 of file completion.hpp.

5.3.4.47 os_env() [1/2]

```
template<class T >
T upcxx::os_env (
            const std::string & name )
```

Definition at line 41 of file os_env.hpp.

5.3.4.48 os_env() [2/2]

```
template<class T >
T upcxx::os_env (
            const std::string & name,
            const T & otherwise )
```

Definition at line 52 of file os_env.hpp.

5.3.4.49 print()

```
template<typename T >
print_proxy<T> upcxx::print (
            T const & subject )  [inline]
```

Definition at line 265 of file reflection.hpp.

5.3.4.50 progress()

```
void upcxx::progress (
            progress_level lev = progress_level::user )
```

Definition at line 438 of file backend.cpp.

5.3.4.51 pshm_local_addr2remote()

```
void* upcxx::pshm_local_addr2remote (
            void * addr,
            intrank_t & rank_out )  [inline]
```

Definition at line 30 of file global_ptr.hpp.

5.3.4.52 pshm_remote_addr2local()

```
void* upcxx::pshm_remote_addr2local (
            intrank_t r,
            void * addr )  [inline]
```

Definition at line 26 of file global_ptr.hpp.

5.3.4.53 rank_me()

```
intrank_t upcxx::rank_me ( )  [inline]
```

Definition at line 98 of file backend.hpp.

5.3.4.54 rank_n()

```
intrank_t upcxx::rank_n ( )  [inline]
```

Definition at line 97 of file backend.hpp.

5.3.4.55 reflect_upon()

```
template<typename Reflector , typename Subject >
void upcxx::reflect_upon (
            Reflector & re,
            Subject && subj )
```

Definition at line 51 of file reflection.hpp.

5.3.4.56 reinterpret_pointer_cast()

```
template<typename T , typename U >
global_ptr<T> upcxx::reinterpret_pointer_cast (
            global_ptr< U > ptr )
```

Definition at line 176 of file global_ptr.hpp.

5.3.4.57 remote_cx_as_rpc()

```
template<typename Fn , typename ...  Args>
auto upcxx::remote_cx_as_rpc (
            Fn && fn,
            Args &&...  args ) -> completions< nil_cx, rpc_cx<decltype(upcxx::bind(std↩
::forward<Fn>(fn), std::forward<Args>(args)...))>, nil_cx >
```

Definition at line 123 of file completion.hpp.

5.3.4.58 rget() [1/2]

```
template<typename T , typename R = nil_cx, typename O = future_cx<0>>
detail::rget_futures_of<detail::rget_byval<T>,R,O>::return_type upcxx::rget (
            global_ptr< T > gp_s,
            completions< nil_cx, R, O > cxs = completions<nil_cx,R,O>{} )
```

Definition at line 168 of file rget.hpp.

5.3.4.59 rget() [2/2]

```
template<typename T , typename R = nil_cx, typename O = future_cx<0>>
detail::rget_futures_of<detail::rget_byref,R,O>::return_type upcxx::rget (
            global_ptr< T > gp_s,
            T * buf_d,
            std::size_t n,
            completions< nil_cx, R, O > cxs = completions<nil_cx,R,O>{} )
```

Definition at line 198 of file rget.hpp.

5.3.4.60 rpc() [1/2]

```
template<typename Fn , typename ...  Args>
auto upcxx::rpc (
             intrank_t recipient,
             Fn && fn,
             Args &&...  args ) -> typename detail::rpc_return<decltype(fn(args...)), Fn,
Args...>::type
```

Definition at line 68 of file rpc.hpp.

5.3.4.61 rpc() [2/2]

```
template<typename Fn , typename ...  T, typename ...  Args>
void upcxx::rpc (
             intrank_t recipient,
             promise< T...  > & prom,
             Fn && fn,
             Args &&...  args )
```

Definition at line 103 of file rpc.hpp.

5.3.4.62 rpc_ff()

```
template<typename Fn , typename ...  Args>
void upcxx::rpc_ff (
             intrank_t recipient,
             Fn && fn,
             Args &&...  args )
```

Definition at line 13 of file rpc.hpp.

5.3.4.63 rput() [1/2]

```
template<typename T , typename S = nil_cx, typename R = nil_cx, typename O = future_cx<0>>
detail::rput_futures_of<S,R,O>::return_type upcxx::rput (
             T value_s,
             global_ptr< T > gp_d,
             completions< S, R, O > cxs = completions<S,R,O>{} )
```

Definition at line 164 of file rput.hpp.

5.3.4.64 rput() [2/2]

```
template<typename T , typename S = nil_cx, typename R = nil_cx, typename O = future_cx<0>>
detail::rput_futures_of<S,R,O>::return_type upcxx::rput (
            T const * buf_s,
            std::size_t n,
            global_ptr< T > gp_d,
            completions< S, R, O > cxs = completions<S,R,O>{} )
```

Definition at line 197 of file rput.hpp.

5.3.4.65 source_cx_as_promise()

```
template<typename ...  T>
completions<promise_cx<T...>, nil_cx, nil_cx> upcxx::source_cx_as_promise (
            promise< T...  > & pro )
```

Definition at line 113 of file completion.hpp.

5.3.4.66 to_future() [1/2]

```
template<typename T >
auto upcxx::to_future (
            T x ) -> decltype(make_future(std::forward<T>(x)))
```

Definition at line 79 of file make_future.hpp.

5.3.4.67 to_future() [2/2]

```
template<typename Kind , typename ...  T>
future1<Kind,T...> upcxx::to_future (
            future1< Kind, T...  > x )
```

Definition at line 85 of file make_future.hpp.

5.3.4.68 tuple_rvals()

```
template<typename Tup >
auto upcxx::tuple_rvals (
            Tup && tup ) -> decltype( detail::tuple_rvals( std::forward<Tup>(tup), make_↩
index_sequence<std::tuple_size<typename std::decay<Tup>::type>::value>() ) )   [inline]
```

Definition at line 408 of file utility.hpp.

5.3.4.69 wait()

```
template<typename Kind , typename ...  T>
auto upcxx::wait (
             future1< Kind, T...  > const & f ) -> decltype(f.result())
```

Definition at line 9 of file wait.hpp.

5.3.4.70 when_all()

```
template<typename ...  Arg>
detail::when_all_return_t<Arg...> upcxx::when_all (
             Arg ...  args )
```

Definition at line 24 of file when_all.hpp.

5.3.5 Variable Documentation

5.3.5.1 dbgbrk_spin

```
bool upcxx::dbgbrk_spin = true
```

Definition at line 12 of file diagnostic.cpp.

5.3.5.2 dbgbrk_spin_init

```
bool upcxx::dbgbrk_spin_init = false
```

Definition at line 11 of file diagnostic.cpp.

5.3.5.3 operxn_cx_as_future

```
constexpr completions<nil_cx, nil_cx, future_cx<0> > upcxx::operxn_cx_as_future = {}
```

Definition at line 110 of file completion.hpp.

5.3.5.4 source_cx_as_future

```
constexpr completions<future_cx<0>, nil_cx, nil_cx> upcxx::source_cx_as_future = {}
```

Definition at line 109 of file completion.hpp.

5.4 upcxx::backend Namespace Reference

Namespaces

- gasnet1_seq

Classes

- struct rma_get_cb
- struct rma_get_cb_wstate
- struct rma_put_cb
- struct rma_put_cb_wstate

Functions

- template<typename Fn1 >
  void during_user (Fn1 &&fn)
- void during_user (promise<> &&pro)
- void during_user (promise<> *pro)
- template<typename Fn1 >
  void during_level (progress_level level, Fn1 &&fn)
- template<upcxx::progress_level level, typename Fn >
  void send_am (intrank_t recipient, Fn &&fn)
- template<typename State , typename SrcCx , typename OpCx >
  rma_put_cb_wstate< State > * make_rma_put_cb (State state, SrcCx src_cx, OpCx op_cx)
- template<typename State , typename OpCx >
  rma_get_cb_wstate< State > * make_rma_get_cb (State state, OpCx op_cx)
- template<typename Fn >
  void during_user (Fn &&fn)
- template<typename Fn >
  void during_level (progress_level level, Fn &&fn)
- void rma_put (intrank_t rank_d, void *buf_d, void *buf_s, std::size_t buf_size, rma_put_cb *cb)
- void rma_get (void *buf_d, intrank_t rank_s, void *buf_s, std::size_t buf_size, rma_get_cb *cb)

Variables

- intrank_t rank_n
- intrank_t rank_me

5.4.1 Function Documentation

5.4.1.1 during_level() [1/2]

```
template<typename Fn >
void upcxx::backend::during_level (
            progress_level level,
            Fn && fn )
```

5.4.1.2 during_level() [2/2]

```
template<typename Fn1 >
void upcxx::backend::during_level (
            progress_level level,
            Fn1 && fn )  [inline]
```

Definition at line 114 of file backend.hpp.

5.4.1.3 during_user() [1/4]

```
template<typename Fn >
void upcxx::backend::during_user (
            Fn && fn )
```

5.4.1.4 during_user() [2/4]

```
template<typename Fn1 >
void upcxx::backend::during_user (
            Fn1 && fn )  [inline]
```

Definition at line 87 of file backend.hpp.

5.4.1.5 during_user() [3/4]

```
void upcxx::backend::during_user (
            promise<> && pro )  [inline]
```

Definition at line 101 of file backend.hpp.

5.4.1.6 during_user() [4/4]

```
void upcxx::backend::during_user (
            promise<> * pro )  [inline]
```

Definition at line 109 of file backend.hpp.

5.4.1.7 make_rma_get_cb()

```
template<typename State , typename OpCx >
rma_get_cb_wstate< State > * upcxx::backend::make_rma_get_cb (
            State state,
            OpCx op_cx )  [inline]
```

Definition at line 226 of file backend.hpp.

5.4.1.8 make_rma_put_cb()

```
template<typename State , typename SrcCx , typename OpCx >
rma_put_cb_wstate< State > * upcxx::backend::make_rma_put_cb (
            State state,
            SrcCx src_cx,
            OpCx op_cx )  [inline]
```

Definition at line 213 of file backend.hpp.

5.4.1.9 rma_get()

```
void upcxx::backend::rma_get (
            void * buf_d,
            intrank_t rank_s,
            void * buf_s,
            std::size_t buf_size,
            rma_get_cb * cb )
```

5.4.1.10 rma_put()

```
void upcxx::backend::rma_put (
            intrank_t rank_d,
            void * buf_d,
            void * buf_s,
            std::size_t buf_size,
            rma_put_cb * cb )
```

5.4.1.11 send_am()

```
template<upcxx::progress_level level, typename Fn >
void upcxx::backend::send_am (
              intrank_t recipient,
              Fn && fn )
```

Definition at line 132 of file backend.hpp.

5.4.2 Variable Documentation

5.4.2.1 rank_me

```
intrank_t upcxx::backend::rank_me
```

Definition at line 30 of file backend.cpp.

5.4.2.2 rank_n

```
intrank_t upcxx::backend::rank_n
```

Definition at line 24 of file backend.cpp.

5.5 upcxx::backend::gasnet1_seq Namespace Reference

Classes

- struct action
- struct action_impl
- struct rma_cb
- struct rma_get_cb_impl
- struct rma_put_cb_impl

Functions

- void send_am_eager_restricted (intrank_t recipient, void *command_buf, std::size_t buf_size, std::size_t buf_align)
- template<typename Fn >
  void send_am_restricted (intrank_t recipient, Fn &&fn)
- void send_am_eager_queued (progress_level level, intrank_t recipient, void *command_buf, std::size_t buf_size, std::size_t buf_align)
- void send_am_rdzv (progress_level level, intrank_t recipient, void *command_buf, std::size_t buf_size, std::size_t buf_align)

Variables

- std::size_t am_size_rdzv_cutover
- bool in_user_progress_ = false
- action * user_actions_head_ = nullptr
- action ** user_actions_tailp_ = &gasnet1_seq::user_actions_head_

5.5.1 Function Documentation

5.5.1.1 send_am_eager_queued()

```
void upcxx::backend::gasnet1_seq::send_am_eager_queued (
            progress_level level,
            intrank_t recipient,
            void * command_buf,
            std::size_t buf_size,
            std::size_t buf_align )
```

Definition at line 245 of file backend.cpp.

5.5.1.2 send_am_eager_restricted()

```
void upcxx::backend::gasnet1_seq::send_am_eager_restricted (
            intrank_t recipient,
            void * command_buf,
            std::size_t buf_size,
            std::size_t buf_align )
```

Definition at line 231 of file backend.cpp.

5.5.1.3 send_am_rdzv()

```
void upcxx::backend::gasnet1_seq::send_am_rdzv (
            progress_level level,
            intrank_t recipient,
            void * command_buf,
            std::size_t buf_size,
            std::size_t buf_align )
```

5.5.1.4 send_am_restricted()

```
template<typename Fn >
void upcxx::backend::gasnet1_seq::send_am_restricted (
             intrank_t recipient,
             Fn && fn )
```

Definition at line 247 of file backend.hpp.

5.5.2 Variable Documentation

5.5.2.1 am_size_rdzv_cutover

```
size_t upcxx::backend::gasnet1_seq::am_size_rdzv_cutover
```

Definition at line 35 of file backend.cpp.

5.5.2.2 in_user_progress_

```
bool upcxx::backend::gasnet1_seq::in_user_progress_ = false
```

Definition at line 37 of file backend.cpp.

5.5.2.3 user_actions_head_

```
gasnet1_seq::action * upcxx::backend::gasnet1_seq::user_actions_head_ = nullptr
```

Definition at line 39 of file backend.cpp.

5.5.2.4 user_actions_tailp_

```
gasnet1_seq::action ** upcxx::backend::gasnet1_seq::user_actions_tailp_ = &gasnet1_seq::user_↩
actions_head_
```

Definition at line 40 of file backend.cpp.

5.6 upcxx::detail Namespace Reference

Classes

- struct allreduce_state
- struct apply_futured_as_future< Fn(future1< Kind, T... >)>
- struct apply_tupled_as_future
- struct apply_tupled_as_future_help
- struct apply_tupled_as_future_help< Fn, ArgTup, std::tuple< T... > >
- struct apply_tupled_as_future_impl
- struct apply_tupled_as_future_impl< future1< Kind, T... > >
- struct apply_tupled_as_future_impl< void >
- struct bind
- struct bind< bound_function< Fn0, B0... > >
- struct bound_function_base
- struct bound_function_base< Fn, std::tuple< B... >, false >
- struct bound_function_base< Fn, std::tuple< B... >, true >
- struct disjoin_cx
- struct disjoin_cx< A, nil_cx, B_ord_bump >
- struct disjoin_cx< nil_cx, B, B_ord_bump >
- struct disjoin_cx< nil_cx, future_cx< B_ord_old >, B_ord_bump >
- struct disjoin_cx< nil_cx, nil_cx, B_ord0 >
- struct future_body
- struct future_body_proxy
- struct future_body_proxy_
- struct future_body_pure
- struct future_body_pure< future1< Kind, T... > >
- struct future_body_then
- struct future_body_then_base
- struct future_body_then_pure
- struct future_dependency
- struct future_dependency< future1< future_kind_mapped< FuArg, Fn >, T... > >
- struct future_dependency< future1< future_kind_result > >
- struct future_dependency< future1< future_kind_result, T... > >
- struct future_dependency< future1< future_kind_shref< HeaderOps >, T... > >
- struct future_dependency< future1< future_kind_when_all< Arg... >, T... > >
- struct future_dependency_shref_base
- struct future_dependency_shref_base< false >
- struct future_dependency_shref_base< true >
- struct future_dependency_when_all_arg
- struct future_dependency_when_all_base
- struct future_dependency_when_all_base< future1< future_kind_when_all< Arg... >, T... >, upcxx↩ ::index_sequence< i... > >
- struct future_from_tuple
- struct future_from_tuple< Kind, std::tuple< T... > >
- struct future_header
- struct future_header_dependent
- struct future_header_ops_general
- struct future_header_ops_result
- struct future_header_ops_result_ready
- struct future_header_result
- struct future_header_result<>
- struct future_impl_mapped
- struct future_impl_result

- struct future_impl_result<>
- struct future_impl_shref
- struct future_impl_when_all
- struct future_impl_when_all< std::tuple< FuArg... >, T... >
- struct future_kind_mapped
- struct future_kind_result
- struct future_kind_shref
- struct future_kind_when_all
- struct future_then
- struct future_then< Arg, Fn, future1< FnRetKind, FnRetT... >, false >
- struct future_then< Arg, Fn, future1< FnRetKind, FnRetT... >, true >
- struct future_then_pure
- struct future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, false, false >
- struct future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, false, true >
- struct future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, true, fnret_trivial >
- struct global_ptr_ctor_internal
- struct is_future_cx
- struct is_future_cx< future_cx< ordinal > >
- struct make_future
- struct make_future_
- struct make_future_< false, T... >
- struct make_future_< true, T... >
- struct make_index_sequence
- struct make_index_sequence< 0, s... >
- struct os_env_parse
- struct os_env_parse< std::string >
- struct packing_tuple_each
- struct packing_tuple_each< n, n, T... >
- struct promise_like
- struct promise_like< future1< Kind, T... > >
- struct rget_byval
- struct rget_futures_of
- struct rget_futures_of< rget_byref, R, future_cx< 0 > >
- struct rget_futures_of< rget_byval< T >, R, future_cx< 0 > >
- struct rget_state_operxn
- struct rget_state_operxn< rget_byref, future_cx< ordinal > >
- struct rget_state_operxn< rget_byref, nil_cx >
- struct rget_state_operxn< rget_byref, promise_cx<> >
- struct rget_state_operxn< rget_byval< T >, future_cx< ordinal > >
- struct rget_state_operxn< rget_byval< T >, nil_cx >
- struct rget_state_operxn< rget_byval< T >, promise_cx< T > >
- struct rget_state_remote
- struct rget_state_remote< nil_cx >
- struct rget_state_remote< rpc_cx< Fn > >
- struct rget_states
- struct rpc_recipient_after
- struct rpc_return
- struct rput_byval
- struct rput_futures_of
- struct rput_futures_of< future_cx< S_ord >, R, future_cx< O_ord > >
- struct rput_futures_of< future_cx< S_ord >, R, O >
- struct rput_futures_of< S, R, future_cx< O_ord > >
- struct rput_state_here
- struct rput_state_here< future_cx< ordinal > >
- struct rput_state_here< nil_cx >

- struct rput_state_here< promise_cx<> >
- struct rput_state_remote
- struct rput_state_remote< nil_cx >
- struct rput_state_remote< rpc_cx< Fn > >
- struct rput_states
- struct rput_states< rput_byref, S, R, O >
- struct rput_states< rput_byval< T >, S, R, O >
- struct tuple_get_or_void
- struct tuple_get_or_void< i, TupRef, false >
- struct tuple_rvals_get
- struct tuple_rvals_get< Tup &&, i, Ti & >
- struct tuple_rvals_get< Tup &&, i, Ti && >
- struct tuple_rvals_get< Tup &&, i, Ti >
- struct tuple_rvals_get< Tup &, i, Ti & >
- struct tuple_rvals_get< Tup &, i, Ti && >
- struct tuple_rvals_get< Tup &, i, Ti >
- struct tuple_rvals_get< Tup const &, i, Ti & >
- struct tuple_rvals_get< Tup const &, i, Ti && >
- struct tuple_rvals_get< Tup const &, i, Ti >

Typedefs

- template<typename App >
  using apply_futured_as_future_return_t = typename apply_futured_as_future< App >::return_type
- template<typename Kind , typename Tup >
  using future_from_tuple_t = typename future_from_tuple< Kind, Tup >::type
- template<typename Fu >
  using promise_like_t = typename promise_like< Fu >::type
- template<typename ... Arg>
  using when_all_return_t = future_from_tuple_t< future_kind_when_all< Arg... >, decltype(std::tuple_↩
  cat(std::declval< typename Arg::results_type >()...)) >

Functions

- template<bool throws, typename T , typename ... Args>
  global_ptr< T > new_ (Args &&...args)
- template<bool throws, typename T >
  global_ptr< T > new_array (std::size_t n)
- template<typename ... P, int ... heads, int tail>
  auto bind_last (std::tuple< P... > parms, upcxx::index_sequence< heads... >, std::integral_constant< int, tail >) -> decltype(detail::bind< typename std::decay< typename std::tuple_element< tail, std::tuple< P... >>::type >::type >()(std::move(std::get< tail >(parms)), std::move(std::get< heads >(parms))...))
- template<typename T >
  void broadcast_receive (T const &value, intrank_t rank_ub, dist_id< promise< T >> id)
- template<typename Fn >
  future command_executor (parcel_reader &r)
- template<typename T >
  promise< dist_object< T > & > * dist_promise (digest id)
- void packing_funptr_basis ()
- template<typename Tup , int ... i>
  auto tuple_rvals (Tup &&tup, index_sequence< i... >) -> std::tuple< decltype(tuple_rvals_get< Tup &&, i >()(tup))... >
- template<typename Fn , typename Tup , int ... i>
  auto apply_tupled (Fn &&fn, Tup &&args, index_sequence< i... >) -> decltype(fn(std::get< i >(args)...))

Variables

- std::unordered_map< digest, void * > dist_master_promises
- std::uint64_t dist_master_id_bump = 0

5.6.1 Typedef Documentation

5.6.1.1 apply_futured_as_future_return_t

```
template<typename App >
using upcxx::detail::apply_futured_as_future_return_t = typedef typename apply_futured_as_↩
future<App>::return_type
```

Definition at line 115 of file core.hpp.

5.6.1.2 future_from_tuple_t

```
template<typename Kind , typename Tup >
using upcxx::detail::future_from_tuple_t = typedef typename future_from_tuple<Kind,Tup>::type
```

Definition at line 131 of file core.hpp.

5.6.1.3 promise_like_t

```
template<typename Fu >
using upcxx::detail::promise_like_t = typedef typename promise_like<Fu>::type
```

Definition at line 25 of file promise.hpp.

5.6.1.4 when_all_return_t

```
template<typename ...  Arg>
using upcxx::detail::when_all_return_t = typedef future_from_tuple_t< future_kind_when_↩
all<Arg...>, decltype(std::tuple_cat( std::declval<typename Arg::results_type>()...  ))  >
```

Definition at line 20 of file when_all.hpp.

5.6.2 Function Documentation

5.6.2.1 apply_tupled()

```
template<typename Fn , typename Tup , int ...  i>
auto upcxx::detail::apply_tupled (
            Fn && fn,
            Tup && args,
            index_sequence< i...  >  ) -> decltype(fn(std::get<i>(args)...))    [inline]
```

Definition at line 427 of file utility.hpp.

5.6.2.2 bind_last()

```
template<typename ...  P, int ...  heads, int tail>
auto upcxx::detail::bind_last (
            std::tuple< P...  > parms,
            upcxx::index_sequence< heads...  > ,
            std::integral_constant< int, tail >  ) -> decltype( detail::bind<typename std↩
::decay<typename std::tuple_element<tail, std::tuple<P...>>::type>::type>()( std::move(std↩
::get<tail>(parms)), std::move(std::get<heads>(parms))...  )  )
```

Definition at line 316 of file bind.hpp.

5.6.2.3 broadcast_receive()

```
template<typename T >
void upcxx::detail::broadcast_receive (
            T const & value,
            intrank_t rank_ub,
            dist_id< promise< T >> id )
```

Definition at line 14 of file broadcast.hpp.

5.6.2.4 command_executor()

```
template<typename Fn >
future upcxx::detail::command_executor (
            parcel_reader & r )
```

Definition at line 69 of file command.hpp.

5.6.2.5 dist_promise()

```
template<typename T >
promise<dist_object<T>&>* upcxx::detail::dist_promise (
            digest id )
```

Definition at line 31 of file dist_object.hpp.

5.6.2.6 new_()

```
template<bool throws, typename T , typename ...  Args>
global_ptr<T> upcxx::detail::new_ (
            Args &&...  args )
```

Definition at line 58 of file allocate.hpp.

5.6.2.7 new_array()

```
template<bool throws, typename T >
global_ptr<T> upcxx::detail::new_array (
            std::size_t n )
```

Definition at line 96 of file allocate.hpp.

5.6.2.8 packing_funptr_basis()

```
void upcxx::detail::packing_funptr_basis ( )
```

Definition at line 3 of file packing.cpp.

5.6.2.9 tuple_rvals()

```
template<typename Tup , int ...  i>
auto upcxx::detail::tuple_rvals (
            Tup && tup,
            index_sequence< i...  >  ) -> std::tuple<decltype(tuple_rvals_get<Tup&&, i>()(tup))...>
[inline]
```

Definition at line 399 of file utility.hpp.

5.6.3 Variable Documentation

5.6.3.1 dist_master_id_bump

```
uint64_t upcxx::detail::dist_master_id_bump = 0
```

Definition at line 8 of file dist_object.cpp.

5.6.3.2 dist_master_promises

```
unordered_map< digest, void * > upcxx::detail::dist_master_promises
```

Definition at line 6 of file dist_object.cpp.

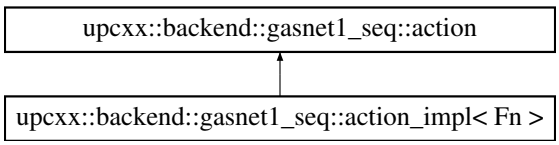
Chapter 6

Class Documentation

6.1 upcxx::backend::gasnet1_seq::action Struct Reference

`#include <backend.hpp>`

Inheritance diagram for upcxx::backend::gasnet1_seq::action:



Public Member Functions

- virtual void fire_and_delete ()=0

Public Attributes

- action * next_

6.1.1 Detailed Description

Definition at line 18 of file backend.hpp.

6.1.2 Member Function Documentation

6.1.2.1 fire_and_delete()

`virtual void upcxx::backend::gasnet1_seq::action::fire_and_delete ( )  [pure virtual]`

Implemented in upcxx::backend::gasnet1_seq::action_impl< Fn >.

6.1.3 Member Data Documentation

6.1.3.1 next_

```
action* upcxx::backend::gasnet1_seq::action::next_
```

Definition at line 19 of file backend.hpp.

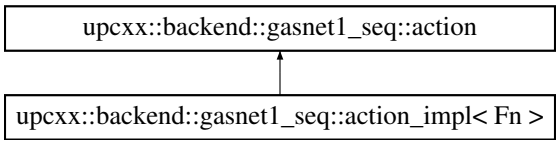
The documentation for this struct was generated from the following file:

- backend/gasnet1_seq/backend.hpp

6.2 upcxx::backend::gasnet1_seq::action_impl< Fn > Struct Template Reference

```
#include <backend.hpp>
```

Inheritance diagram for upcxx::backend::gasnet1_seq::action_impl< Fn >:



Public Member Functions

- action_impl (Fn fn)
- void fire_and_delete ()

Public Attributes

- Fn fn

6.2.1 Detailed Description

template<typename Fn>
struct upcxx::backend::gasnet1_seq::action_impl< Fn >

Definition at line 75 of file backend.hpp.

6.2.2 Constructor & Destructor Documentation

6.2.2.1 action_impl()

```
template<typename Fn >
upcxx::backend::gasnet1_seq::action_impl< Fn >::action_impl (
            Fn fn )  [inline]
```

Definition at line 77 of file backend.hpp.

6.2.3 Member Function Documentation

6.2.3.1 fire_and_delete()

```
template<typename Fn >
void upcxx::backend::gasnet1_seq::action_impl< Fn >::fire_and_delete ( )  [inline], [virtual]
```

Implements upcxx::backend::gasnet1_seq::action.

Definition at line 79 of file backend.hpp.

6.2.4 Member Data Documentation

6.2.4.1 fn

```
template<typename Fn >
Fn upcxx::backend::gasnet1_seq::action_impl< Fn >::fn
```

Definition at line 76 of file backend.hpp.

The documentation for this struct was generated from the following file:

- backend/gasnet1_seq/backend.hpp

6.3 upcxx::add_lref_if_nonref< T > Struct Template Reference

```
#include <utility.hpp>
```

Public Types

- using type = T &

6.3.1 Detailed Description

template<typename T>
struct upcxx::add_lref_if_nonref< T >

Definition at line 210 of file utility.hpp.

6.3.2 Member Typedef Documentation

6.3.2.1 type

```
template<typename T >
using upcxx::add_lref_if_nonref< T >::type = T&
```

Definition at line 210 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.4 upcxx::add_lref_if_nonref< T & > Struct Template Reference

```
#include <utility.hpp>
```

Public Types

- using type = T &

6.4.1 Detailed Description

template<typename T>
struct upcxx::add_lref_if_nonref< T & >

Definition at line 213 of file utility.hpp.

6.4.2 Member Typedef Documentation

6.4.2.1 type

```
template<typename T >
using upcxx::add_lref_if_nonref< T & >::type = T&
```

Definition at line 213 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.5 upcxx::add_lref_if_nonref< T && > Struct Template Reference

```
#include <utility.hpp>
```

Public Types

- using type = T &&

6.5.1 Detailed Description

template<typename T>
struct upcxx::add_lref_if_nonref< T && >

Definition at line 216 of file utility.hpp.

6.5.2 Member Typedef Documentation

6.5.2.1 type

```
template<typename T >
using upcxx::add_lref_if_nonref< T && >::type = T&&
```

Definition at line 216 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.6 upcxx::detail::allreduce_state< T, Op > Struct Template Reference

```
#include <allreduce.hpp>
```

Public Member Functions

- void contributed (dist_object< allreduce_state > &this_obj)
- void broadcast (dist_object< allreduce_state > &this_obj, T const &value, intrank_t rank_ub)

Public Attributes

- int incoming
- Op op
- T accum
- promise< T > answer

6.6.1 Detailed Description

template<typename T, typename Op>
struct upcxx::detail::allreduce_state< T, Op >

Definition at line 11 of file allreduce.hpp.

6.6.2 Member Function Documentation

6.6.2.1 broadcast()

```
template<typename T , typename Op >
void upcxx::detail::allreduce_state< T, Op >::broadcast (
             dist_object< allreduce_state< T, Op > > & this_obj,
             T const & value,
             intrank_t rank_ub )
```

Definition at line 95 of file allreduce.hpp.

6.6.2.2 contributed()

```
template<typename T , typename Op >
void upcxx::detail::allreduce_state< T, Op >::contributed (
             dist_object< allreduce_state< T, Op > > & this_obj )
```

Definition at line 68 of file allreduce.hpp.

6.6.3 Member Data Documentation

6.6.3.1 accum

```
template<typename T , typename Op >
T upcxx::detail::allreduce_state< T, Op >::accum
```

Definition at line 14 of file allreduce.hpp.

6.6.3.2 answer

```
template<typename T , typename Op >
promise<T> upcxx::detail::allreduce_state< T, Op >::answer
```

Definition at line 15 of file allreduce.hpp.

6.6.3.3 incoming

```
template<typename T , typename Op >
int upcxx::detail::allreduce_state< T, Op >::incoming
```

Definition at line 12 of file allreduce.hpp.

6.6.3.4 op

```
template<typename T , typename Op >
Op upcxx::detail::allreduce_state< T, Op >::op
```

Definition at line 13 of file allreduce.hpp.

The documentation for this struct was generated from the following file:

- allreduce.hpp

6.7 upcxx::detail::bound_function_base< Fn, std::tuple< B... >, false >::applicator< Arg > Struct Template Reference

```
#include <bind.hpp>
```

Public Member Functions

- template<int ... ai>
  auto apply_ (upcxx::index_sequence< ai... >, typename binding< Fn >::off_wire_type &fn, typename binding< B >::off_wire_type &...b) -> decltype(fn(b..., std::get< ai >(a)...))
- auto operator() (typename binding< Fn >::off_wire_type &fn, typename binding< B >::off_wire_type &...b) -> decltype(apply_(upcxx::make_index_sequence< sizeof...(Arg)>

Public Attributes

- std::tuple< Arg... > a
- fn
- b

6.7.1 Detailed Description

template<typename Fn, typename ... B>
template<typename ... Arg>
struct upcxx::detail::bound_function_base< Fn, std::tuple< B... >, false >::applicator< Arg >

Definition at line 128 of file bind.hpp.

6.7.2 Member Function Documentation

6.7.2.1 apply_()

```
template<typename Fn , typename ...  B>
template<typename ...  Arg>
template<int ...  ai>
auto upcxx::detail::bound_function_base< Fn, std::tuple< B...  >, false >::applicator< Arg
>::apply_ (
            upcxx::index_sequence< ai...  > ,
            typename binding< Fn >::off_wire_type & fn,
            typename binding< B >::off_wire_type &...  b ) -> decltype(fn(b..., std::get<ai>(a)...))
[inline]
```

Definition at line 132 of file bind.hpp.

6.7.2.2 operator()()

```
template<typename Fn , typename ...  B>
template<typename ...  Arg>
auto upcxx::detail::bound_function_base< Fn, std::tuple< B...  >, false >::applicator< Arg
>::operator() (
            typename binding< Fn >::off_wire_type & fn,
            typename binding< B >::off_wire_type &...  b ) -> decltype( apply_(upcxx::make↩
_index_sequence<sizeof...(Arg)>  [inline]
```

Definition at line 141 of file bind.hpp.

6.7.3 Member Data Documentation

6.7.3.1 a

```
template<typename Fn , typename ...  B>
template<typename ...  Arg>
std::tuple<Arg...> upcxx::detail::bound_function_base< Fn, std::tuple< B...  >, false >↩
::applicator< Arg >::a
```

Definition at line 129 of file bind.hpp.

6.7.3.2 b

```
template<typename Fn , typename ...  B>
template<typename ...  Arg>
upcxx::detail::bound_function_base< Fn, std::tuple< B...  >, false >::applicator< Arg >::b
```

Initial value:

```
{
          return apply_(upcxx::make_index_sequence<sizeof...(Arg)>{},
      fn, b...)
```

Definition at line 147 of file bind.hpp.

6.7.3.3 fn

```
template<typename Fn , typename ...  B>
template<typename ...  Arg>
upcxx::detail::bound_function_base< Fn, std::tuple< B...  >, false >::applicator< Arg >::fn
```

Definition at line 146 of file bind.hpp.

The documentation for this struct was generated from the following file:

- bind.hpp

6.8 upcxx::detail::apply_futured_as_future< Fn(future1< Kind, T... >)> Struct Template Reference

```
#include <apply.hpp>
```

Public Types

- using tupled_impl = apply_tupled_as_future< Fn, std::tuple< typename upcxx::add_lref_if_nonref< T >↩ ::type... > >
- using return_type = typename tupled_impl::return_type

Public Member Functions

- template<typename Fn1 >
  return_type operator() (Fn1 &&fn, future1< Kind, T... > const &arg)
- template<typename Fn1 >
  return_type operator() (Fn1 &&fn, future_dependency< future1< Kind, T... >> const &arg)

6.8.1 Detailed Description

template<typename Fn, typename Kind, typename ... T>
struct upcxx::detail::apply_futured_as_future< Fn(future1< Kind, T... >)>

Definition at line 74 of file apply.hpp.

6.8.2 Member Typedef Documentation

6.8.2.1 return_type

```
template<typename Fn , typename Kind , typename ...  T>
using upcxx::detail::apply_futured_as_future< Fn(future1< Kind, T...  >)>::return_type =
typename tupled_impl::return_type
```

Definition at line 80 of file apply.hpp.

6.8.2.2 tupled_impl

```
template<typename Fn , typename Kind , typename ...  T>
using upcxx::detail::apply_futured_as_future< Fn(future1< Kind, T...  >)>::tupled_impl =
apply_tupled_as_future< Fn, std::tuple<typename upcxx::add_lref_if_nonref<T>::type...> >
```

Definition at line 78 of file apply.hpp.

6.8.3 Member Function Documentation

6.8.3.1 operator()() [1/2]

```
template<typename Fn , typename Kind , typename ...  T>
template<typename Fn1 >
return_type upcxx::detail::apply_futured_as_future< Fn(future1< Kind, T...  >)>::operator() (
            Fn1 && fn,
            future1< Kind, T...  > const & arg )  [inline]
```

Definition at line 83 of file apply.hpp.

6.8.3.2 operator()() [2/2]

```
template<typename Fn , typename Kind , typename ...  T>
template<typename Fn1 >
return_type upcxx::detail::apply_futured_as_future< Fn(future1< Kind, T...  >)>::operator() (
            Fn1 && fn,
            future_dependency< future1< Kind, T...  >> const & arg )  [inline]
```

Definition at line 91 of file apply.hpp.

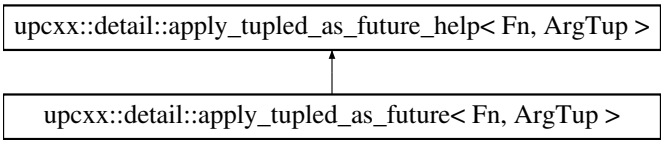
The documentation for this struct was generated from the following file:

- future/apply.hpp

6.9 upcxx::detail::apply_tupled_as_future< Fn, ArgTup > Struct Template Reference

```
#include <apply.hpp>
```

Inheritance diagram for upcxx::detail::apply_tupled_as_future< Fn, ArgTup >:



6.9.1 Detailed Description

template<typename Fn, typename ArgTup>
struct upcxx::detail::apply_tupled_as_future< Fn, ArgTup >

Definition at line 69 of file apply.hpp.

The documentation for this struct was generated from the following file:

- future/apply.hpp

6.10 upcxx::detail::apply_tupled_as_future_help< Fn, ArgTup, ArgTupDecayed > Struct Template Reference

```
#include <apply.hpp>
```

6.10.1 Detailed Description

template<typename Fn, typename ArgTup, typename ArgTupDecayed = typename std::decay<ArgTup>::type>
struct upcxx::detail::apply_tupled_as_future_help< Fn, ArgTup, ArgTupDecayed >

Definition at line 56 of file apply.hpp.

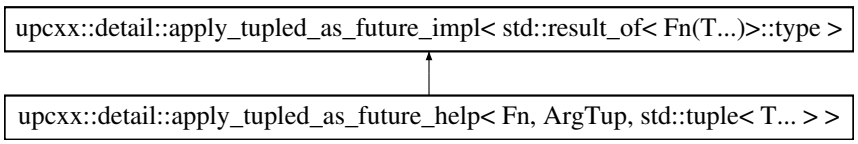
The documentation for this struct was generated from the following file:

- future/apply.hpp

6.11 upcxx::detail::apply_tupled_as_future_help< Fn, ArgTup, std::tuple< T... > > Struct Template Reference

`#include <apply.hpp>`

Inheritance diagram for upcxx::detail::apply_tupled_as_future_help< Fn, ArgTup, std::tuple< T... > >:



Additional Inherited Members

6.11.1 Detailed Description

template<typename Fn, typename ArgTup, typename ... T>
struct upcxx::detail::apply_tupled_as_future_help< Fn, ArgTup, std::tuple< T... > >

Definition at line 59 of file apply.hpp.

The documentation for this struct was generated from the following file:

- future/apply.hpp

6.12 upcxx::detail::apply_tupled_as_future_impl< Return > Struct Template Reference

`#include <apply.hpp>`

Public Member Functions

- template<typename Fn , typename ArgTup >
  return_type operator() (Fn &&fn, ArgTup &&argtup)

Public Attributes

- decltype(upcxx::make_future< Return >(std::declval< Return >())) typedef return_type

6.12.1 Detailed Description

template<typename Return>
struct upcxx::detail::apply_tupled_as_future_impl< Return >

Definition at line 13 of file apply.hpp.

6.12.2 Member Function Documentation

6.12.2.1 operator()()

```
template<typename Return>
template<typename Fn , typename ArgTup >
return_type upcxx::detail::apply_tupled_as_future_impl< Return >::operator() (
            Fn && fn,
            ArgTup && argtup )  [inline]
```

Definition at line 33 of file apply.hpp.

6.12.3 Member Data Documentation

6.12.3.1 return_type

```
template<typename Return>
decltype(upcxx::make_future<Return>(std::declval<Return>())) typedef upcxx::detail::apply_↩
tupled_as_future_impl< Return >::return_type
```

Definition at line 30 of file apply.hpp.

The documentation for this struct was generated from the following file:

- future/apply.hpp

6.13 upcxx::detail::apply_tupled_as_future_impl< future1< Kind, T... > > Struct Template Reference

```
#include <apply.hpp>
```

Public Types

- typedef future1< Kind, T... > return_type

Public Member Functions

- template<typename Fn , typename ArgTup >
  return_type operator() (Fn &&fn, ArgTup &&argtup)

6.13.1 Detailed Description

template<typename Kind, typename ... T>
struct upcxx::detail::apply_tupled_as_future_impl< future1< Kind, T... > >

Definition at line 42 of file apply.hpp.

6.13.2 Member Typedef Documentation

6.13.2.1 return_type

```
template<typename Kind , typename ...  T>
typedef future1<Kind,T...> upcxx::detail::apply_tupled_as_future_impl< future1< Kind, T...
> >::return_type
```

Definition at line 43 of file apply.hpp.

6.13.3 Member Function Documentation

6.13.3.1 operator()()

```
template<typename Kind , typename ...  T>
template<typename Fn , typename ArgTup >
return_type upcxx::detail::apply_tupled_as_future_impl< future1< Kind, T...  > >::operator()
(
            Fn && fn,
            ArgTup && argtup )  [inline]
```

Definition at line 46 of file apply.hpp.

The documentation for this struct was generated from the following file:

- future/apply.hpp

6.14 upcxx::detail::apply_tupled_as_future_impl< void > Struct Template Reference

`#include <apply.hpp>`

Public Member Functions

- template<typename Fn , typename ArgTup >
  return_type operator() (Fn &&fn, ArgTup &&argtup)

Public Attributes

- decltype(upcxx::make_future<>()) typedef return_type

6.14.1 Detailed Description

template<>
struct upcxx::detail::apply_tupled_as_future_impl< void >

Definition at line 17 of file apply.hpp.

6.14.2 Member Function Documentation

6.14.2.1 operator()()

```
template<typename Fn , typename ArgTup >
return_type upcxx::detail::apply_tupled_as_future_impl< void >::operator() (
            Fn && fn,
            ArgTup && argtup )  [inline]
```

Definition at line 21 of file apply.hpp.

6.14.3 Member Data Documentation

6.14.3.1 return_type

```
decltype(upcxx::make_future<>()) typedef upcxx::detail::apply_tupled_as_future_impl< void >↩
::return_type
```

Definition at line 18 of file apply.hpp.

The documentation for this struct was generated from the following file:

- future/apply.hpp

6.15 upcxx::detail::bind< FnDecayed > Struct Template Reference

`#include <bind.hpp>`

Public Member Functions

- template<typename Fn , typename ... B>
  bound_function< Fn &&, B &&... > operator() (Fn &&fn, B &&...b) const

6.15.1 Detailed Description

template<typename FnDecayed>
struct upcxx::detail::bind< FnDecayed >

Definition at line 261 of file bind.hpp.

6.15.2 Member Function Documentation

6.15.2.1 operator()()

```
template<typename FnDecayed >
template<typename Fn , typename ...  B>
bound_function<Fn&&, B&&...> upcxx::detail::bind< FnDecayed >::operator() (
            Fn && fn,
            B &&...  b ) const  [inline]
```

Definition at line 263 of file bind.hpp.

The documentation for this struct was generated from the following file:

- bind.hpp

6.16 upcxx::detail::bind< bound_function< Fn0, B0... > > Struct Template Reference

`#include <bind.hpp>`

Public Member Functions

- template<typename Bf , typename ... B1>
  bound_function< Fn0, B0..., B1 &&... > operator() (Bf &&bf, B1 &&...b1) const

6.16.1 Detailed Description

template<typename Fn0, typename ... B0>
struct upcxx::detail::bind< bound_function< Fn0, B0... > >

Definition at line 275 of file bind.hpp.

6.16.2 Member Function Documentation

6.16.2.1 operator()()

```
template<typename Fn0 , typename ...  B0>
template<typename Bf , typename ...  B1>
bound_function<Fn0, B0..., B1&&...> upcxx::detail::bind< bound_function< Fn0, B0...  > >↩
::operator() (
             Bf && bf,
             B1 &&...  b1 ) const  [inline]
```

Definition at line 277 of file bind.hpp.

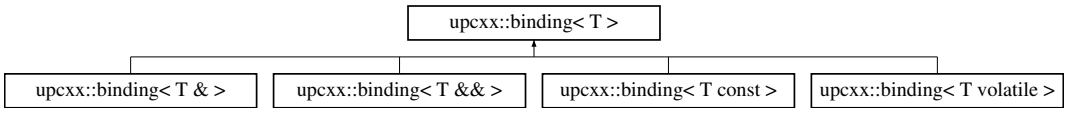
The documentation for this struct was generated from the following file:

- bind.hpp

6.17 upcxx::binding< T > Struct Template Reference

```
#include <bind.hpp>
```

Inheritance diagram for upcxx::binding< T >:



Public Types

- using on_wire_type = T
- using off_wire_type = T

Static Public Member Functions

- static T on_wire (T x)
- static auto off_wire (T x) -> decltype(make_future(std::move(x)))

Static Public Attributes

- static constexpr bool is_trivial = true

6.17.1 Detailed Description

template<typename T>
struct upcxx::binding< T >

Definition at line 31 of file bind.hpp.

6.17.2 Member Typedef Documentation

6.17.2.1 off_wire_type

```
template<typename T>
using upcxx::binding< T >::off_wire_type = T
```

Definition at line 33 of file bind.hpp.

6.17.2.2 on_wire_type

```
template<typename T>
using upcxx::binding< T >::on_wire_type = T
```

Definition at line 32 of file bind.hpp.

6.17.3 Member Function Documentation

6.17.3.1 off_wire()

```
template<typename T>
static auto upcxx::binding< T >::off_wire (
            T x ) -> decltype(make_future(std::move(x)))   [inline], [static]
```

Definition at line 39 of file bind.hpp.

6.17.3.2 on_wire()

```
template<typename T>
static T upcxx::binding< T >::on_wire (
            T x )  [inline], [static]
```

Definition at line 35 of file bind.hpp.

6.17.4 Member Data Documentation

6.17.4.1 is_trivial

```
template<typename T>
constexpr bool upcxx::binding< T >::is_trivial = true  [static]
```

Definition at line 46 of file bind.hpp.

The documentation for this struct was generated from the following file:

- bind.hpp

6.18 upcxx::binding< dist_object< T > & > Struct Template Reference

```
#include <dist_object.hpp>
```

Public Types

- using on_wire_type = dist_id< T >
- using off_wire_type = dist_object< T > &

Static Public Member Functions

- static dist_id< T > on_wire (dist_object< T > &o)
- static future< dist_object< T > & > off_wire (dist_id< T > id)

6.18.1 Detailed Description

template<typename T>
struct upcxx::binding< dist_object< T > & >

Definition at line 153 of file dist_object.hpp.

6.18.2 Member Typedef Documentation

6.18.2.1 off_wire_type

```
template<typename T >
using upcxx::binding< dist_object< T > & >::off_wire_type = dist_object<T>&
```

Definition at line 155 of file dist_object.hpp.

6.18.2.2 on_wire_type

```
template<typename T >
using upcxx::binding< dist_object< T > & >::on_wire_type = dist_id<T>
```

Definition at line 154 of file dist_object.hpp.

6.18.3 Member Function Documentation

6.18.3.1 off_wire()

```
template<typename T >
static future<dist_object<T>&> upcxx::binding< dist_object< T > & >::off_wire (
            dist_id< T > id )  [inline], [static]
```

Definition at line 161 of file dist_object.hpp.

6.18.3.2 on_wire()

```
template<typename T >
static dist_id<T> upcxx::binding< dist_object< T > & >::on_wire (
            dist_object< T > & o )  [inline], [static]
```

Definition at line 157 of file dist_object.hpp.

The documentation for this struct was generated from the following file:

- dist_object.hpp

6.19 upcxx::binding< dist_object< T > && > Struct Template Reference

`#include <dist_object.hpp>`

6.19.1 Detailed Description

template<typename T>
struct upcxx::binding< dist_object< T > && >

Definition at line 167 of file dist_object.hpp.

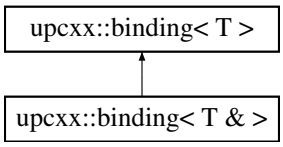
The documentation for this struct was generated from the following file:

- dist_object.hpp

6.20 upcxx::binding< T & > Struct Template Reference

`#include <bind.hpp>`

Inheritance diagram for upcxx::binding< T & >:



Additional Inherited Members

6.20.1 Detailed Description

template<typename T>
struct upcxx::binding< T & >

Definition at line 60 of file bind.hpp.

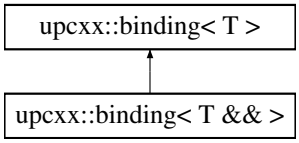
The documentation for this struct was generated from the following file:

- bind.hpp

6.21 upcxx::binding< T && > Struct Template Reference

`#include <bind.hpp>`

Inheritance diagram for upcxx::binding< T && >:



Additional Inherited Members

6.21.1 Detailed Description

template<typename T>
struct upcxx::binding< T && >

Definition at line 62 of file bind.hpp.

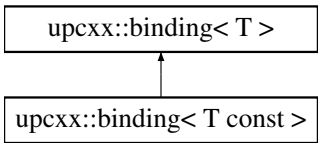
The documentation for this struct was generated from the following file:

- bind.hpp

6.22 upcxx::binding< T const > Struct Template Reference

`#include <bind.hpp>`

Inheritance diagram for upcxx::binding< T const >:



Additional Inherited Members

6.22.1 Detailed Description

template<typename T>
struct upcxx::binding< T const >

Definition at line 64 of file bind.hpp.

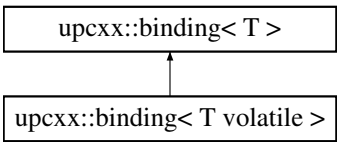
The documentation for this struct was generated from the following file:

- bind.hpp

6.23 upcxx::binding< T volatile > Struct Template Reference

`#include <bind.hpp>`

Inheritance diagram for upcxx::binding< T volatile >:



Additional Inherited Members

6.23.1 Detailed Description

template<typename T>
struct upcxx::binding< T volatile >

Definition at line 66 of file bind.hpp.

The documentation for this struct was generated from the following file:

- bind.hpp

6.24 upcxx::binding_is_trivial< T, trivial > Struct Template Reference

`#include <bind.hpp>`

Static Public Attributes

- static constexpr bool value = trivial::value

6.24.1 Detailed Description

template<typename T, typename trivial = std::false_type>
struct upcxx::binding_is_trivial< T, trivial >

Definition at line 50 of file bind.hpp.

6.24.2 Member Data Documentation

6.24.2.1 value

```
template<typename T , typename trivial = std::false_type>
constexpr bool upcxx::binding_is_trivial< T, trivial >::value = trivial::value  [static]
```

Definition at line 51 of file bind.hpp.

The documentation for this struct was generated from the following file:

- bind.hpp

6.25 upcxx::binding_is_trivial< T, std::integral_constant< bool, binding< T >::is_trivial > > Struct Template Reference

```
#include <bind.hpp>
```

Static Public Attributes

- static constexpr bool value = binding<T>::is_trivial

6.25.1 Detailed Description

template<typename T>
struct upcxx::binding_is_trivial< T, std::integral_constant< bool, binding< T >::is_trivial > >

Definition at line 54 of file bind.hpp.

6.25.2 Member Data Documentation

6.25.2.1 value

```
template<typename T >
constexpr bool upcxx::binding_is_trivial< T, std::integral_constant< bool, binding< T >::is_trivial > >::value = binding<T>::is_trivial  [static]
```

Definition at line 55 of file bind.hpp.

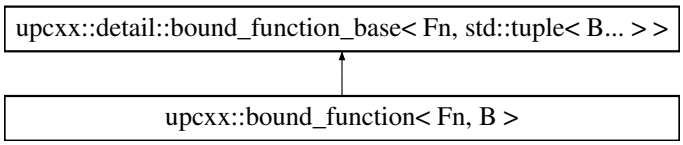
The documentation for this struct was generated from the following file:

- bind.hpp

6.26 upcxx::bound_function< Fn, B > Struct Template Reference

`#include <bind.hpp>`

Inheritance diagram for upcxx::bound_function< Fn, B >:



Public Types

- using base_type = detail::bound_function_base< Fn, std::tuple< B... > >

Public Member Functions

- bound_function (typename binding< Fn >::on_wire_type &&fn, std::tuple< typename binding< B >::on_↩ wire_type... > &&b)
- template<typename ... Arg>
  auto operator() (Arg &&...a) const -> decltype(base_type::apply_(*this, upcxx::make_index_sequence< sizeof...(B)>(), std::forward< Arg >(a)...))
- template<typename ... Arg>
  auto operator() (Arg &&...a) -> decltype(base_type::apply_(*this, upcxx::make_index_sequence< sizeof...(B)>(), std::forward< Arg >(a)...))

6.26.1 Detailed Description

template<typename Fn, typename ... B>
struct upcxx::bound_function< Fn, B >

Definition at line 179 of file bind.hpp.

6.26.2 Member Typedef Documentation

6.26.2.1 base_type

```
template<typename Fn, typename ...  B>
using upcxx::bound_function< Fn, B >::base_type = detail::bound_function_base<Fn, std::tuple<B...>
>
```

Definition at line 182 of file bind.hpp.

6.26.3 Constructor & Destructor Documentation

6.26.3.1 bound_function()

```
template<typename Fn, typename ... B>
upcxx::bound_function< Fn, B >::bound_function (
            typename binding< Fn >::on_wire_type && fn,
            std::tuple< typename binding< B >::on_wire_type... > && b ) [inline]
```

Definition at line 184 of file bind.hpp.

6.26.4 Member Function Documentation

6.26.4.1 operator()() [1/2]

```
template<typename Fn, typename ... B>
template<typename ... Arg>
auto upcxx::bound_function< Fn, B >::operator() (
            Arg &&... a ) const -> decltype( base_type::apply_(*this, upcxx::make_index_↩
sequence<sizeof...(B)>(), std::forward<Arg>(a)... ) ) [inline]
```

Definition at line 192 of file bind.hpp.

6.26.4.2 operator()() [2/2]

```
template<typename Fn, typename ... B>
template<typename ... Arg>
auto upcxx::bound_function< Fn, B >::operator() (
            Arg &&... a ) -> decltype( base_type::apply_(*this, upcxx::make_index_sequence<sizeof...(B)>(),
std::forward<Arg>(a)... ) ) [inline]
```

Definition at line 206 of file bind.hpp.

The documentation for this struct was generated from the following file:

- bind.hpp

6.27 upcxx::detail::bound_function_base< Fn, BndTup, all_trivial > Struct Template Reference

```
#include <bind.hpp>
```

6.27.1 Detailed Description

template<typename Fn, typename BndTup, bool all_trivial = binding_is_trivial<Fn>::value && upcxx::trait_forall_tupled<binding_is_trivial, BndTup>::value>
struct upcxx::detail::bound_function_base< Fn, BndTup, all_trivial >

Definition at line 90 of file bind.hpp.

The documentation for this struct was generated from the following file:

- bind.hpp

6.28 upcxx::detail::bound_function_base< Fn, std::tuple< B... >, false > Struct Template Reference

`#include <bind.hpp>`

Classes

- struct applicator

Static Public Member Functions

- template<typename Me , int ... bi, typename ... Arg>
  static auto apply_ (Me &&me, upcxx::index_sequence< bi... > b_seq, Arg &&...a) -> decltype(upcxx::when_all(binding< Fn >::off_wire(me.fn_), binding< B >::off_wire(std::get< bi >(const_cast< std::tuple< typename binding< B >::on_wire_type... > &>(me.b_)))...) >> std::declval< applicator< Arg &&... >>())

Public Attributes

- binding< Fn >::on_wire_type fn_
- std::tuple< typename binding< B >::on_wire_type... > b_

6.28.1 Detailed Description

template<typename Fn, typename ... B>
struct upcxx::detail::bound_function_base< Fn, std::tuple< B... >, false >

Definition at line 120 of file bind.hpp.

6.28.2 Member Function Documentation

6.28.2.1 apply_()

```
template<typename Fn , typename ... B>
template<typename Me , int ... bi, typename ... Arg>
static auto upcxx::detail::bound_function_base< Fn, std::tuple< B... >, false >::apply_ (
            Me && me,
            upcxx::index_sequence< bi... > b_seq,
            Arg &&... a ) -> decltype( upcxx::when_all( binding<Fn>::off_wire(me.fn_),
binding<B>::off_wire( std::get<bi>(const_cast<std::tuple<typename binding<B>::on_wire_↩
type...>&>(me.b_)) )... ) >> std::declval<applicator<Arg&&...>>() ) [inline], [static]
```

Definition at line 153 of file bind.hpp.

6.28.3 Member Data Documentation

6.28.3.1 b_

```
template<typename Fn , typename ... B>
std::tuple<typename binding<B>::on_wire_type...> upcxx::detail::bound_function_base< Fn,
std::tuple< B... >, false >::b_
```

Definition at line 125 of file bind.hpp.

6.28.3.2 fn_

```
template<typename Fn , typename ... B>
binding<Fn>::on_wire_type upcxx::detail::bound_function_base< Fn, std::tuple< B... >, false
>::fn_
```

Definition at line 124 of file bind.hpp.

The documentation for this struct was generated from the following file:

- bind.hpp

6.29 upcxx::detail::bound_function_base< Fn, std::tuple< B... >, true > Struct Template Reference

```
#include <bind.hpp>
```

Static Public Member Functions

- template<typename Me , int ... bi, typename ... Arg>
  static auto apply_ (Me &&me, upcxx::index_sequence< bi... > b_seq, Arg &&...a) -> decltype(me.fn_↩
  (std::get< bi >(const_cast< std::tuple< typename binding< B >::on_wire_type... > &>(me.b_))..., std↩
  ::forward< Arg >(a)...))

Public Attributes

- binding< Fn >::on_wire_type fn_
- std::tuple< typename binding< B >::on_wire_type... > b_

6.29.1 Detailed Description

template<typename Fn, typename ... B>
struct upcxx::detail::bound_function_base< Fn, std::tuple< B... >, true >

Definition at line 93 of file bind.hpp.

6.29.2 Member Function Documentation

6.29.2.1 apply_()

```
template<typename Fn , typename ...  B>
template<typename Me , int ...  bi, typename ...  Arg>
static auto upcxx::detail::bound_function_base< Fn, std::tuple< B...  >, true >::apply_ (
            Me && me,
            upcxx::index_sequence< bi...  > b_seq,
            Arg &&...  a ) -> decltype( me.fn_( std::get<bi>(const_cast<std::tuple<typename
binding<B>::on_wire_type...>&>(me.b_))..., std::forward<Arg>(a)...  )  )    [inline], [static]
```

Definition at line 101 of file bind.hpp.

6.29.3 Member Data Documentation

6.29.3.1 b_

```
template<typename Fn , typename ...  B>
std::tuple<typename binding<B>::on_wire_type...> upcxx::detail::bound_function_base< Fn,
std::tuple< B...  >, true >::b_
```

Definition at line 98 of file bind.hpp.

6.29.3.2 fn_

```
template<typename Fn , typename ...  B>
binding<Fn>::on_wire_type upcxx::detail::bound_function_base< Fn, std::tuple< B...  >, true
>::fn_
```

Definition at line 97 of file bind.hpp.

The documentation for this struct was generated from the following file:

- bind.hpp

6.30 upcxx::commanding< Fn > Struct Template Reference

```
#include <command.hpp>
```

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, Fn const &x)
- static void pack (parcel_writer &w, Fn const &x)
- static auto execute (parcel_reader &r) -> decltype(make_future())

6.30.1 Detailed Description

template<typename Fn>
struct upcxx::commanding< Fn >

Definition at line 35 of file command.hpp.

6.30.2 Member Function Documentation

6.30.2.1 execute()

```
template<typename Fn >
static auto upcxx::commanding< Fn >::execute (
            parcel_reader & r ) -> decltype(make_future())   [inline], [static]
```

Definition at line 44 of file command.hpp.

6.30.2.2 pack()

```
template<typename Fn >
static void upcxx::commanding< Fn >::pack (
             parcel_writer & w,
             Fn const & x )  [inline], [static]
```

Definition at line 40 of file command.hpp.

6.30.2.3 size_ubound()

```
template<typename Fn >
static void upcxx::commanding< Fn >::size_ubound (
             parcel_layout & ub,
             Fn const & x )  [inline], [static]
```

Definition at line 36 of file command.hpp.

The documentation for this struct was generated from the following file:

- command.hpp

6.31 upcxx::completions< SourceCx, RemoteCx, OpxnCx > Struct Template Reference

```
#include <completion.hpp>
```

Public Attributes

- SourceCx source
- RemoteCx remote
- OpxnCx operxn

Static Public Attributes

- static constexpr int future_n

6.31.1 Detailed Description

template<typename SourceCx, typename RemoteCx, typename OpxnCx>
struct upcxx::completions< SourceCx, RemoteCx, OpxnCx >

Definition at line 72 of file completion.hpp.

6.31.2 Member Data Documentation

6.31.2.1 future_n

```
template<typename SourceCx, typename RemoteCx, typename OpxnCx>
constexpr int upcxx::completions< SourceCx, RemoteCx, OpxnCx >::future_n  [static]
```

Initial value:

```
=
      (detail::is_future_cx<SourceCx>::value ? 1 : 0) +
      (detail::is_future_cx<OpxnCx>::value ? 1 : 0)
```

Definition at line 77 of file completion.hpp.

6.31.2.2 operxn

```
template<typename SourceCx, typename RemoteCx, typename OpxnCx>
OpxnCx upcxx::completions< SourceCx, RemoteCx, OpxnCx >::operxn
```

Definition at line 75 of file completion.hpp.

6.31.2.3 remote

```
template<typename SourceCx, typename RemoteCx, typename OpxnCx>
RemoteCx upcxx::completions< SourceCx, RemoteCx, OpxnCx >::remote
```

Definition at line 74 of file completion.hpp.

6.31.2.4 source

```
template<typename SourceCx, typename RemoteCx, typename OpxnCx>
SourceCx upcxx::completions< SourceCx, RemoteCx, OpxnCx >::source
```

Definition at line 73 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.32 upcxx::constant_function< T > Struct Template Reference

`#include <utility.hpp>`

Public Member Functions

- constant_function (T value)
- template<typename ... Arg>
  T operator() (Arg &&...args) const

Public Attributes

- T value_

6.32.1 Detailed Description

template<typename T>
struct upcxx::constant_function< T >

Definition at line 44 of file utility.hpp.

6.32.2 Constructor & Destructor Documentation

6.32.2.1 constant_function()

```
template<typename T >
upcxx::constant_function< T >::constant_function (
            T value )  [inline]
```

Definition at line 46 of file utility.hpp.

6.32.3 Member Function Documentation

6.32.3.1 operator()()

```
template<typename T >
template<typename ...  Arg>
T upcxx::constant_function< T >::operator() (
            Arg &&...  args ) const  [inline]
```

Definition at line 49 of file utility.hpp.

6.32.4 Member Data Documentation

6.32.4.1 value_

```
template<typename T >
T upcxx::constant_function< T >::value_
```

Definition at line 45 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.33 upcxx::decay_tupled< Tup > Struct Template Reference

```
#include <utility.hpp>
```

6.33.1 Detailed Description

template<typename Tup>
struct upcxx::decay_tupled< Tup >

Definition at line 221 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.34 upcxx::decay_tupled< std::tuple< T... > > Struct Template Reference

```
#include <utility.hpp>
```

Public Types

- typedef std::tuple< typename std::decay< T >::type... > type

6.34.1 Detailed Description

template<typename ... T>
struct upcxx::decay_tupled< std::tuple< T... > >

Definition at line 223 of file utility.hpp.

6.34.2 Member Typedef Documentation

6.34.2.1 type

```
template<typename ...  T>
typedef std::tuple<typename std::decay<T>::type...> upcxx::decay_tupled< std::tuple< T...  >
>::type
```

Definition at line 224 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.35 upcxx::detail::future_header::dependency_link Struct Reference

```
#include <core.hpp>
```

Public Member Functions

- void unlink ()

Public Attributes

- future_header * dep
- future_header_dependent * suc
- dependency_link * sucs_next

6.35.1 Detailed Description

Definition at line 187 of file core.hpp.

6.35.2 Member Function Documentation

6.35.2.1 unlink()

```
void future_header::dependency_link::unlink ( )
```

Definition at line 31 of file core.cpp.

6.35.3 Member Data Documentation

6.35.3.1 dep

```
future_header* upcxx::detail::future_header::dependency_link::dep
```

Definition at line 189 of file core.hpp.

6.35.3.2 suc

```
future_header_dependent* upcxx::detail::future_header::dependency_link::suc
```

Definition at line 192 of file core.hpp.

6.35.3.3 sucs_next

```
dependency_link* upcxx::detail::future_header::dependency_link::sucs_next
```

Definition at line 195 of file core.hpp.

The documentation for this struct was generated from the following files:

- future/core.hpp
- future/core.cpp

6.36 upcxx::digest Struct Reference

```
#include <digest.hpp>
```

Public Member Functions

- digest eat (std::uint64_t x0, std::uint64_t x1=0) const
- digest eat (digest that) const

Static Public Member Functions

- static constexpr digest zero ()

Public Attributes

- std::uint64_t w0
- std::uint64_t w1

Friends

- bool operator== (digest a, digest b)
- bool operator!= (digest a, digest b)
- bool operator< (digest a, digest b)
- bool operator<= (digest a, digest b)
- bool operator> (digest a, digest b)
- bool operator>= (digest a, digest b)

6.36.1 Detailed Description

Definition at line 9 of file digest.hpp.

6.36.2 Member Function Documentation

6.36.2.1 eat() [1/2]

```
digest upcxx::digest::eat (
            std::uint64_t x0,
            std::uint64_t x1 = 0 ) const
```

6.36.2.2 eat() [2/2]

```
digest upcxx::digest::eat (
            digest that ) const  [inline]
```

Definition at line 18 of file digest.hpp.

6.36.2.3 zero()

```
static constexpr digest upcxx::digest::zero ( )  [inline], [static]
```

Definition at line 12 of file digest.hpp.

6.36.3 Friends And Related Function Documentation

6.36.3.1 operator"!=

```
bool operator!= (
            digest a,
            digest b )  [friend]
```

Definition at line 23 of file digest.hpp.

6.36.3.2 operator<

```
bool operator< (
            digest a,
            digest b )  [friend]
```

Definition at line 25 of file digest.hpp.

6.36.3.3 operator<=

```
bool operator<= (
            digest a,
            digest b )  [friend]
```

Definition at line 26 of file digest.hpp.

6.36.3.4 operator==

```
bool operator== (
            digest a,
            digest b )  [friend]
```

Definition at line 22 of file digest.hpp.

6.36.3.5 operator>

```
bool operator> (
            digest a,
            digest b )  [friend]
```

Definition at line 27 of file digest.hpp.

6.36.3.6 operator>=

```
bool operator>= (
            digest a,
            digest b )  [friend]
```

Definition at line 28 of file digest.hpp.

6.36.4 Member Data Documentation

6.36.4.1 w0

```
std::uint64_t upcxx::digest::w0
```

Definition at line 10 of file digest.hpp.

6.36.4.2 w1

```
std::uint64_t upcxx::digest::w1
```

Definition at line 10 of file digest.hpp.

The documentation for this struct was generated from the following file:

- digest.hpp

6.37 upcxx::detail::disjoin_cx< A, B, B_ord_bump > Struct Template Reference

```
#include <completion.hpp>
```

6.37.1 Detailed Description

template<typename A, typename B, int B_ord_bump>
struct upcxx::detail::disjoin_cx< A, B, B_ord_bump >

Definition at line 28 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.38 upcxx::detail::disjoin_cx< A, nil_cx, B_ord_bump > Struct Template Reference

`#include <completion.hpp>`

Public Types

- using type = A

Public Member Functions

- A && operator() (A &&a, nil_cx &&b)

6.38.1 Detailed Description

template<typename A, int B_ord_bump>
struct upcxx::detail::disjoin_cx< A, nil_cx, B_ord_bump >

Definition at line 31 of file completion.hpp.

6.38.2 Member Typedef Documentation

6.38.2.1 type

```
template<typename A , int B_ord_bump>
using upcxx::detail::disjoin_cx< A, nil_cx, B_ord_bump >::type = A
```

Definition at line 32 of file completion.hpp.

6.38.3 Member Function Documentation

6.38.3.1 operator()()

```
template<typename A , int B_ord_bump>
A&& upcxx::detail::disjoin_cx< A, nil_cx, B_ord_bump >::operator() (
            A && a,
            nil_cx && b )  [inline]
```

Definition at line 34 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.39 upcxx::detail::disjoin_cx< nil_cx, B, B_ord_bump > Struct Template Reference

`#include <completion.hpp>`

Public Types

- using type = B

Public Member Functions

- B && operator() (nil_cx &&a, B &&b)

6.39.1 Detailed Description

template<typename B, int B_ord_bump>
struct upcxx::detail::disjoin_cx< nil_cx, B, B_ord_bump >

Definition at line 39 of file completion.hpp.

6.39.2 Member Typedef Documentation

6.39.2.1 type

```
template<typename B , int B_ord_bump>
using upcxx::detail::disjoin_cx< nil_cx, B, B_ord_bump >::type = B
```

Definition at line 40 of file completion.hpp.

6.39.3 Member Function Documentation

6.39.3.1 operator()()

```
template<typename B , int B_ord_bump>
B&& upcxx::detail::disjoin_cx< nil_cx, B, B_ord_bump >::operator() (
            nil_cx && a,
            B && b )  [inline]
```

Definition at line 42 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.40 upcxx::detail::disjoin_cx< nil_cx, future_cx< B_ord_old >, B_ord_bump > Struct Template Reference

`#include <completion.hpp>`

Public Types

- using type = future_cx< B_ord_old+B_ord_bump >

Public Member Functions

- future_cx< B_ord_old+B_ord_bump > operator() (nil_cx &&a, future_cx< B_ord_old > &&b)

6.40.1 Detailed Description

template<int B_ord_old, int B_ord_bump>
struct upcxx::detail::disjoin_cx< nil_cx, future_cx< B_ord_old >, B_ord_bump >

Definition at line 47 of file completion.hpp.

6.40.2 Member Typedef Documentation

6.40.2.1 type

```
template<int B_ord_old, int B_ord_bump>
using upcxx::detail::disjoin_cx< nil_cx, future_cx< B_ord_old >, B_ord_bump >::type = future↩
_cx<B_ord_old + B_ord_bump>
```

Definition at line 48 of file completion.hpp.

6.40.3 Member Function Documentation

6.40.3.1 operator()()

```
template<int B_ord_old, int B_ord_bump>
future_cx<B_ord_old + B_ord_bump> upcxx::detail::disjoin_cx< nil_cx, future_cx< B_ord_old >,
B_ord_bump >::operator() (
            nil_cx && a,
            future_cx< B_ord_old > && b )  [inline]
```

Definition at line 50 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.41 upcxx::detail::disjoin_cx< nil_cx, nil_cx, B_ord0 > Struct Template Reference

`#include <completion.hpp>`

Public Types

- using type = nil_cx

Public Member Functions

- nil_cx operator() (nil_cx &&a, nil_cx &&b)

6.41.1 Detailed Description

template<int B_ord0>
struct upcxx::detail::disjoin_cx< nil_cx, nil_cx, B_ord0 >

Definition at line 55 of file completion.hpp.

6.41.2 Member Typedef Documentation

6.41.2.1 type

```
template<int B_ord0>
using upcxx::detail::disjoin_cx< nil_cx, nil_cx, B_ord0 >::type = nil_cx
```

Definition at line 56 of file completion.hpp.

6.41.3 Member Function Documentation

6.41.3.1 operator()()

```
template<int B_ord0>
nil_cx upcxx::detail::disjoin_cx< nil_cx, nil_cx, B_ord0 >::operator() (
            nil_cx && a,
            nil_cx && b )  [inline]
```

Definition at line 58 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.42 upcxx::dist_id< T > Struct Template Reference

`#include <dist_object.hpp>`

Public Member Functions

- dist_object< T > & here () const
- future< dist_object< T > & > when_here () const

Public Attributes

- digest dig_

6.42.1 Detailed Description

template<typename T>
struct upcxx::dist_id< T >

Definition at line 15 of file dist_object.hpp.

6.42.2 Member Function Documentation

6.42.2.1 here()

```
template<typename T>
dist_object<T>& upcxx::dist_id< T >::here ( ) const  [inline]
```

Definition at line 56 of file dist_object.hpp.

6.42.2.2 when_here()

```
template<typename T>
future<dist_object<T>&> upcxx::dist_id< T >::when_here ( ) const  [inline]
```

Definition at line 60 of file dist_object.hpp.

6.42.3 Member Data Documentation

6.42.3.1 dig_

```
template<typename T>
digest upcxx::dist_id< T >::dig_
```

Definition at line 53 of file dist_object.hpp.

The documentation for this struct was generated from the following file:

- dist_object.hpp

6.43 upcxx::dist_object< T > Class Template Reference

```
#include <dist_object.hpp>
```

Public Member Functions

- dist_object (T value)
- dist_object (dist_object const &)=delete
- dist_object (dist_object &&that)
- ~dist_object ()
- T * operator-> () const
- T & operator* () const
- dist_id< T > id () const
- future< T > fetch (intrank_t rank)

6.43.1 Detailed Description

template<typename T>
class upcxx::dist_object< T >

Definition at line 18 of file dist_object.hpp.

6.43.2 Constructor & Destructor Documentation

6.43.2.1 dist_object() [1/3]

```
template<typename T>
upcxx::dist_object< T >::dist_object (
            T value )  [inline]
```

Definition at line 101 of file dist_object.hpp.

6.43.2.2 dist_object() [2/3]

```
template<typename T>
upcxx::dist_object< T >::dist_object (
            dist_object< T > const &  )  [delete]
```

6.43.2.3 dist_object() [3/3]

```
template<typename T>
upcxx::dist_object< T >::dist_object (
            dist_object< T > && that )  [inline]
```

Definition at line 113 of file dist_object.hpp.

6.43.2.4 ~dist_object()

```
template<typename T>
upcxx::dist_object< T >::~dist_object ( )  [inline]
```

Definition at line 129 of file dist_object.hpp.

6.43.3 Member Function Documentation

6.43.3.1 fetch()

```
template<typename T>
future<T> upcxx::dist_object< T >::fetch (
            intrank_t rank )  [inline]
```

Definition at line 142 of file dist_object.hpp.

6.43.3.2 id()

```
template<typename T>
dist_id<T> upcxx::dist_object< T >::id ( ) const  [inline]
```

Definition at line 140 of file dist_object.hpp.

6.43.3.3 operator*()

```
template<typename T>
T& upcxx::dist_object< T >::operator* ( ) const  [inline]
```

Definition at line 138 of file dist_object.hpp.

6.43.3.4 operator->()

```
template<typename T>
T* upcxx::dist_object< T >::operator-> ( ) const  [inline]
```

Definition at line 137 of file dist_object.hpp.

The documentation for this class was generated from the following file:

- dist_object.hpp

6.44 upcxx::fast_hasher Struct Reference

```
#include <reflection.hpp>
```

Public Member Functions

- fast_hasher (std::size_t salt)
- void operator() (std::size_t x)
- std::size_t result () const

Public Attributes

- std::size_t s

6.44.1 Detailed Description

Definition at line 61 of file reflection.hpp.

6.44.2 Constructor & Destructor Documentation

6.44.2.1 fast_hasher()

```
upcxx::fast_hasher::fast_hasher (
            std::size_t salt )  [inline]
```

Definition at line 64 of file reflection.hpp.

6.44.3 Member Function Documentation

6.44.3.1 operator()()

```
void upcxx::fast_hasher::operator() (
            std::size_t x )  [inline]
```

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Definition at line 68 of file reflection.hpp.

6.44.3.2 result()

```
std::size_t upcxx::fast_hasher::result ( ) const  [inline]
```

Definition at line 98 of file reflection.hpp.

6.44.4 Member Data Documentation

6.44.4.1 s

```
std::size_t upcxx::fast_hasher::s
```

Definition at line 62 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.45 upcxx::fast_hashing< T > Struct Template Reference

```
#include <reflection.hpp>
```

Public Member Functions

- std::size_t operator() (const T &x, std::size_t salt=0) const

6.45.1 Detailed Description

template<typename T>
struct upcxx::fast_hashing< T >

Definition at line 123 of file reflection.hpp.

6.45.2 Member Function Documentation

6.45.2.1 operator()()

```
template<typename T >
std::size_t upcxx::fast_hashing< T >::operator() (
            const T & x,
            std::size_t salt = 0 ) const  [inline]
```

Definition at line 124 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.46 upcxx::function_ref< Sig > Class Template Reference

```
#include <utility.hpp>
```

6.46.1 Detailed Description

template<typename Sig>
class upcxx::function_ref< Sig >

Definition at line 74 of file utility.hpp.

The documentation for this class was generated from the following file:

- utility.hpp

6.47 upcxx::function_ref< Ret(Arg...)> Class Template Reference

`#include <utility.hpp>`

Public Member Functions

- function_ref ()
- template<typename Fn >
  function_ref (Fn &&fn)
- function_ref (const function_ref &)=default
- function_ref & operator= (const function_ref &)=default
- function_ref (function_ref &&)=default
- function_ref & operator= (function_ref &&)=default
- Ret operator() (Arg ...arg) const

6.47.1 Detailed Description

template<typename Ret, typename ... Arg>
class upcxx::function_ref< Ret(Arg...)>

Definition at line 77 of file utility.hpp.

6.47.2 Constructor & Destructor Documentation

6.47.2.1 function_ref() [1/4]

```
template<typename Ret , typename ...  Arg>
upcxx::function_ref< Ret(Arg...)>::function_ref ( )  [inline]
```

Definition at line 92 of file utility.hpp.

6.47.2.2 function_ref() [2/4]

```
template<typename Ret , typename ...  Arg>
template<typename Fn >
upcxx::function_ref< Ret(Arg...)>::function_ref (
            Fn && fn )  [inline]
```

Definition at line 97 of file utility.hpp.

6.47.2.3 function_ref() [3/4]

```
template<typename Ret , typename ...  Arg>
upcxx::function_ref< Ret(Arg...)>::function_ref (
            const function_ref< Ret(Arg...)> &  )  [default]
```

6.47.2.4 function_ref() [4/4]

```
template<typename Ret , typename ...  Arg>
upcxx::function_ref< Ret(Arg...)>::function_ref (
            function_ref< Ret(Arg...)> &&  )  [default]
```

6.47.3 Member Function Documentation

6.47.3.1 operator()()

```
template<typename Ret , typename ...  Arg>
Ret upcxx::function_ref< Ret(Arg...)>::operator() (
            Arg ...  arg ) const  [inline]
```

Definition at line 106 of file utility.hpp.

6.47.3.2 operator=() [1/2]

```
template<typename Ret , typename ...  Arg>
function_ref& upcxx::function_ref< Ret(Arg...)>::operator= (
            const function_ref< Ret(Arg...)> &  )  [default]
```

6.47.3.3 operator=() [2/2]

```
template<typename Ret , typename ...  Arg>
function_ref& upcxx::function_ref< Ret(Arg...)>::operator= (
             function_ref< Ret(Arg...)> &&  )  [default]
```

The documentation for this class was generated from the following file:

- utility.hpp

6.48 upcxx::future1< Kind, T > Struct Template Reference

`#include <core.hpp>`

Public Types

- typedef Kind kind_type
- typedef std::tuple< T... > results_type
- typedef Kind::template with_types< T... > impl_type

Public Member Functions

- future1 ()=default
- ~future1 ()=default
- future1 (impl_type impl)
- template<typename impl_type1 >
  future1 (impl_type1 impl)
- future1 (future1 const &)=default
- template<typename Kind1 >
  future1 (future1< Kind1, T... > const &that)
- future1 (future1 &&)=default
- template<typename Kind1 >
  future1 (future1< Kind1, T... > &&that)
- future1 & operator= (future1 const &)=default
- template<typename Kind1 >
  future1 & operator= (future1< Kind1, T... > const &that)
- future1 & operator= (future1 &&)=default
- template<typename Kind1 >
  future1 & operator= (future1< Kind1, T... > &&that)
- bool ready () const
- template<int i = 0>
  upcxx::tuple_element_or_void< i, results_type >::type result () const
- results_type results () const
- template<int i = 0>
  auto result_moved () -> decltype(upcxx::get_or_void< i >(impl_.template result_rvals()))
- auto results_moved () -> decltype(impl_.template result_rvals())
- template<typename Fn >
  auto then (Fn &&fn) -> decltype(detail::future_then< future1< Kind, T... >, typename std::decay< Fn >↩
  ::type >()(*this, std::forward< Fn >(fn)))
- template<typename Fn >
  auto then_pure (Fn &&pure_fn) -> decltype(detail::future_then_pure< future1< Kind, T... >, typename std↩
  ::decay< Fn >::type >()(*this, std::forward< Fn >(pure_fn)))

Public Attributes

- impl_type impl_

6.48.1 Detailed Description

template<typename Kind, typename ... T>
struct upcxx::future1< Kind, T >

Definition at line 74 of file core.hpp.

6.48.2 Member Typedef Documentation

6.48.2.1 impl_type

```
template<typename Kind, typename ...  T>
typedef Kind::template with_types<T...> upcxx::future1< Kind, T >::impl_type
```

Definition at line 53 of file future1.hpp.

6.48.2.2 kind_type

```
template<typename Kind, typename ...  T>
typedef Kind upcxx::future1< Kind, T >::kind_type
```

Definition at line 51 of file future1.hpp.

6.48.2.3 results_type

```
template<typename Kind, typename ...  T>
typedef std::tuple<T...> upcxx::future1< Kind, T >::results_type
```

Definition at line 52 of file future1.hpp.

6.48.3 Constructor & Destructor Documentation

6.48.3.1 future1() [1/7]

```
template<typename Kind, typename ... T>
upcxx::future1< Kind, T >::future1 ( ) [default]
```

6.48.3.2 ~future1()

```
template<typename Kind, typename ... T>
upcxx::future1< Kind, T >::~future1 ( ) [default]
```

6.48.3.3 future1() [2/7]

```
template<typename Kind, typename ... T>
upcxx::future1< Kind, T >::future1 (
            impl_type impl ) [inline]
```

Definition at line 61 of file future1.hpp.

6.48.3.4 future1() [3/7]

```
template<typename Kind, typename ... T>
template<typename impl_type1 >
upcxx::future1< Kind, T >::future1 (
            impl_type1 impl ) [inline]
```

Definition at line 63 of file future1.hpp.

6.48.3.5 future1() [4/7]

```
template<typename Kind, typename ... T>
upcxx::future1< Kind, T >::future1 (
            future1< Kind, T > const & ) [default]
```

6.48.3.6 future1() [5/7]

```
template<typename Kind, typename ... T>
template<typename Kind1 >
upcxx::future1< Kind, T >::future1 (
            future1< Kind1, T... > const & that ) [inline]
```

Definition at line 67 of file future1.hpp.

6.48.3.7 future1() [6/7]

```
template<typename Kind, typename ...  T>
upcxx::future1< Kind, T >::future1 (
             future1< Kind, T > &&  )  [default]
```

6.48.3.8 future1() [7/7]

```
template<typename Kind, typename ...  T>
template<typename Kind1 >
upcxx::future1< Kind, T >::future1 (
             future1< Kind1, T...  > && that )  [inline]
```

Definition at line 71 of file future1.hpp.

6.48.4 Member Function Documentation

6.48.4.1 operator=() [1/4]

```
template<typename Kind, typename ...  T>
future1& upcxx::future1< Kind, T >::operator= (
             future1< Kind, T > const &  )  [default]
```

6.48.4.2 operator=() [2/4]

```
template<typename Kind, typename ...  T>
template<typename Kind1 >
future1& upcxx::future1< Kind, T >::operator= (
             future1< Kind1, T...  > const & that )  [inline]
```

Definition at line 75 of file future1.hpp.

6.48.4.3 operator=() [3/4]

```
template<typename Kind, typename ...  T>
future1& upcxx::future1< Kind, T >::operator= (
             future1< Kind, T > &&  )  [default]
```

6.48.4.4 operator=() [4/4]

```
template<typename Kind, typename ... T>
template<typename Kind1 >
future1& upcxx::future1< Kind, T >::operator= (
            future1< Kind1, T... > && that ) [inline]
```

Definition at line 82 of file future1.hpp.

6.48.4.5 ready()

```
template<typename Kind, typename ... T>
bool upcxx::future1< Kind, T >::ready ( ) const [inline]
```

Definition at line 87 of file future1.hpp.

6.48.4.6 result()

```
template<typename Kind, typename ... T>
template<int i = 0>
upcxx::tuple_element_or_void<i, results_type>::type upcxx::future1< Kind, T >::result ( )
const [inline]
```

Definition at line 92 of file future1.hpp.

6.48.4.7 result_moved()

```
template<typename Kind, typename ... T>
template<int i = 0>
auto upcxx::future1< Kind, T >::result_moved ( ) -> decltype(upcxx::get_or_void<i>(impl_.↩
template result_rvals())) [inline]
```

Definition at line 102 of file future1.hpp.

6.48.4.8 results()

```
template<typename Kind, typename ... T>
results_type upcxx::future1< Kind, T >::results ( ) const [inline]
```

Definition at line 97 of file future1.hpp.

6.48.4.9 results_moved()

```
template<typename Kind, typename ... T>
auto upcxx::future1< Kind, T >::results_moved ( ) -> decltype(impl_.template result_rvals())
[inline]
```

Definition at line 107 of file future1.hpp.

6.48.4.10 then()

```
template<typename Kind, typename ... T>
template<typename Fn >
auto upcxx::future1< Kind, T >::then (
            Fn && fn ) -> decltype( detail::future_then<future1<Kind,T...>, typename std↩
::decay<Fn>::type>()( *this, std::forward<Fn>(fn) ) )   [inline]
```

Definition at line 113 of file future1.hpp.

6.48.4.11 then_pure()

```
template<typename Kind, typename ... T>
template<typename Fn >
auto upcxx::future1< Kind, T >::then_pure (
            Fn && pure_fn ) -> decltype( detail::future_then_pure<future1<Kind,T...>, typename
std::decay<Fn>::type>()( *this, std::forward<Fn>(pure_fn) ) )   [inline]
```

Definition at line 127 of file future1.hpp.

6.48.5 Member Data Documentation

6.48.5.1 impl_

```
template<typename Kind, typename ... T>
impl_type upcxx::future1< Kind, T >::impl_
```

Definition at line 55 of file future1.hpp.

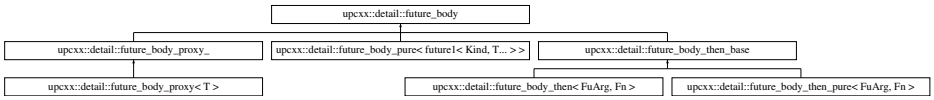
The documentation for this struct was generated from the following files:

- future/core.hpp
- future/future1.hpp

6.49 upcxx::detail::future_body Struct Reference

`#include <core.hpp>`

Inheritance diagram for upcxx::detail::future_body:



Public Member Functions

- future_body (void *storage)
- virtual void destruct_early ()
- virtual void leave_active (future_header_dependent *owner_hdr)=0

Public Attributes

- void * storage_

6.49.1 Detailed Description

Definition at line 329 of file core.hpp.

6.49.2 Constructor & Destructor Documentation

6.49.2.1 future_body()

```
upcxx::detail::future_body::future_body (
            void * storage ) [inline]
```

Definition at line 333 of file core.hpp.

6.49.3 Member Function Documentation

6.49.3.1 destruct_early()

```
void future_body::destruct_early ( ) [virtual]
```

Reimplemented in upcxx::detail::future_body_proxy< T >, upcxx::detail::future_body_then_pure< FuArg, Fn >, and upcxx::detail::future_body_pure< future1< Kind, T... > >.

Definition at line 270 of file core.cpp.

6.49.3.2 leave_active()

```
virtual void upcxx::detail::future_body::leave_active (
            future_header_dependent * owner_hdr )  [pure virtual]
```

Implemented in upcxx::detail::future_body_proxy_, upcxx::detail::future_body_then_pure< FuArg, Fn >, upcxx::detail::future_body_then< FuArg, Fn >, and upcxx::detail::future_body_pure< future1< Kind, T... > >.

6.49.4 Member Data Documentation

6.49.4.1 storage_

```
void* upcxx::detail::future_body::storage_
```

Definition at line 331 of file core.hpp.

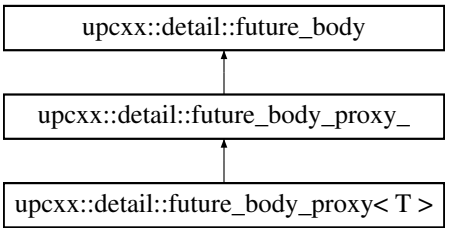
The documentation for this struct was generated from the following files:

- future/core.hpp
- future/core.cpp

6.50 upcxx::detail::future_body_proxy< T > Struct Template Reference

```
#include <core.hpp>
```

Inheritance diagram for upcxx::detail::future_body_proxy< T >:



Public Member Functions

- future_body_proxy (void *storage)
- void destruct_early ()

Additional Inherited Members

6.50.1 Detailed Description

template<typename ... T>
struct upcxx::detail::future_body_proxy< T >

Definition at line 23 of file core.hpp.

6.50.2 Constructor & Destructor Documentation

6.50.2.1 future_body_proxy()

```
template<typename ...  T>
upcxx::detail::future_body_proxy< T >::future_body_proxy (
            void * storage )  [inline]
```

Definition at line 357 of file core.hpp.

6.50.3 Member Function Documentation

6.50.3.1 destruct_early()

```
template<typename ...  T>
void upcxx::detail::future_body_proxy< T >::destruct_early ( )  [inline], [virtual]
```

Reimplemented from upcxx::detail::future_body.

Definition at line 359 of file core.hpp.

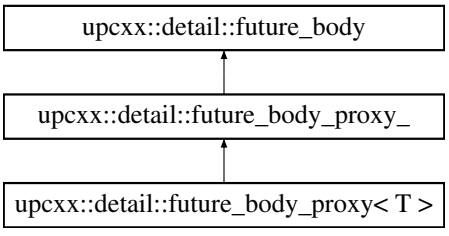
The documentation for this struct was generated from the following file:

- future/core.hpp

6.51 upcxx::detail::future_body_proxy_ Struct Reference

```
#include <core.hpp>
```

Inheritance diagram for upcxx::detail::future_body_proxy_:



Public Member Functions

- future_body_proxy_ (void *storage)
- void leave_active (future_header_dependent *owner_hdr)

Public Attributes

- future_header::dependency_link link_

6.51.1 Detailed Description

Definition at line 346 of file core.hpp.

6.51.2 Constructor & Destructor Documentation

6.51.2.1 future_body_proxy_()

```
upcxx::detail::future_body_proxy_::future_body_proxy_ (
            void * storage )  [inline]
```

Definition at line 350 of file core.hpp.

6.51.3 Member Function Documentation

6.51.3.1 leave_active()

```
void future_body_proxy_::leave_active (
            future_header_dependent * owner_hdr )  [virtual]
```

Implements upcxx::detail::future_body.

Definition at line 250 of file core.cpp.

6.51.4 Member Data Documentation

6.51.4.1 link_

```
future_header::dependency_link upcxx::detail::future_body_proxy_::link_
```

Definition at line 348 of file core.hpp.

The documentation for this struct was generated from the following files:

- future/core.hpp
- future/core.cpp

6.52 upcxx::detail::future_body_pure< FuArg > Struct Template Reference

```
#include <core.hpp>
```

6.52.1 Detailed Description

template<typename FuArg>
struct upcxx::detail::future_body_pure< FuArg >

Definition at line 25 of file core.hpp.

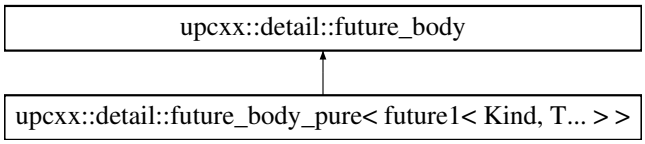
The documentation for this struct was generated from the following file:

- future/core.hpp

6.53 upcxx::detail::future_body_pure< future1< Kind, T... > > Struct Template Reference

```
#include <body_pure.hpp>
```

Inheritance diagram for upcxx::detail::future_body_pure< future1< Kind, T... > >:



Public Member Functions

- future_body_pure (void *storage, future_header_dependent *suc_hdr, future1< Kind, T... > arg)
- void destruct_early ()
- void leave_active (future_header_dependent *hdr)

Public Attributes

- future_dependency< future1< Kind, T... > > dep_

6.53.1 Detailed Description

template<typename Kind, typename ... T>
struct upcxx::detail::future_body_pure< future1< Kind, T... > >

Definition at line 12 of file body_pure.hpp.

6.53.2 Constructor & Destructor Documentation

6.53.2.1 future_body_pure()

```
template<typename Kind , typename ...  T>
upcxx::detail::future_body_pure< future1< Kind, T...  > >::future_body_pure (
            void * storage,
            future_header_dependent * suc_hdr,
            future1< Kind, T...  > arg )  [inline]
```

Definition at line 16 of file body_pure.hpp.

6.53.3 Member Function Documentation

6.53.3.1 destruct_early()

```
template<typename Kind , typename ...  T>
void upcxx::detail::future_body_pure< future1< Kind, T...  > >::destruct_early ( )  [inline],
[virtual]
```

Reimplemented from upcxx::detail::future_body.

Definition at line 25 of file body_pure.hpp.

6.53.3.2 leave_active()

```
template<typename Kind , typename ...  T>
void upcxx::detail::future_body_pure< future1< Kind, T...  > >::leave_active (
            future_header_dependent * hdr )  [inline], [virtual]
```

Implements upcxx::detail::future_body.

Definition at line 30 of file body_pure.hpp.

6.53.4 Member Data Documentation

6.53.4.1 dep_

```
template<typename Kind , typename ...  T>
future_dependency<future1<Kind, T...> > upcxx::detail::future_body_pure< future1< Kind, T...
> >::dep_
```

Definition at line 13 of file body_pure.hpp.

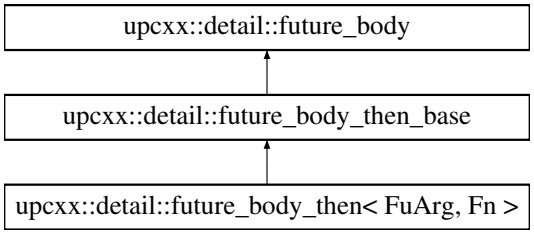
The documentation for this struct was generated from the following file:

- future/body_pure.hpp

6.54 upcxx::detail::future_body_then< FuArg, Fn > Struct Template Reference

```
#include <core.hpp>
```

Inheritance diagram for upcxx::detail::future_body_then< FuArg, Fn >:



Public Member Functions

- future_body_then (void *storage, future_header_dependent *hdr, FuArg arg, Fn fn)
- void leave_active (future_header_dependent *hdr)

Public Attributes

- future_dependency< FuArg > dep_
- Fn fn_

6.54.1 Detailed Description

template<typename FuArg, typename Fn>
struct upcxx::detail::future_body_then< FuArg, Fn >

Definition at line 27 of file core.hpp.

6.54.2 Constructor & Destructor Documentation

6.54.2.1 future_body_then()

```
template<typename FuArg , typename Fn >
upcxx::detail::future_body_then< FuArg, Fn >::future_body_then (
            void * storage,
            future_header_dependent * hdr,
            FuArg arg,
            Fn fn )  [inline]
```

Definition at line 59 of file then.hpp.

6.54.3 Member Function Documentation

6.54.3.1 leave_active()

```
template<typename FuArg , typename Fn >
void upcxx::detail::future_body_then< FuArg, Fn >::leave_active (
            future_header_dependent * hdr )  [inline], [virtual]
```

Implements upcxx::detail::future_body.

Definition at line 71 of file then.hpp.

6.54.4 Member Data Documentation

6.54.4.1 dep_

```
template<typename FuArg , typename Fn >
future_dependency<FuArg> upcxx::detail::future_body_then< FuArg, Fn >::dep_
```

Definition at line 56 of file then.hpp.

6.54.4.2 fn_

```
template<typename FuArg , typename Fn >
Fn upcxx::detail::future_body_then< FuArg, Fn >::fn_
```

Definition at line 57 of file then.hpp.

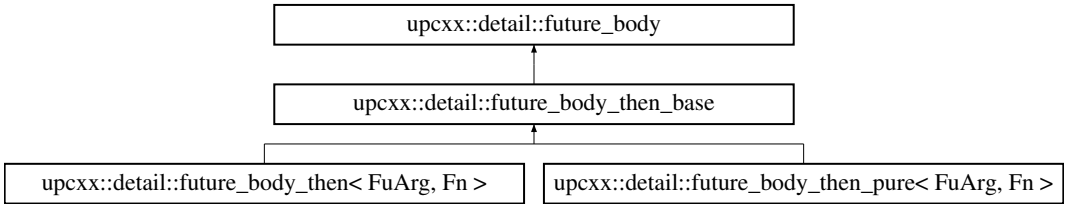
The documentation for this struct was generated from the following files:

- future/core.hpp
- future/then.hpp

6.55 upcxx::detail::future_body_then_base Struct Reference

```
#include <then.hpp>
```

Inheritance diagram for upcxx::detail::future_body_then_base:



Public Member Functions

- future_body_then_base (void *storage)
- template<typename Kind , typename ... T>
  void leave_active_into_proxy (bool pure, future_header_dependent *hdr, void *storage, future1< Kind, T... > proxied)

Additional Inherited Members

6.55.1 Detailed Description

Definition at line 17 of file then.hpp.

6.55.2 Constructor & Destructor Documentation

6.55.2.1 future_body_then_base()

```
upcxx::detail::future_body_then_base::future_body_then_base (
            void * storage )  [inline]
```

Definition at line 18 of file then.hpp.

6.55.3 Member Function Documentation

6.55.3.1 leave_active_into_proxy()

```
template<typename Kind , typename ...  T>
void upcxx::detail::future_body_then_base::leave_active_into_proxy (
             bool pure,
             future_header_dependent * hdr,
             void * storage,
             future1< Kind, T...  > proxied )  [inline]
```

Definition at line 22 of file then.hpp.

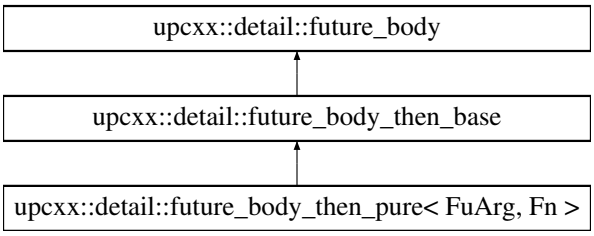
The documentation for this struct was generated from the following file:

- future/then.hpp

6.56 upcxx::detail::future_body_then_pure< FuArg, Fn > Struct Template Reference

```
#include <then.hpp>
```

Inheritance diagram for upcxx::detail::future_body_then_pure< FuArg, Fn >:



Public Member Functions

- future_body_then_pure (void *storage, future_header_dependent *hdr, FuArg arg, Fn fn)
- void destruct_early ()
- void leave_active (future_header_dependent *hdr)

Public Attributes

- future_dependency< FuArg > dep_
- Fn fn_

6.56.1 Detailed Description

template<typename FuArg, typename Fn>
struct upcxx::detail::future_body_then_pure< FuArg, Fn >

Definition at line 88 of file then.hpp.

6.56.2 Constructor & Destructor Documentation

6.56.2.1 future_body_then_pure()

```
template<typename FuArg, typename Fn>
upcxx::detail::future_body_then_pure< FuArg, Fn >::future_body_then_pure (
            void * storage,
            future_header_dependent * hdr,
            FuArg arg,
            Fn fn )  [inline]
```

Definition at line 92 of file then.hpp.

6.56.3 Member Function Documentation

6.56.3.1 destruct_early()

```
template<typename FuArg, typename Fn>
void upcxx::detail::future_body_then_pure< FuArg, Fn >::destruct_early ( )  [inline], [virtual]
```

Reimplemented from upcxx::detail::future_body.

Definition at line 102 of file then.hpp.

6.56.3.2 leave_active()

```
template<typename FuArg, typename Fn>
void upcxx::detail::future_body_then_pure< FuArg, Fn >::leave_active (
            future_header_dependent * hdr )  [inline], [virtual]
```

Implements upcxx::detail::future_body.

Definition at line 107 of file then.hpp.

6.56.4 Member Data Documentation

6.56.4.1 dep_

```
template<typename FuArg, typename Fn>
future_dependency<FuArg> upcxx::detail::future_body_then_pure< FuArg, Fn >::dep_
```

Definition at line 89 of file then.hpp.

6.56.4.2 fn_

```
template<typename FuArg, typename Fn>
Fn upcxx::detail::future_body_then_pure< FuArg, Fn >::fn_
```

Definition at line 90 of file then.hpp.

The documentation for this struct was generated from the following file:

- future/then.hpp

6.57 upcxx::future_cx< ordinal > Struct Template Reference

```
#include <completion.hpp>
```

6.57.1 Detailed Description

template<int ordinal>
struct upcxx::future_cx< ordinal >

Definition at line 17 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.58 upcxx::detail::future_dependency< FuArg > Struct Template Reference

```
#include <core.hpp>
```

6.58.1 Detailed Description

template<typename FuArg>
struct upcxx::detail::future_dependency< FuArg >

Definition at line 18 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.59 upcxx::detail::future_dependency< future1< future_kind_mapped< FuArg, Fn >, T... > > Struct Template Reference

`#include <impl_mapped.hpp>`

Public Types

- typedef future_impl_mapped< FuArg, Fn, T... >::result_lrefs_function result_lrefs_function

Public Member Functions

- future_dependency (future_header_dependent *suc_hdr, future1< future_kind_mapped< FuArg, Fn >, T... > arg)
- void cleanup_early ()
- void cleanup_ready ()
- result_lrefs_function result_lrefs_getter () const
- future_header * cleanup_ready_get_header ()

Public Attributes

- future_dependency< FuArg > dep_
- Fn fn_

6.59.1 Detailed Description

template<typename FuArg, typename Fn, typename ... T>
struct upcxx::detail::future_dependency< future1< future_kind_mapped< FuArg, Fn >, T... > >

Definition at line 115 of file impl_mapped.hpp.

6.59.2 Member Typedef Documentation

6.59.2.1 result_lrefs_function

```
template<typename FuArg , typename Fn , typename ...  T>
typedef future_impl_mapped<FuArg,Fn,T...>::result_lrefs_function upcxx::detail::future_↩
dependency< future1< future_kind_mapped< FuArg, Fn >, T...  > >::result_lrefs_function
```

Definition at line 133 of file impl_mapped.hpp.

6.59.3 Constructor & Destructor Documentation

6.59.3.1 future_dependency()

```
template<typename FuArg , typename Fn , typename ...  T>
upcxx::detail::future_dependency< future1< future_kind_mapped< FuArg, Fn >, T...  > >↩
::future_dependency (
            future_header_dependent * suc_hdr,
            future1< future_kind_mapped< FuArg, Fn >, T...  > arg )  [inline]
```

Definition at line 122 of file impl_mapped.hpp.

6.59.4 Member Function Documentation

6.59.4.1 cleanup_early()

```
template<typename FuArg , typename Fn , typename ...  T>
void upcxx::detail::future_dependency< future1< future_kind_mapped< FuArg, Fn >, T...  > >↩
::cleanup_early ( )  [inline]
```

Definition at line 130 of file impl_mapped.hpp.

6.59.4.2 cleanup_ready()

```
template<typename FuArg , typename Fn , typename ...  T>
void upcxx::detail::future_dependency< future1< future_kind_mapped< FuArg, Fn >, T...  > >↩
::cleanup_ready ( )  [inline]
```

Definition at line 131 of file impl_mapped.hpp.

6.59.4.3 cleanup_ready_get_header()

```
template<typename FuArg , typename Fn , typename ...  T>
future_header* upcxx::detail::future_dependency< future1< future_kind_mapped< FuArg, Fn >,
T...  > >::cleanup_ready_get_header ( )  [inline]
```

Definition at line 141 of file impl_mapped.hpp.

6.59.4.4 result_lrefs_getter()

```
template<typename FuArg , typename Fn , typename ...  T>
result_lrefs_function upcxx::detail::future_dependency< future1< future_kind_mapped< FuArg,
Fn >, T...  > >::result_lrefs_getter ( ) const  [inline]
```

Definition at line 135 of file impl_mapped.hpp.

6.59.5 Member Data Documentation

6.59.5.1 dep_

```
template<typename FuArg , typename Fn , typename ...  T>
future_dependency<FuArg> upcxx::detail::future_dependency< future1< future_kind_mapped< Fu↩
Arg, Fn >, T...  > >::dep_
```

Definition at line 118 of file impl_mapped.hpp.

6.59.5.2 fn_

```
template<typename FuArg , typename Fn , typename ...  T>
Fn upcxx::detail::future_dependency< future1< future_kind_mapped< FuArg, Fn >, T...  > >↩
::fn_
```

Definition at line 119 of file impl_mapped.hpp.

The documentation for this struct was generated from the following file:

- future/impl_mapped.hpp

6.60 upcxx::detail::future_dependency< future1< future_kind_result > > Struct Template Reference

```
#include <impl_result.hpp>
```

Public Member Functions

- future_dependency (future_header_dependent *suc_hdr, future1< future_kind_result > arg)
- void cleanup_early ()
- upcxx::constant_function< std::tuple<> > result_lrefs_getter () const
- void cleanup_ready ()
- future_header * cleanup_ready_get_header ()

6.60.1 Detailed Description

template<>
struct upcxx::detail::future_dependency< future1< future_kind_result > >

Definition at line 103 of file impl_result.hpp.

6.60.2 Constructor & Destructor Documentation

6.60.2.1 future_dependency()

```
upcxx::detail::future_dependency< future1< future_kind_result > >::future_dependency (
            future_header_dependent * suc_hdr,
            future1< future_kind_result > arg )  [inline]
```

Definition at line 106 of file impl_result.hpp.

6.60.3 Member Function Documentation

6.60.3.1 cleanup_early()

```
void upcxx::detail::future_dependency< future1< future_kind_result > >::cleanup_early ( )
[inline]
```

Definition at line 112 of file impl_result.hpp.

6.60.3.2 cleanup_ready()

```
void upcxx::detail::future_dependency< future1< future_kind_result > >::cleanup_ready ( )
[inline]
```

Definition at line 118 of file impl_result.hpp.

6.60.3.3 cleanup_ready_get_header()

```
future_header* upcxx::detail::future_dependency< future1< future_kind_result > >::cleanup_↩
ready_get_header ( )  [inline]
```

Definition at line 120 of file impl_result.hpp.

6.60.3.4 result_lrefs_getter()

```
upcxx::constant_function<std::tuple<> > upcxx::detail::future_dependency< future1< future_↩
kind_result > >::result_lrefs_getter ( ) const  [inline]
```

Definition at line 114 of file impl_result.hpp.

The documentation for this struct was generated from the following file:

- future/impl_result.hpp

6.61 upcxx::detail::future_dependency< future1< future_kind_result, T... > > Struct Template Reference

```
#include <impl_result.hpp>
```

Public Member Functions

- future_dependency (future_header_dependent *suc_hdr, future1< future_kind_result, T... > arg)
- void cleanup_early ()
- upcxx::constant_function< std::tuple< T &... > > result_lrefs_getter () const
- void cleanup_ready ()
- future_header * cleanup_ready_get_header ()

Public Attributes

- std::tuple< T... > results_

6.61.1 Detailed Description

template<typename ... T>
struct upcxx::detail::future_dependency< future1< future_kind_result, T... > >

Definition at line 72 of file impl_result.hpp.

6.61.2 Constructor & Destructor Documentation

6.61.2.1 future_dependency()

```
template<typename ... T>
upcxx::detail::future_dependency< future1< future_kind_result, T... > >::future_dependency (
            future_header_dependent * suc_hdr,
            future1< future_kind_result, T... > arg ) [inline]
```

Definition at line 77 of file impl_result.hpp.

6.61.3 Member Function Documentation

6.61.3.1 cleanup_early()

```
template<typename ... T>
void upcxx::detail::future_dependency< future1< future_kind_result, T... > >::cleanup_early
( ) [inline]
```

Definition at line 84 of file impl_result.hpp.

6.61.3.2 cleanup_ready()

```
template<typename ... T>
void upcxx::detail::future_dependency< future1< future_kind_result, T... > >::cleanup_ready
( ) [inline]
```

Definition at line 92 of file impl_result.hpp.

6.61.3.3 cleanup_ready_get_header()

```
template<typename ... T>
future_header* upcxx::detail::future_dependency< future1< future_kind_result, T... > >↩
::cleanup_ready_get_header ( ) [inline]
```

Definition at line 94 of file impl_result.hpp.

6.61.3.4 result_lrefs_getter()

```
template<typename ... T>
upcxx::constant_function<std::tuple<T&...> > upcxx::detail::future_dependency< future1<
future_kind_result, T... > >::result_lrefs_getter ( ) const [inline]
```

Definition at line 86 of file impl_result.hpp.

6.61.4 Member Data Documentation

6.61.4.1 results_

```
template<typename ... T>
std::tuple<T...> upcxx::detail::future_dependency< future1< future_kind_result, T... > >↩
::results_
```

Definition at line 75 of file impl_result.hpp.

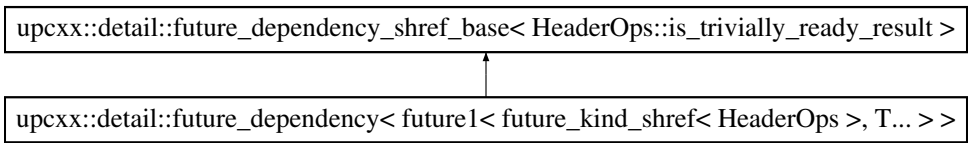
The documentation for this struct was generated from the following file:

- future/impl_result.hpp

6.62 upcxx::detail::future_dependency< future1< future_kind_shref< HeaderOps >, T... > > Struct Template Reference

```
#include <impl_shref.hpp>
```

Inheritance diagram for upcxx::detail::future_dependency< future1< future_kind_shref< HeaderOps >, T... > >:



Public Member Functions

- future_dependency (future_header_dependent *suc_hdr, future1< future_kind_shref< HeaderOps >, T... > arg)

6.62.1 Detailed Description

template<typename HeaderOps, typename ... T>
struct upcxx::detail::future_dependency< future1< future_kind_shref< HeaderOps >, T... > >

Definition at line 227 of file impl_shref.hpp.

6.62.2 Constructor & Destructor Documentation

6.62.2.1 future_dependency()

```
template<typename HeaderOps , typename ...  T>
upcxx::detail::future_dependency< future1< future_kind_shref< HeaderOps >, T...  > >::future_dependency (
            future_header_dependent * suc_hdr,
            future1< future_kind_shref< HeaderOps >, T...  > arg )  [inline]
```

Definition at line 232 of file impl_shref.hpp.

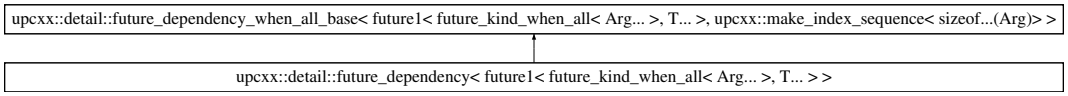
The documentation for this struct was generated from the following file:

- future/impl_shref.hpp

6.63 upcxx::detail::future_dependency< future1< future_kind_when_all< Arg... >, T... > > Struct Template Reference

```
#include <impl_when_all.hpp>
```

Inheritance diagram for upcxx::detail::future_dependency< future1< future_kind_when_all< Arg... >, T... > >:



Public Member Functions

- future_dependency (future_header_dependent *suc_hdr, future1< future_kind_when_all< Arg... >, T... > arg)

6.63.1 Detailed Description

template<typename ... Arg, typename ... T>
struct upcxx::detail::future_dependency< future1< future_kind_when_all< Arg... >, T... > >

Definition at line 200 of file impl_when_all.hpp.

6.63.2 Constructor & Destructor Documentation

6.63.2.1 future_dependency()

```
template<typename ...  Arg, typename ...  T>
upcxx::detail::future_dependency< future1< future_kind_when_all< Arg...  >, T...  > ><↩
::future_dependency (
            future_header_dependent * suc_hdr,
            future1< future_kind_when_all< Arg...  >, T...  > arg )  [inline]
```

Definition at line 208 of file impl_when_all.hpp.

The documentation for this struct was generated from the following file:

- future/impl_when_all.hpp

6.64 upcxx::detail::future_dependency_shref_base< is_trivially_ready_result > Struct Template Reference

```
#include <impl_shref.hpp>
```

6.64.1 Detailed Description

template<bool is_trivially_ready_result>
struct upcxx::detail::future_dependency_shref_base< is_trivially_ready_result >

Definition at line 173 of file impl_shref.hpp.

The documentation for this struct was generated from the following file:

- future/impl_shref.hpp

6.65 upcxx::detail::future_dependency_shref_base< false > Struct Template Reference

```
#include <impl_shref.hpp>
```

Public Member Functions

- future_dependency_shref_base (future_header_dependent *suc_hdr, future_header *arg_hdr)
- future_dependency_shref_base (future_dependency_shref_base const &)=delete
- future_dependency_shref_base (future_dependency_shref_base &&)=delete
- void unlink_ ()
- future_header * header_ () const

Public Attributes

- future_header::dependency_link link_

6.65.1 Detailed Description

template<>
struct upcxx::detail::future_dependency_shref_base< false >

Definition at line 176 of file impl_shref.hpp.

6.65.2 Constructor & Destructor Documentation

6.65.2.1 future_dependency_shref_base() [1/3]

```
upcxx::detail::future_dependency_shref_base< false >::future_dependency_shref_base (
            future_header_dependent * suc_hdr,
            future_header * arg_hdr )  [inline]
```

Definition at line 179 of file impl_shref.hpp.

6.65.2.2 future_dependency_shref_base() [2/3]

```
upcxx::detail::future_dependency_shref_base< false >::future_dependency_shref_base (
            future_dependency_shref_base< false > const &  )  [delete]
```

6.65.2.3 future_dependency_shref_base() [3/3]

```
upcxx::detail::future_dependency_shref_base< false >::future_dependency_shref_base (
            future_dependency_shref_base< false > &&  )  [delete]
```

6.65.3 Member Function Documentation

6.65.3.1 header_()

```
future_header* upcxx::detail::future_dependency_shref_base< false >::header_ ( ) const  [inline]
```

Definition at line 207 of file impl_shref.hpp.

6.65.3.2 unlink_()

```
void upcxx::detail::future_dependency_shref_base< false >::unlink_ ( )  [inline]
```

Definition at line 205 of file impl_shref.hpp.

6.65.4 Member Data Documentation

6.65.4.1 link_

```
future_header::dependency_link upcxx::detail::future_dependency_shref_base< false >::link_
```

Definition at line 177 of file impl_shref.hpp.

The documentation for this struct was generated from the following file:

- future/impl_shref.hpp

6.66 upcxx::detail::future_dependency_shref_base< true > Struct Template Reference

```
#include <impl_shref.hpp>
```

Public Member Functions

- future_dependency_shref_base (future_header_dependent *suc_hdr, future_header *arg_hdr)
- void unlink_ ()
- future_header * header_ () const

Public Attributes

- future_header * hdr_

6.66.1 Detailed Description

template<>
struct upcxx::detail::future_dependency_shref_base< true >

Definition at line 211 of file impl_shref.hpp.

6.66.2 Constructor & Destructor Documentation

6.66.2.1 future_dependency_shref_base()

```
upcxx::detail::future_dependency_shref_base< true >::future_dependency_shref_base (
            future_header_dependent * suc_hdr,
            future_header * arg_hdr )  [inline]
```

Definition at line 214 of file impl_shref.hpp.

6.66.3 Member Function Documentation

6.66.3.1 header_()

```
future_header* upcxx::detail::future_dependency_shref_base< true >::header_ ( ) const  [inline]
```

Definition at line 223 of file impl_shref.hpp.

6.66.3.2 unlink_()

```
void upcxx::detail::future_dependency_shref_base< true >::unlink_ ( )  [inline]
```

Definition at line 221 of file impl_shref.hpp.

6.66.4 Member Data Documentation

6.66.4.1 hdr_

```
future_header* upcxx::detail::future_dependency_shref_base< true >::hdr_
```

Definition at line 212 of file impl_shref.hpp.

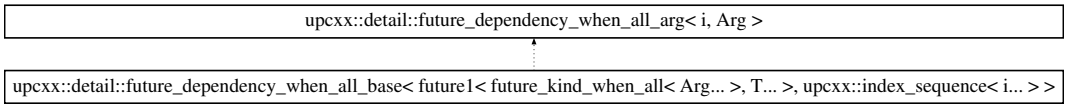
The documentation for this struct was generated from the following file:

- future/impl_shref.hpp

6.67 upcxx::detail::future_dependency_when_all_arg< i, Arg > Struct Template Reference

`#include <impl_when_all.hpp>`

Inheritance diagram for upcxx::detail::future_dependency_when_all_arg< i, Arg >:



Public Member Functions

- future_dependency_when_all_arg (future_header_dependent *suc_hdr, Arg arg)

Public Attributes

- future_dependency< Arg > dep_

6.67.1 Detailed Description

template<int i, typename Arg>
struct upcxx::detail::future_dependency_when_all_arg< i, Arg >

Definition at line 121 of file impl_when_all.hpp.

6.67.2 Constructor & Destructor Documentation

6.67.2.1 future_dependency_when_all_arg()

```
template<int i, typename Arg >
upcxx::detail::future_dependency_when_all_arg< i, Arg >::future_dependency_when_all_arg (
            future_header_dependent * suc_hdr,
            Arg arg )  [inline]
```

Definition at line 124 of file impl_when_all.hpp.

6.67.3 Member Data Documentation

6.67.3.1 dep_

```
template<int i, typename Arg >
future_dependency<Arg> upcxx::detail::future_dependency_when_all_arg< i, Arg >::dep_
```

Definition at line 122 of file impl_when_all.hpp.

The documentation for this struct was generated from the following file:

- future/impl_when_all.hpp

6.68 upcxx::detail::future_dependency_when_all_base< AllArg, IxSeq > Struct Template Reference

```
#include <impl_when_all.hpp>
```

6.68.1 Detailed Description

template<typename AllArg, typename IxSeq>
struct upcxx::detail::future_dependency_when_all_base< AllArg, IxSeq >

Definition at line 133 of file impl_when_all.hpp.

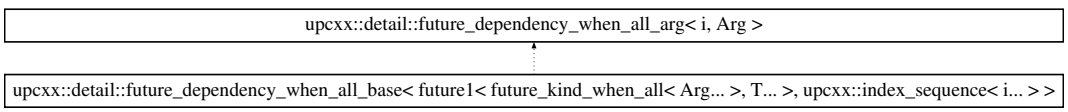
The documentation for this struct was generated from the following file:

- future/impl_when_all.hpp

6.69 upcxx::detail::future_dependency_when_all_base< future1< future_kind_when_all< Arg... >, T... >, upcxx::index_sequence< i... > > Struct Template Reference

```
#include <impl_when_all.hpp>
```

Inheritance diagram for upcxx::detail::future_dependency_when_all_base< future1< future_kind_when_all< Arg... >, T... >, upcxx::index_sequence< i... > >:



Public Types

- typedef future_dependency_when_all_base< future1< future_kind_when_all< Arg... >, T... >, upcxx::index_sequence< i... > > this_t

Public Member Functions

- future_dependency_when_all_base (future_header_dependent *suc_hdr, future1< future_kind_when_all< Arg... >, T... > all_args)
- result_lrefs_function result_lrefs_getter () const

6.69.1 Detailed Description

template<typename ... Arg, typename ... T, int ... i>
struct upcxx::detail::future_dependency_when_all_base< future1< future_kind_when_all< Arg... >, T... >, upcxx::index_sequence< i... > >

Definition at line 136 of file impl_when_all.hpp.

6.69.2 Member Typedef Documentation

6.69.2.1 this_t

```
template<typename ... Arg, typename ... T, int ... i>
typedef future_dependency_when_all_base< future1<future_kind_when_all<Arg...>, T...>, upcxx::index_sequence<i...> > upcxx::detail::future_dependency_when_all_base< future1< future_kind_when_all< Arg... >, T... >, upcxx::index_sequence< i... > >::this_t
```

Definition at line 146 of file impl_when_all.hpp.

6.69.3 Constructor & Destructor Documentation

6.69.3.1 future_dependency_when_all_base()

```
template<typename ... Arg, typename ... T, int ... i>
upcxx::detail::future_dependency_when_all_base< future1< future_kind_when_all< Arg... >, T... >, upcxx::index_sequence< i... > >::future_dependency_when_all_base (
            future_header_dependent * suc_hdr,
            future1< future_kind_when_all< Arg... >, T... > all_args ) [inline]
```

Definition at line 148 of file impl_when_all.hpp.

6.69.4 Member Function Documentation

6.69.4.1 result_lrefs_getter()

```
template<typename ... Arg, typename ... T, int ... i>
result_lrefs_function upcxx::detail::future_dependency_when_all_base< future1< future_kind↩
_when_all< Arg... >, T... >, upcxx::index_sequence< i... > >::result_lrefs_getter ( )
const [inline]
```

Definition at line 194 of file impl_when_all.hpp.

The documentation for this struct was generated from the following file:

- future/impl_when_all.hpp

6.70 upcxx::detail::future_from_tuple< Kind, Tup > Struct Template Reference

```
#include <core.hpp>
```

6.70.1 Detailed Description

template<typename Kind, typename Tup>
struct upcxx::detail::future_from_tuple< Kind, Tup >

Definition at line 124 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.71 upcxx::detail::future_from_tuple< Kind, std::tuple< T... > > Struct Template Reference

```
#include <core.hpp>
```

Public Types

- using type = future1< Kind, T... >

6.71.1 Detailed Description

template<typename Kind, typename ... T>
struct upcxx::detail::future_from_tuple< Kind, std::tuple< T... > >

Definition at line 126 of file core.hpp.

6.71.2 Member Typedef Documentation

6.71.2.1 type

```
template<typename Kind , typename ...  T>
using upcxx::detail::future_from_tuple< Kind, std::tuple< T...  > >::type = future1<Kind,
T...>
```

Definition at line 127 of file core.hpp.

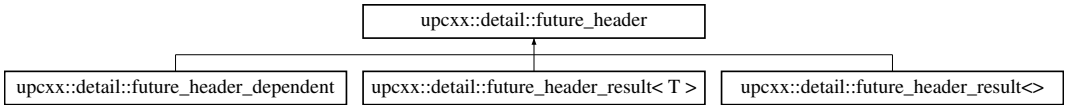
The documentation for this struct was generated from the following file:

- future/core.hpp

6.72 upcxx::detail::future_header Struct Reference

```
#include <core.hpp>
```

Inheritance diagram for upcxx::detail::future_header:



Classes

- struct dependency_link

Public Member Functions

- void enter_ready (future_header *result)
- void refs_add (int n)
- int refs_drop (int n)

Static Public Member Functions

- static future_header * drop_for_result (future_header *a)
- static future_header * drop_for_proxied (future_header *a)

Public Attributes

- int ref_n_
- int status_
- dependency_link * sucs_head_
- union {
  future_header * result_
  future_body * body_
  };

Static Public Attributes

- static constexpr int status_active = 0
- static constexpr int status_ready = -1
- static constexpr int status_proxying = -2
- static constexpr int status_proxying_active = -3
- static future_header the_nil

6.72.1 Detailed Description

Definition at line 158 of file core.hpp.

6.72.2 Member Function Documentation

6.72.2.1 drop_for_proxied()

```
future_header * upcxx::detail::future_header::drop_for_proxied (
            future_header * a )  [inline], [static]
```

Definition at line 593 of file core.hpp.

6.72.2.2 drop_for_result()

```
future_header * upcxx::detail::future_header::drop_for_result (
            future_header * a )  [inline], [static]
```

Definition at line 564 of file core.hpp.

6.72.2.3 enter_ready()

```
void future_header::enter_ready (
            future_header * result )
```

Definition at line 73 of file core.cpp.

6.72.2.4 refs_add()

```
void upcxx::detail::future_header::refs_add (
            int n )  [inline]
```

Definition at line 223 of file core.hpp.

6.72.2.5 refs_drop()

```
int upcxx::detail::future_header::refs_drop (
            int n )  [inline]
```

Definition at line 228 of file core.hpp.

6.72.3 Member Data Documentation

6.72.3.1 "@2

```
union { ...  }
```

6.72.3.2 body_

```
future_body* upcxx::detail::future_header::body_
```

Definition at line 211 of file core.hpp.

6.72.3.3 ref_n_

```
int upcxx::detail::future_header::ref_n_
```

Definition at line 160 of file core.hpp.

6.72.3.4 result_

```
future_header* upcxx::detail::future_header::result_
```

Definition at line 207 of file core.hpp.

6.72.3.5 status_

```
int upcxx::detail::future_header::status_
```

Definition at line 185 of file core.hpp.

6.72.3.6 status_active

```
constexpr int upcxx::detail::future_header::status_active = 0  [static]
```

Definition at line 171 of file core.hpp.

6.72.3.7 status_proxying

```
constexpr int upcxx::detail::future_header::status_proxying = -2  [static]
```

Definition at line 179 of file core.hpp.

6.72.3.8 status_proxying_active

```
constexpr int upcxx::detail::future_header::status_proxying_active = -3  [static]
```

Definition at line 183 of file core.hpp.

6.72.3.9 status_ready

```
constexpr int upcxx::detail::future_header::status_ready = -1  [static]
```

Definition at line 175 of file core.hpp.

6.72.3.10 sucs_head_

```
dependency_link* upcxx::detail::future_header::sucs_head_
```

Definition at line 201 of file core.hpp.

6.72.3.11 the_nil

```
future_header future_header::the_nil  [static]
```

Initial value:

```
= {
  -1,
  future_header::status_active + 666,
  nullptr,
  {nullptr}
}
```

Definition at line 220 of file core.hpp.

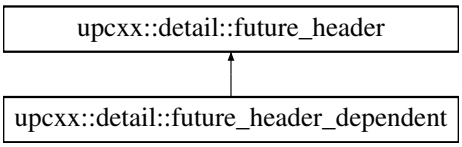
The documentation for this struct was generated from the following files:

- future/core.hpp
- future/core.cpp

6.73 upcxx::detail::future_header_dependent Struct Reference

```
#include <core.hpp>
```

Inheritance diagram for upcxx::detail::future_header_dependent:



Public Member Functions

- future_header_dependent ()
- void entered_active ()
- void enter_proxying (future_body_proxy_ *body, future_header *proxied)
- void refs_add (int n)
- int refs_drop (int n)

Public Attributes

- future_header_dependent * active_next_

Additional Inherited Members

6.73.1 Detailed Description

Definition at line 253 of file core.hpp.

6.73.2 Constructor & Destructor Documentation

6.73.2.1 future_header_dependent()

```
upcxx::detail::future_header_dependent::future_header_dependent ( )  [inline]
```

Definition at line 257 of file core.hpp.

6.73.3 Member Function Documentation

6.73.3.1 enter_proxying()

```
void future_header_dependent::enter_proxying (
             future_body_proxy_ * body,
             future_header * proxied )
```

Definition at line 150 of file core.cpp.

6.73.3.2 entered_active()

```
void future_header_dependent::entered_active ( )
```

Definition at line 40 of file core.cpp.

6.73.3.3 refs_add()

```
void upcxx::detail::future_header_dependent::refs_add (
            int n )  [inline]
```

Definition at line 273 of file core.hpp.

6.73.3.4 refs_drop()

```
int upcxx::detail::future_header_dependent::refs_drop (
            int n )  [inline]
```

Definition at line 276 of file core.hpp.

6.73.4 Member Data Documentation

6.73.4.1 active_next_

```
future_header_dependent* upcxx::detail::future_header_dependent::active_next_
```

Definition at line 255 of file core.hpp.

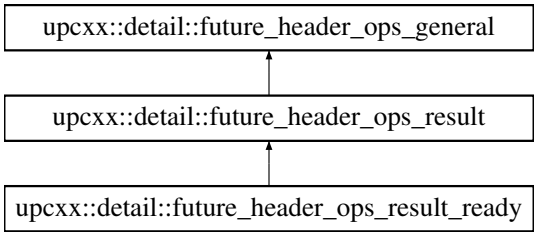
The documentation for this struct was generated from the following files:

- future/core.hpp
- future/core.cpp

6.74 upcxx::detail::future_header_ops_general Struct Reference

```
#include <core.hpp>
```

Inheritance diagram for upcxx::detail::future_header_ops_general:



Static Public Member Functions

- template<typename ... T>
  static void decref_header (future_header *hdr)
- template<typename ... T>
  static void delete_header (future_header *hdr)

Static Public Attributes

- static constexpr bool is_trivially_ready_result = false

6.74.1 Detailed Description

Definition at line 286 of file core.hpp.

6.74.2 Member Function Documentation

6.74.2.1 decref_header()

```
template<typename ... T>
void upcxx::detail::future_header_ops_general::decref_header (
            future_header * hdr )  [inline], [static]
```

Definition at line 526 of file core.hpp.

6.74.2.2 delete_header()

```
template<typename ... T>
void upcxx::detail::future_header_ops_general::delete_header (
            future_header * hdr )  [static]
```

Definition at line 490 of file core.hpp.

6.74.3 Member Data Documentation

6.74.3.1 is_trivially_ready_result

```
constexpr bool upcxx::detail::future_header_ops_general::is_trivially_ready_result = false
[static]
```

Definition at line 287 of file core.hpp.

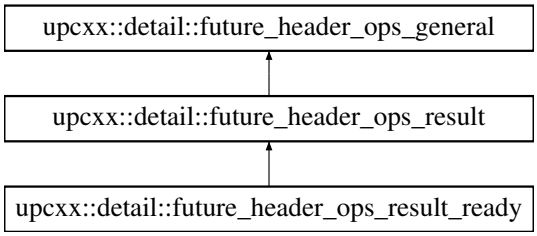
The documentation for this struct was generated from the following file:

- future/core.hpp

6.75 upcxx::detail::future_header_ops_result Struct Reference

```
#include <core.hpp>
```

Inheritance diagram for upcxx::detail::future_header_ops_result:



Static Public Member Functions

- template<typename ... T>
  static void decref_header (future_header *hdr)
- template<typename ... T>
  static void delete_header (future_header *hdr)

Static Public Attributes

- static constexpr bool is_trivially_ready_result = false

6.75.1 Detailed Description

Definition at line 300 of file core.hpp.

6.75.2 Member Function Documentation

6.75.2.1 decref_header()

```
template<typename ...  T>
void upcxx::detail::future_header_ops_result::decref_header (
             future_header * hdr )  [static]
```

Definition at line 541 of file core.hpp.

6.75.2.2 delete_header()

```
template<typename ...  T>
void upcxx::detail::future_header_ops_result::delete_header (
             future_header * hdr )  [static]
```

Definition at line 536 of file core.hpp.

6.75.3 Member Data Documentation

6.75.3.1 is_trivially_ready_result

```
constexpr bool upcxx::detail::future_header_ops_result::is_trivially_ready_result = false
[static]
```

Definition at line 301 of file core.hpp.

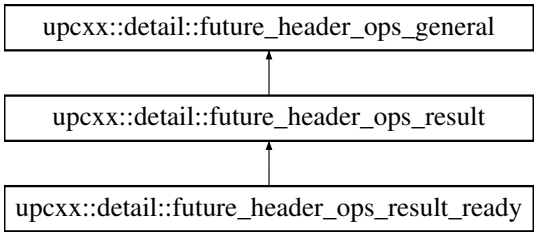
The documentation for this struct was generated from the following file:

- future/core.hpp

6.76 upcxx::detail::future_header_ops_result_ready Struct Reference

```
#include <core.hpp>
```

Inheritance diagram for upcxx::detail::future_header_ops_result_ready:



Static Public Member Functions

- template<typename ... T>
  static void decref_header (future_header *hdr)
- template<typename ... T>
  static void delete_header (future_header *hdr)

Static Public Attributes

- static constexpr bool is_trivially_ready_result = true

6.76.1 Detailed Description

Definition at line 314 of file core.hpp.

6.76.2 Member Function Documentation

6.76.2.1 decref_header()

```
template<typename ... T>
void upcxx::detail::future_header_ops_result_ready::decref_header (
            future_header * hdr )  [static]
```

Definition at line 556 of file core.hpp.

6.76.2.2 delete_header()

```
template<typename ... T>
void upcxx::detail::future_header_ops_result_ready::delete_header (
            future_header * hdr )  [static]
```

Definition at line 551 of file core.hpp.

6.76.3 Member Data Documentation

6.76.3.1 is_trivially_ready_result

```
constexpr bool upcxx::detail::future_header_ops_result_ready::is_trivially_ready_result = true
[static]
```

Definition at line 315 of file core.hpp.

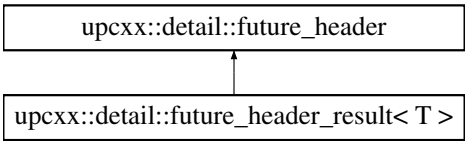
The documentation for this struct was generated from the following file:

- future/core.hpp

6.77 upcxx::detail::future_header_result< T > Struct Template Reference

```
#include <core.hpp>
```

Inheritance diagram for upcxx::detail::future_header_result< T >:



Public Member Functions

- future_header_result ()
- template<typename ... U>
  future_header_result (bool not_ready, std::tuple< U... > values)
- void readify ()
- template<typename ... U>
  void construct_results (U &&...values)
- template<typename ... U>
  void construct_results (std::tuple< U... > &&values)
- void delete_me_ready ()
- void delete_me ()

Static Public Member Functions

- static std::tuple< T... > & results_of (future_header *hdr)

Public Attributes

- union {
    std::tuple< T... > results_
  };

Static Public Attributes

- static constexpr int status_results_yes = status_active + 1
- static constexpr int status_results_no = status_active + 2

6.77.1 Detailed Description

template<typename ... T>
struct upcxx::detail::future_header_result< T >

Definition at line 14 of file core.hpp.

6.77.2 Constructor & Destructor Documentation

6.77.2.1 future_header_result() [1/2]

```
template<typename ... T>
upcxx::detail::future_header_result< T >::future_header_result ( )  [inline]
```

Definition at line 377 of file core.hpp.

6.77.2.2 future_header_result() [2/2]

```
template<typename ... T>
template<typename ... U>
upcxx::detail::future_header_result< T >::future_header_result (
            bool not_ready,
            std::tuple< U... > values )  [inline]
```

Definition at line 387 of file core.hpp.

6.77.3 Member Function Documentation

6.77.3.1 construct_results() [1/2]

```
template<typename ... T>
template<typename ... U>
void upcxx::detail::future_header_result< T >::construct_results (
            U &&... values )  [inline]
```

Definition at line 414 of file core.hpp.

6.77.3.2 construct_results() [2/2]

```
template<typename ... T>
template<typename ... U>
void upcxx::detail::future_header_result< T >::construct_results (
            std::tuple< U... > && values ) [inline]
```

Definition at line 421 of file core.hpp.

6.77.3.3 delete_me()

```
template<typename ... T>
void upcxx::detail::future_header_result< T >::delete_me ( ) [inline]
```

Definition at line 433 of file core.hpp.

6.77.3.4 delete_me_ready()

```
template<typename ... T>
void upcxx::detail::future_header_result< T >::delete_me_ready ( ) [inline]
```

Definition at line 427 of file core.hpp.

6.77.3.5 readify()

```
template<typename ... T>
void upcxx::detail::future_header_result< T >::readify ( ) [inline]
```

Definition at line 408 of file core.hpp.

6.77.3.6 results_of()

```
template<typename ... T>
static std::tuple<T...>& upcxx::detail::future_header_result< T >::results_of (
            future_header * hdr ) [inline], [static]
```

Definition at line 404 of file core.hpp.

6.77.4 Member Data Documentation

6.77.4.1 "@4

```
union { ... }
```

6.77.4.2 results_

```
template<typename ... T>
std::tuple<T...> upcxx::detail::future_header_result< T >::results_
```

Definition at line 375 of file core.hpp.

6.77.4.3 status_results_no

```
template<typename ... T>
constexpr int upcxx::detail::future_header_result< T >::status_results_no = status_active + 2
[static]
```

Definition at line 373 of file core.hpp.

6.77.4.4 status_results_yes

```
template<typename ... T>
constexpr int upcxx::detail::future_header_result< T >::status_results_yes = status_active + 1
[static]
```

Definition at line 372 of file core.hpp.

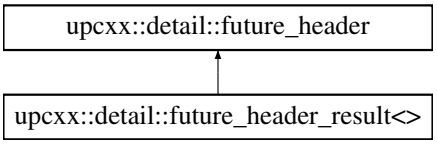
The documentation for this struct was generated from the following file:

- future/core.hpp

6.78 upcxx::detail::future_header_result<> Struct Template Reference

```
#include <core.hpp>
```

Inheritance diagram for upcxx::detail::future_header_result<>:



Public Types

- enum { status_not_ready = status_active + 1 }

Public Member Functions

- future_header_result ()
- future_header_result (bool not_ready, std::tuple<>)
- void readify ()
- void construct_results ()
- void construct_results (std::tuple<>)
- void delete_me_ready ()
- void delete_me ()

Static Public Member Functions

- static std::tuple results_of (future_header *hdr)

Static Public Attributes

- static future_header the_always

Additional Inherited Members

6.78.1 Detailed Description

template<>
struct upcxx::detail::future_header_result<>

Definition at line 444 of file core.hpp.

6.78.2 Member Enumeration Documentation

6.78.2.1 anonymous enum

`anonymous enum`

Enumerator

status_not_ready	

Definition at line 447 of file core.hpp.

6.78.3 Constructor & Destructor Documentation

6.78.3.1 future_header_result() [1/2]

```
upcxx::detail::future_header_result<>::future_header_result ( )  [inline]
```

Definition at line 451 of file core.hpp.

6.78.3.2 future_header_result() [2/2]

```
upcxx::detail::future_header_result<>::future_header_result (
            bool not_ready,
            std::tuple<>  )  [inline]
```

Definition at line 460 of file core.hpp.

6.78.4 Member Function Documentation

6.78.4.1 construct_results() [1/2]

```
void upcxx::detail::future_header_result<>::construct_results ( )  [inline]
```

Definition at line 478 of file core.hpp.

6.78.4.2 construct_results() [2/2]

```
void upcxx::detail::future_header_result<>::construct_results (
            std::tuple<>  )  [inline]
```

Definition at line 479 of file core.hpp.

6.78.4.3 delete_me()

```
void upcxx::detail::future_header_result<>::delete_me ( )  [inline]
```

Definition at line 482 of file core.hpp.

6.78.4.4 delete_me_ready()

```
void upcxx::detail::future_header_result<>::delete_me_ready ( )  [inline]
```

Definition at line 481 of file core.hpp.

6.78.4.5 readify()

```
void upcxx::detail::future_header_result<>::readify ( )  [inline]
```

Definition at line 473 of file core.hpp.

6.78.4.6 results_of()

```
static std::tuple upcxx::detail::future_header_result<>::results_of (
            future_header * hdr )  [inline], [static]
```

Definition at line 469 of file core.hpp.

6.78.5 Member Data Documentation

6.78.5.1 the_always

```
future_header upcxx::detail::future_header_result<>::the_always  [static]
```

Definition at line 445 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.79 upcxx::detail::future_impl_mapped< FuArg, Fn, T > Struct Template Reference

```
#include <core.hpp>
```

Classes

- struct result_lrefs_function

Public Types

- typedef future_header_ops_general header_ops

Public Member Functions

- future_impl_mapped (FuArg arg, Fn fn)
- bool ready () const
- result_lrefs_function result_lrefs_getter () const
- std::tuple< T... > result_rvals ()
- future_header * steal_header ()

Public Attributes

- FuArg arg_
- Fn fn_

6.79.1 Detailed Description

template<typename FuArg, typename Fn, typename ... T>
struct upcxx::detail::future_impl_mapped< FuArg, Fn, T >

Definition at line 42 of file core.hpp.

6.79.2 Member Typedef Documentation

6.79.2.1 header_ops

```
template<typename FuArg , typename Fn , typename ...  T>
typedef future_header_ops_general upcxx::detail::future_impl_mapped< FuArg, Fn, T >::header_↩
ops
```

Definition at line 90 of file impl_mapped.hpp.

6.79.3 Constructor & Destructor Documentation

6.79.3.1 future_impl_mapped()

```
template<typename FuArg , typename Fn , typename ...  T>
upcxx::detail::future_impl_mapped< FuArg, Fn, T >::future_impl_mapped (
            FuArg arg,
            Fn fn )  [inline]
```

Definition at line 29 of file impl_mapped.hpp.

6.79.4 Member Function Documentation

6.79.4.1 ready()

```
template<typename FuArg , typename Fn , typename ... T>
bool upcxx::detail::future_impl_mapped< FuArg, Fn, T >::ready ( ) const [inline]
```

Definition at line 34 of file impl_mapped.hpp.

6.79.4.2 result_lrefs_getter()

```
template<typename FuArg , typename Fn , typename ... T>
result_lrefs_function upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_getter (
) const [inline]
```

Definition at line 76 of file impl_mapped.hpp.

6.79.4.3 result_rvals()

```
template<typename FuArg , typename Fn , typename ... T>
std::tuple<T...> upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_rvals ( ) [inline]
```

Definition at line 82 of file impl_mapped.hpp.

6.79.4.4 steal_header()

```
template<typename FuArg , typename Fn , typename ... T>
future_header* upcxx::detail::future_impl_mapped< FuArg, Fn, T >::steal_header ( ) [inline]
```

Definition at line 92 of file impl_mapped.hpp.

6.79.5 Member Data Documentation

6.79.5.1 arg_

```
template<typename FuArg , typename Fn , typename ...  T>
FuArg upcxx::detail::future_impl_mapped< FuArg, Fn, T >::arg_
```

Definition at line 25 of file impl_mapped.hpp.

6.79.5.2 fn_

```
template<typename FuArg , typename Fn , typename ...  T>
Fn upcxx::detail::future_impl_mapped< FuArg, Fn, T >::fn_
```

Definition at line 26 of file impl_mapped.hpp.

The documentation for this struct was generated from the following files:

- future/core.hpp
- future/impl_mapped.hpp

6.80 upcxx::detail::future_impl_result< T > Struct Template Reference

```
#include <core.hpp>
```

Public Types

- typedef future_header_ops_result_ready header_ops

Public Member Functions

- future_impl_result (T ...values)
- bool ready () const
- upcxx::constant_function< std::tuple< T &... > > result_lrefs_getter () const
- auto result_rvals () -> decltype(upcxx::tuple_rvals(results_))
- future_header * steal_header ()

Public Attributes

- std::tuple< T... > results_

6.80.1 Detailed Description

template<typename ... T>
struct upcxx::detail::future_impl_result< T >

Definition at line 38 of file core.hpp.

6.80.2 Member Typedef Documentation

6.80.2.1 header_ops

```
template<typename ... T>
typedef future_header_ops_result_ready upcxx::detail::future_impl_result< T >::header_ops
```

Definition at line 43 of file impl_result.hpp.

6.80.3 Constructor & Destructor Documentation

6.80.3.1 future_impl_result()

```
template<typename ... T>
upcxx::detail::future_impl_result< T >::future_impl_result (
            T ... values ) [inline]
```

Definition at line 26 of file impl_result.hpp.

6.80.4 Member Function Documentation

6.80.4.1 ready()

```
template<typename ... T>
bool upcxx::detail::future_impl_result< T >::ready ( ) const [inline]
```

Definition at line 30 of file impl_result.hpp.

6.80.4.2 result_lrefs_getter()

```
template<typename ... T>
upcxx::constant_function<std::tuple<T&...> > upcxx::detail::future_impl_result< T >::result↩
_lrefs_getter ( ) const [inline]
```

Definition at line 32 of file impl_result.hpp.

6.80.4.3 result_rvals()

```
template<typename ... T>
auto upcxx::detail::future_impl_result< T >::result_rvals ( ) -> decltype(upcxx::tuple_↩
rvals(results_))   [inline]
```

Definition at line 38 of file impl_result.hpp.

6.80.4.4 steal_header()

```
template<typename ... T>
future_header* upcxx::detail::future_impl_result< T >::steal_header ( )  [inline]
```

Definition at line 45 of file impl_result.hpp.

6.80.5 Member Data Documentation

6.80.5.1 results_

```
template<typename ... T>
std::tuple<T...> upcxx::detail::future_impl_result< T >::results_
```

Definition at line 23 of file impl_result.hpp.

The documentation for this struct was generated from the following files:

- future/core.hpp
- future/impl_result.hpp

6.81 upcxx::detail::future_impl_result<> Struct Template Reference

```
#include <impl_result.hpp>
```

Public Types

- typedef future_header_ops_result_ready header_ops

Public Member Functions

- bool ready () const
- upcxx::constant_function< std::tuple<> > result_lrefs_getter () const
- std::tuple result_rvals ()
- future_header * steal_header ()

6.81.1 Detailed Description

template<>
struct upcxx::detail::future_impl_result<>

Definition at line 51 of file impl_result.hpp.

6.81.2 Member Typedef Documentation

6.81.2.1 header_ops

```
typedef future_header_ops_result_ready upcxx::detail::future_impl_result<>::header_ops
```

Definition at line 60 of file impl_result.hpp.

6.81.3 Member Function Documentation

6.81.3.1 ready()

```
bool upcxx::detail::future_impl_result<>::ready ( ) const  [inline]
```

Definition at line 52 of file impl_result.hpp.

6.81.3.2 result_lrefs_getter()

```
upcxx::constant_function<std::tuple<> > upcxx::detail::future_impl_result<>::result_lrefs_↩
getter ( ) const  [inline]
```

Definition at line 54 of file impl_result.hpp.

6.81.3.3 result_rvals()

```
std::tuple upcxx::detail::future_impl_result<>::result_rvals ( )  [inline]
```

Definition at line 58 of file impl_result.hpp.

6.81.3.4 steal_header()

```
future_header* upcxx::detail::future_impl_result<>::steal_header ( )  [inline]
```

Definition at line 62 of file impl_result.hpp.

The documentation for this struct was generated from the following file:

- future/impl_result.hpp

6.82 upcxx::detail::future_impl_shref< HeaderOps, T > Struct Template Reference

```
#include <core.hpp>
```

Public Types

- typedef HeaderOps header_ops

Public Member Functions

- future_impl_shref ()
- template<typename Header >
  future_impl_shref (Header *hdr)
- future_impl_shref (const future_impl_shref &that)
- template<typename Ops1 >
  future_impl_shref (const future_impl_shref< Ops1, T... > &that, typename std::enable_if< std::is_base_of< HeaderOps, Ops1 >::value >::type *=0)
- future_impl_shref & operator= (const future_impl_shref &that)
- template<typename HeaderOps1 >
  std::enable_if< std::is_base_of< HeaderOps, HeaderOps1 >::value, future_impl_shref &>::type operator= (const future_impl_shref< HeaderOps1, T... > &that)
- future_impl_shref (future_impl_shref &&that)
- template<typename Ops1 >
  future_impl_shref (future_impl_shref< Ops1, T... > &&that, typename std::enable_if< std::is_base_of< HeaderOps, Ops1 >::value >::type *=0)
- future_impl_shref & operator= (future_impl_shref &&that)
- template<typename Impl >
  future_impl_shref (Impl &&that)
- ~future_impl_shref ()
- bool ready () const
- upcxx::constant_function< std::tuple< T &... > > result_lrefs_getter () const
- auto result_rvals () -> decltype(upcxx::tuple_rvals(future_header_result< T... >::results_of(hdr_->result_)))
- future_header * steal_header ()

Public Attributes

- future_header * hdr_

6.82.1 Detailed Description

template<typename HeaderOps, typename ... T>
struct upcxx::detail::future_impl_shref< HeaderOps, T >

Definition at line 36 of file core.hpp.

6.82.2 Member Typedef Documentation

6.82.2.1 header_ops

```
template<typename HeaderOps, typename ...  T>
typedef HeaderOps upcxx::detail::future_impl_shref< HeaderOps, T >::header_ops
```

Definition at line 159 of file impl_shref.hpp.

6.82.3 Constructor & Destructor Documentation

6.82.3.1 future_impl_shref() [1/7]

```
template<typename HeaderOps, typename ...  T>
upcxx::detail::future_impl_shref< HeaderOps, T >::future_impl_shref ( )  [inline]
```

Definition at line 27 of file impl_shref.hpp.

6.82.3.2 future_impl_shref() [2/7]

```
template<typename HeaderOps, typename ...  T>
template<typename Header >
upcxx::detail::future_impl_shref< HeaderOps, T >::future_impl_shref (
            Header * hdr )  [inline]
```

Definition at line 32 of file impl_shref.hpp.

6.82.3.3 future_impl_shref() [3/7]

```
template<typename HeaderOps, typename ...  T>
upcxx::detail::future_impl_shref< HeaderOps, T >::future_impl_shref (
            const future_impl_shref< HeaderOps, T > & that )  [inline]
```

Definition at line 36 of file impl_shref.hpp.

6.82.3.4 future_impl_shref() [4/7]

```
template<typename HeaderOps, typename ...  T>
template<typename Ops1 >
upcxx::detail::future_impl_shref< HeaderOps, T >::future_impl_shref (
            const future_impl_shref< Ops1, T...  > & that,
            typename std::enable_if< std::is_base_of< HeaderOps, Ops1 >::value >::type *  =
0 )  [inline]
```

Definition at line 41 of file impl_shref.hpp.

6.82.3.5 future_impl_shref() [5/7]

```
template<typename HeaderOps, typename ...  T>
upcxx::detail::future_impl_shref< HeaderOps, T >::future_impl_shref (
            future_impl_shref< HeaderOps, T > && that )  [inline]
```

Definition at line 102 of file impl_shref.hpp.

6.82.3.6 future_impl_shref() [6/7]

```
template<typename HeaderOps, typename ...  T>
template<typename Ops1 >
upcxx::detail::future_impl_shref< HeaderOps, T >::future_impl_shref (
            future_impl_shref< Ops1, T...  > && that,
            typename std::enable_if< std::is_base_of< HeaderOps, Ops1 >::value >::type *  =
0 )  [inline]
```

Definition at line 107 of file impl_shref.hpp.

6.82.3.7 future_impl_shref() [7/7]

```
template<typename HeaderOps, typename ...  T>
template<typename Impl >
upcxx::detail::future_impl_shref< HeaderOps, T >::future_impl_shref (
            Impl && that )  [inline]
```

Definition at line 124 of file impl_shref.hpp.

6.82.3.8 ~future_impl_shref()

```
template<typename HeaderOps, typename ...  T>
upcxx::detail::future_impl_shref< HeaderOps, T >::~future_impl_shref ( )  [inline]
```

Definition at line 128 of file impl_shref.hpp.

6.82.4 Member Function Documentation

6.82.4.1 operator=() [1/3]

```
template<typename HeaderOps, typename ...  T>
future_impl_shref& upcxx::detail::future_impl_shref< HeaderOps, T >::operator= (
            const future_impl_shref< HeaderOps, T > & that )  [inline]
```

Definition at line 49 of file impl_shref.hpp.

6.82.4.2 operator=() [2/3]

```
template<typename HeaderOps, typename ...  T>
template<typename HeaderOps1 >
std::enable_if< std::is_base_of<HeaderOps,HeaderOps1>::value, future_impl_shref& >::type
upcxx::detail::future_impl_shref< HeaderOps, T >::operator= (
            const future_impl_shref< HeaderOps1, T...  > & that )  [inline]
```

Definition at line 78 of file impl_shref.hpp.

6.82.4.3 operator=() [3/3]

```
template<typename HeaderOps, typename ...  T>
future_impl_shref& upcxx::detail::future_impl_shref< HeaderOps, T >::operator= (
            future_impl_shref< HeaderOps, T > && that )  [inline]
```

Definition at line 115 of file impl_shref.hpp.

6.82.4.4 ready()

```
template<typename HeaderOps, typename ...  T>
bool upcxx::detail::future_impl_shref< HeaderOps, T >::ready ( ) const  [inline]
```

Definition at line 136 of file impl_shref.hpp.

6.82.4.5 result_lrefs_getter()

```
template<typename HeaderOps, typename ... T>
upcxx::constant_function<std::tuple<T&...> > upcxx::detail::future_impl_shref< HeaderOps, T
>::result_lrefs_getter ( ) const [inline]
```

Definition at line 140 of file impl_shref.hpp.

6.82.4.6 result_rvals()

```
template<typename HeaderOps, typename ... T>
auto upcxx::detail::future_impl_shref< HeaderOps, T >::result_rvals ( ) -> decltype( upcxx↩
::tuple_rvals( future_header_result<T...>::results_of(hdr_->result_) ) ) [inline]
```

Definition at line 148 of file impl_shref.hpp.

6.82.4.7 steal_header()

```
template<typename HeaderOps, typename ... T>
future_header* upcxx::detail::future_impl_shref< HeaderOps, T >::steal_header ( ) [inline]
```

Definition at line 161 of file impl_shref.hpp.

6.82.5 Member Data Documentation

6.82.5.1 hdr_

```
template<typename HeaderOps, typename ... T>
future_header* upcxx::detail::future_impl_shref< HeaderOps, T >::hdr_
```

Definition at line 24 of file impl_shref.hpp.

The documentation for this struct was generated from the following files:

- future/core.hpp
- future/impl_shref.hpp

6.83 upcxx::detail::future_impl_when_all< ArgTuple, T > Struct Template Reference

```
#include <core.hpp>
```

6.83.1 Detailed Description

template<typename ArgTuple, typename ... T>
struct upcxx::detail::future_impl_when_all< ArgTuple, T >

Definition at line 40 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.84 upcxx::detail::future_impl_when_all< std::tuple< FuArg... >, T... > Struct Template Reference

`#include <impl_when_all.hpp>`

Public Types

- typedef future_header_ops_general header_ops

Public Member Functions

- future_impl_when_all (FuArg ...args)
- bool ready () const
- auto result_lrefs_getter () const -> decltype(this->result_lrefs_getter_(upcxx::make_index_sequence< sizeof...(FuArg)>()))
- auto result_rvals () -> decltype(this->result_rvals_(upcxx::make_index_sequence< sizeof...(FuArg)>()))
- future_header * steal_header ()

Public Attributes

- std::tuple< FuArg... > args_

6.84.1 Detailed Description

template<typename ... FuArg, typename ... T>
struct upcxx::detail::future_impl_when_all< std::tuple< FuArg... >, T... >

Definition at line 27 of file impl_when_all.hpp.

6.84.2 Member Typedef Documentation

6.84.2.1 header_ops

```
template<typename ... FuArg, typename ... T>
typedef future_header_ops_general upcxx::detail::future_impl_when_all< std::tuple< FuArg...
>, T... >::header_ops
```

Definition at line 99 of file impl_when_all.hpp.

6.84.3 Constructor & Destructor Documentation

6.84.3.1 future_impl_when_all()

```
template<typename ... FuArg, typename ... T>
upcxx::detail::future_impl_when_all< std::tuple< FuArg... >, T... >::future_impl_when_all (
            FuArg ... args ) [inline]
```

Definition at line 75 of file impl_when_all.hpp.

6.84.4 Member Function Documentation

6.84.4.1 ready()

```
template<typename ... FuArg, typename ... T>
bool upcxx::detail::future_impl_when_all< std::tuple< FuArg... >, T... >::ready ( ) const
[inline]
```

Definition at line 79 of file impl_when_all.hpp.

6.84.4.2 result_lrefs_getter()

```
template<typename ... FuArg, typename ... T>
auto upcxx::detail::future_impl_when_all< std::tuple< FuArg... >, T... >::result_lrefs_↩
getter ( ) const -> decltype(this->result_lrefs_getter_(upcxx::make_index_sequence<sizeof...(Fu↩
Arg)>()))  [inline]
```

Definition at line 83 of file impl_when_all.hpp.

6.84.4.3 result_rvals()

```
template<typename ... FuArg, typename ... T>
auto upcxx::detail::future_impl_when_all< std::tuple< FuArg... >, T... >::result_rvals ( )
-> decltype(this->result_rvals_(upcxx::make_index_sequence<sizeof...(FuArg)>())) [inline]
```

Definition at line 88 of file impl_when_all.hpp.

6.84.4.4 steal_header()

```
template<typename ... FuArg, typename ... T>
future_header* upcxx::detail::future_impl_when_all< std::tuple< FuArg... >, T... >::steal↩
_header ( ) [inline]
```

Definition at line 101 of file impl_when_all.hpp.

6.84.5 Member Data Documentation

6.84.5.1 args_

```
template<typename ... FuArg, typename ... T>
std::tuple<FuArg...> upcxx::detail::future_impl_when_all< std::tuple< FuArg... >, T... >↩
::args_
```

Definition at line 28 of file impl_when_all.hpp.

The documentation for this struct was generated from the following file:

- future/impl_when_all.hpp

6.85 upcxx::future_is_trivially_ready< FutureOrKind > Struct Template Reference

```
#include <core.hpp>
```

Static Public Attributes

- static constexpr bool value = false

6.85.1 Detailed Description

template<typename FutureOrKind>
struct upcxx::future_is_trivially_ready< FutureOrKind >

Definition at line 90 of file core.hpp.

6.85.2 Member Data Documentation

6.85.2.1 value

```
template<typename FutureOrKind>
constexpr bool upcxx::future_is_trivially_ready< FutureOrKind >::value = false  [static]
```

Definition at line 91 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.86 upcxx::future_is_trivially_ready< future1< detail::future_kind_mapped< Arg, Fn >, T... > > Struct Template Reference

```
#include <impl_mapped.hpp>
```

Static Public Attributes

- static constexpr bool value = future_is_trivially_ready<Arg>::value

6.86.1 Detailed Description

template<typename Arg, typename Fn, typename ... T>
struct upcxx::future_is_trivially_ready< future1< detail::future_kind_mapped< Arg, Fn >, T... > >

Definition at line 13 of file impl_mapped.hpp.

6.86.2 Member Data Documentation

6.86.2.1 value

```
template<typename Arg , typename Fn , typename ...  T>
constexpr bool upcxx::future_is_trivially_ready< future1< detail::future_kind_mapped< Arg, Fn
>, T...  > >::value = future_is_trivially_ready<Arg>::value  [static]
```

Definition at line 16 of file impl_mapped.hpp.

The documentation for this struct was generated from the following file:

- future/impl_mapped.hpp

6.87 upcxx::future_is_trivially_ready< future1< detail::future_kind_result, T... > > Struct Template Reference

`#include <impl_result.hpp>`

Static Public Attributes

- static constexpr bool value = true

6.87.1 Detailed Description

template<typename ... T>
struct upcxx::future_is_trivially_ready< future1< detail::future_kind_result, T... > >

Definition at line 11 of file impl_result.hpp.

6.87.2 Member Data Documentation

6.87.2.1 value

```
template<typename ...  T>
constexpr bool upcxx::future_is_trivially_ready< future1< detail::future_kind_result, T...  >
>::value = true  [static]
```

Definition at line 14 of file impl_result.hpp.

The documentation for this struct was generated from the following file:

- future/impl_result.hpp

6.88 upcxx::future_is_trivially_ready< future1< detail::future_kind_shref< HeaderOps >, T... > > Struct Template Reference

`#include <impl_shref.hpp>`

Static Public Attributes

- static constexpr bool value = HeaderOps::is_trivially_ready_result

6.88.1 Detailed Description

template<typename HeaderOps, typename ... T>
struct upcxx::future_is_trivially_ready< future1< detail::future_kind_shref< HeaderOps >, T... > >

Definition at line 11 of file impl_shref.hpp.

6.88.2 Member Data Documentation

6.88.2.1 value

```
template<typename HeaderOps , typename ...  T>
constexpr bool upcxx::future_is_trivially_ready< future1< detail::future_kind_shref< Header↩
Ops >, T...  > >::value = HeaderOps::is_trivially_ready_result  [static]
```

Definition at line 14 of file impl_shref.hpp.

The documentation for this struct was generated from the following file:

- future/impl_shref.hpp

6.89 upcxx::future_is_trivially_ready< future1< detail::future_kind_when_all< Arg... >, T... > > Struct Template Reference

```
#include <impl_when_all.hpp>
```

Static Public Attributes

- static constexpr bool value = upcxx::trait_forall<upcxx::future_is_trivially_ready, Arg...>::value

6.89.1 Detailed Description

template<typename ... Arg, typename ... T>
struct upcxx::future_is_trivially_ready< future1< detail::future_kind_when_all< Arg... >, T... > >

Definition at line 12 of file impl_when_all.hpp.

6.89.2 Member Data Documentation

6.89.2.1 value

```
template<typename ...  Arg, typename ...  T>
constexpr bool upcxx::future_is_trivially_ready< future1< detail::future_kind_when_all< Arg...
>, T...  > >::value = upcxx::trait_forall<upcxx::future_is_trivially_ready, Arg...>::value
[static]
```

Definition at line 15 of file impl_when_all.hpp.

The documentation for this struct was generated from the following file:

- future/impl_when_all.hpp

6.90 upcxx::detail::future_kind_mapped< FuArg, Fn > Struct Template Reference

```
#include <core.hpp>
```

Public Types

- template<typename ... T>
  using with_types = future_impl_mapped< FuArg, Fn, T... >

6.90.1 Detailed Description

template<typename FuArg, typename Fn>
struct upcxx::detail::future_kind_mapped< FuArg, Fn >

Definition at line 63 of file core.hpp.

6.90.2 Member Typedef Documentation

6.90.2.1 with_types

```
template<typename FuArg , typename Fn >
template<typename ...  T>
using upcxx::detail::future_kind_mapped< FuArg, Fn >::with_types = future_impl_mapped<Fu↩
Arg,Fn,T...>
```

Definition at line 65 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.91 upcxx::detail::future_kind_result Struct Reference

`#include <core.hpp>`

Public Types

- template<typename ... T>
  using with_types = future_impl_result< T... >

6.91.1 Detailed Description

Definition at line 51 of file core.hpp.

6.91.2 Member Typedef Documentation

6.91.2.1 with_types

```
template<typename ...  T>
using upcxx::detail::future_kind_result::with_types = future_impl_result<T...>
```

Definition at line 53 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.92 upcxx::detail::future_kind_shref< HeaderOps > Struct Template Reference

`#include <core.hpp>`

Public Types

- template<typename ... T>
  using with_types = future_impl_shref< HeaderOps, T... >

6.92.1 Detailed Description

template<typename HeaderOps>
struct upcxx::detail::future_kind_shref< HeaderOps >

Definition at line 46 of file core.hpp.

6.92.2 Member Typedef Documentation

6.92.2.1 with_types

```
template<typename HeaderOps>
template<typename ...  T>
using upcxx::detail::future_kind_shref< HeaderOps >::with_types = future_impl_shref<Header↩
Ops,T...>
```

Definition at line 48 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.93 upcxx::detail::future_kind_when_all< FuArg > Struct Template Reference

```
#include <core.hpp>
```

Public Types

- template<typename ... T>
  using with_types = future_impl_when_all< std::tuple< FuArg... >, T... >

6.93.1 Detailed Description

template<typename ... FuArg>
struct upcxx::detail::future_kind_when_all< FuArg >

Definition at line 57 of file core.hpp.

6.93.2 Member Typedef Documentation

6.93.2.1 with_types

```
template<typename ...  FuArg>
template<typename ...  T>
using upcxx::detail::future_kind_when_all< FuArg >::with_types = future_impl_when_all<std↩
::tuple<FuArg...>, T...>
```

Definition at line 59 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.94 upcxx::detail::future_then< Arg, Fn, FnRet, arg_trivial > Struct Template Reference

`#include <core.hpp>`

6.94.1 Detailed Description

template<typename Arg, typename Fn, typename FnRet = apply_futured_as_future_return_t<Fn(Arg)>, bool arg_trivial = future_is_trivially_ready<Arg>::value>
struct upcxx::detail::future_then< Arg, Fn, FnRet, arg_trivial >

Definition at line 144 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.95 upcxx::detail::future_then< Arg, Fn, future1< FnRetKind, FnRetT... >, false > Struct Template Reference

`#include <then.hpp>`

Public Member Functions

- template<typename Arg1 , typename Fn1 >
  future1< future_kind_shref< future_header_ops_general >, FnRetT... > operator() (Arg1 &&arg, Fn1 &&fn)

6.95.1 Detailed Description

template<typename Arg, typename Fn, typename FnRetKind, typename ... FnRetT>
struct upcxx::detail::future_then< Arg, Fn, future1< FnRetKind, FnRetT... >, false >

Definition at line 127 of file then.hpp.

6.95.2 Member Function Documentation

6.95.2.1 operator()()

```
template<typename Arg , typename Fn , typename FnRetKind , typename ...  FnRetT>
template<typename Arg1 , typename Fn1 >
future1<future_kind_shref<future_header_ops_general>, FnRetT...> upcxx::detail::future_then<
Arg, Fn, future1< FnRetKind, FnRetT...  >, false >::operator() (
            Arg1 && arg,
            Fn1 && fn )  [inline]
```

Definition at line 134 of file then.hpp.

The documentation for this struct was generated from the following file:

- future/then.hpp

6.96 upcxx::detail::future_then< Arg, Fn, future1< FnRetKind, FnRetT... >, true > Struct Template Reference

```
#include <then.hpp>
```

Public Member Functions

- template<typename Arg1 , typename Fn1 >
  future1< FnRetKind, FnRetT... > operator() (Arg1 &&arg, Fn1 &&fn)

6.96.1 Detailed Description

template<typename Arg, typename Fn, typename FnRetKind, typename ... FnRetT>
struct upcxx::detail::future_then< Arg, Fn, future1< FnRetKind, FnRetT... >, true >

Definition at line 161 of file then.hpp.

6.96.2 Member Function Documentation

6.96.2.1 operator()()

```
template<typename Arg , typename Fn , typename FnRetKind , typename ...  FnRetT>
template<typename Arg1 , typename Fn1 >
future1<FnRetKind,FnRetT...> upcxx::detail::future_then< Arg, Fn, future1< FnRetKind, FnRet↩
T...  >, true >::operator() (
            Arg1 && arg,
            Fn1 && fn )  [inline]
```

Definition at line 168 of file then.hpp.

The documentation for this struct was generated from the following file:

- future/then.hpp

6.97 upcxx::detail::future_then_pure< Arg, Fn, FnRet, arg_trivial, fnret_trivial > Struct Template Reference

`#include <core.hpp>`

6.97.1 Detailed Description

template<typename Arg, typename Fn, typename FnRet = apply_futured_as_future_return_t<Fn(Arg)>, bool arg_trivial = future_is_trivially_ready<Arg>::value, bool fnret_trivial = future_is_trivially_ready<FnRet>::value>
struct upcxx::detail::future_then_pure< Arg, Fn, FnRet, arg_trivial, fnret_trivial >

Definition at line 151 of file core.hpp.

The documentation for this struct was generated from the following file:

- future/core.hpp

6.98 upcxx::detail::future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, false, false > Struct Template Reference

`#include <then.hpp>`

Public Member Functions

- template<typename Arg1 , typename Fn1 >
  future1< future_kind_shref< future_header_ops_general >, FnRetT... > operator() (Arg1 &&arg, Fn1 &&fn)

6.98.1 Detailed Description

template<typename Arg, typename Fn, typename FnRetKind, typename ... FnRetT>
struct upcxx::detail::future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, false, false >

Definition at line 212 of file then.hpp.

6.98.2 Member Function Documentation

6.98.2.1 operator()()

```
template<typename Arg , typename Fn , typename FnRetKind , typename ...  FnRetT>
template<typename Arg1 , typename Fn1 >
future1<future_kind_shref<future_header_ops_general>, FnRetT...> upcxx::detail::future_then↩
_pure< Arg, Fn, future1< FnRetKind, FnRetT...  >, false, false >::operator() (
            Arg1 && arg,
            Fn1 && fn )  [inline]
```

Definition at line 220 of file then.hpp.

The documentation for this struct was generated from the following file:

- future/then.hpp

6.99 upcxx::detail::future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, false, true > Struct Template Reference

```
#include <then.hpp>
```

Public Member Functions

- template<typename Arg1 , typename Fn1 >
  future1< future_kind_mapped< Arg, Fn >, FnRetT... > operator() (Arg1 &&arg, Fn1 &&fn)

6.99.1 Detailed Description

template<typename Arg, typename Fn, typename FnRetKind, typename ... FnRetT>
struct upcxx::detail::future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, false, true >

Definition at line 258 of file then.hpp.

6.99.2 Member Function Documentation

6.99.2.1 operator()()

```
template<typename Arg , typename Fn , typename FnRetKind , typename ...  FnRetT>
template<typename Arg1 , typename Fn1 >
future1<future_kind_mapped<Arg,Fn>, FnRetT...> upcxx::detail::future_then_pure< Arg, Fn,
future1< FnRetKind, FnRetT...  >, false, true >::operator() (
            Arg1 && arg,
            Fn1 && fn )  [inline]
```

Definition at line 265 of file then.hpp.

The documentation for this struct was generated from the following file:

- future/then.hpp

6.100 upcxx::detail::future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, true, fnret_trivial > Struct Template Reference

`#include <then.hpp>`

Public Member Functions

- template<typename Arg1 , typename Fn1 >
  future1< FnRetKind, FnRetT... > operator() (Arg &&arg, Fn1 &&fn)

6.100.1 Detailed Description

template<typename Arg, typename Fn, typename FnRetKind, typename ... FnRetT, bool fnret_trivial>
struct upcxx::detail::future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, true, fnret_trivial >

Definition at line 243 of file then.hpp.

6.100.2 Member Function Documentation

6.100.2.1 operator()()

```
template<typename Arg , typename Fn , typename FnRetKind , typename ...  FnRetT, bool fnret_↩
trivial>
template<typename Arg1 , typename Fn1 >
future1<FnRetKind, FnRetT...> upcxx::detail::future_then_pure< Arg, Fn, future1< FnRetKind,
FnRetT...  >, true, fnret_trivial >::operator() (
            Arg && arg,
            Fn1 && fn )  [inline]
```

Definition at line 249 of file then.hpp.

The documentation for this struct was generated from the following file:

- future/then.hpp

6.101 upcxx::global_ptr< T > Class Template Reference

`#include <global_ptr.hpp>`

Public Types

- using element_type = T

Public Member Functions

- global_ptr (std::nullptr_t nil=nullptr)
- global_ptr (T *ptr)
- global_ptr (detail::global_ptr_ctor_internal, intrank_t rank, T *raw)
- bool is_local () const
- bool is_null () const
- T * local () const
- intrank_t where () const
- global_ptr operator+ (std::ptrdiff_t diff) const
- global_ptr operator- (std::ptrdiff_t diff) const
- std::ptrdiff_t operator- (global_ptr rhs) const
- global_ptr & operator++ ()
- global_ptr operator++ (int)
- global_ptr & operator-- ()
- global_ptr operator-- (int)
- bool operator== (global_ptr rhs) const
- bool operator!= (global_ptr rhs) const
- bool operator< (global_ptr rhs) const
- bool operator<= (global_ptr rhs) const
- bool operator> (global_ptr rhs) const
- bool operator>= (global_ptr rhs) const

Public Attributes

- intrank_t rank_
- T * raw_ptr_

Friends

- struct std::less< global_ptr< T > >
- struct std::less_equal< global_ptr< T > >
- struct std::greater< global_ptr< T > >
- struct std::greater_equal< global_ptr< T > >
- struct std::hash< global_ptr< T > >
- template<typename U , typename V >
  global_ptr< U > reinterpret_pointer_cast (global_ptr< V > ptr)
- template<typename U >
  std::ostream & operator<< (std::ostream &os, global_ptr< U > ptr)

6.101.1 Detailed Description

template<typename T>
class upcxx::global_ptr< T >

Definition at line 43 of file global_ptr.hpp.

6.101.2 Member Typedef Documentation

6.101.2.1 element_type

```
template<typename T>
using upcxx::global_ptr< T >::element_type = T
```

Definition at line 48 of file global_ptr.hpp.

6.101.3 Constructor & Destructor Documentation

6.101.3.1 global_ptr() [1/3]

```
template<typename T>
upcxx::global_ptr< T >::global_ptr (
            std::nullptr_t nil = nullptr )  [inline]
```

Definition at line 51 of file global_ptr.hpp.

6.101.3.2 global_ptr() [2/3]

```
template<typename T>
upcxx::global_ptr< T >::global_ptr (
            T * ptr )  [inline], [explicit]
```

Definition at line 56 of file global_ptr.hpp.

6.101.3.3 global_ptr() [3/3]

```
template<typename T>
upcxx::global_ptr< T >::global_ptr (
            detail::global_ptr_ctor_internal ,
            intrank_t rank,
            T * raw )  [inline], [explicit]
```

Definition at line 66 of file global_ptr.hpp.

6.101.4 Member Function Documentation

6.101.4.1 is_local()

```
template<typename T>
bool upcxx::global_ptr< T >::is_local ( ) const  [inline]
```

Definition at line 74 of file global_ptr.hpp.

6.101.4.2 is_null()

```
template<typename T>
bool upcxx::global_ptr< T >::is_null ( ) const  [inline]
```

Definition at line 78 of file global_ptr.hpp.

6.101.4.3 local()

```
template<typename T>
T* upcxx::global_ptr< T >::local ( ) const  [inline]
```

Definition at line 82 of file global_ptr.hpp.

6.101.4.4 operator"!=()

```
template<typename T>
bool upcxx::global_ptr< T >::operator!= (
            global_ptr< T > rhs ) const  [inline]
```

Definition at line 128 of file global_ptr.hpp.

6.101.4.5 operator+()

```
template<typename T>
global_ptr upcxx::global_ptr< T >::operator+ (
            std::ptrdiff_t diff ) const  [inline]
```

Definition at line 90 of file global_ptr.hpp.

6.101.4.6 operator++() [1/2]

```
template<typename T>
global_ptr& upcxx::global_ptr< T >::operator++ ( )  [inline]
```

Definition at line 104 of file global_ptr.hpp.

6.101.4.7 operator++() [2/2]

```
template<typename T>
global_ptr upcxx::global_ptr< T >::operator++ (
            int  )  [inline]
```

Definition at line 108 of file global_ptr.hpp.

6.101.4.8 operator-() [1/2]

```
template<typename T>
global_ptr upcxx::global_ptr< T >::operator- (
            std::ptrdiff_t diff ) const  [inline]
```

Definition at line 94 of file global_ptr.hpp.

6.101.4.9 operator-() [2/2]

```
template<typename T>
std::ptrdiff_t upcxx::global_ptr< T >::operator- (
            global_ptr< T > rhs ) const  [inline]
```

Definition at line 98 of file global_ptr.hpp.

6.101.4.10 operator--() [1/2]

```
template<typename T>
global_ptr& upcxx::global_ptr< T >::operator-- ( )  [inline]
```

Definition at line 114 of file global_ptr.hpp.

6.101.4.11 operator--() [2/2]

```
template<typename T>
global_ptr upcxx::global_ptr< T >::operator-- (
            int  )  [inline]
```

Definition at line 118 of file global_ptr.hpp.

6.101.4.12 operator<()

```
template<typename T>
bool upcxx::global_ptr< T >::operator< (
            global_ptr< T > rhs ) const  [inline]
```

Definition at line 133 of file global_ptr.hpp.

6.101.4.13 operator<=()

```
template<typename T>
bool upcxx::global_ptr< T >::operator<= (
            global_ptr< T > rhs ) const  [inline]
```

Definition at line 137 of file global_ptr.hpp.

6.101.4.14 operator==()

```
template<typename T>
bool upcxx::global_ptr< T >::operator== (
            global_ptr< T > rhs ) const  [inline]
```

Definition at line 124 of file global_ptr.hpp.

6.101.4.15 operator>()

```
template<typename T>
bool upcxx::global_ptr< T >::operator> (
            global_ptr< T > rhs ) const  [inline]
```

Definition at line 141 of file global_ptr.hpp.

6.101.4.16 operator>=()

```
template<typename T>
bool upcxx::global_ptr< T >::operator>= (
             global_ptr< T > rhs ) const  [inline]
```

Definition at line 145 of file global_ptr.hpp.

6.101.4.17 where()

```
template<typename T>
intrank_t upcxx::global_ptr< T >::where ( ) const  [inline]
```

Definition at line 86 of file global_ptr.hpp.

6.101.5 Friends And Related Function Documentation

6.101.5.1 operator<<

```
template<typename T>
template<typename U >
std::ostream& operator<< (
             std::ostream & os,
             global_ptr< U > ptr )  [friend]
```

6.101.5.2 reinterpret_pointer_cast

```
template<typename T>
template<typename U , typename V >
global_ptr<U> reinterpret_pointer_cast (
             global_ptr< V > ptr )  [friend]
```

6.101.5.3 std::greater< global_ptr< T > >

```
template<typename T>
friend struct std::greater< global_ptr< T > >  [friend]
```

Definition at line 152 of file global_ptr.hpp.

6.101.5.4 std::greater_equal< global_ptr< T > >

```
template<typename T>
friend struct std::greater_equal< global_ptr< T > >  [friend]
```

Definition at line 153 of file global_ptr.hpp.

6.101.5.5 std::hash< global_ptr< T > >

```
template<typename T>
friend struct std::hash< global_ptr< T > >  [friend]
```

Definition at line 154 of file global_ptr.hpp.

6.101.5.6 std::less< global_ptr< T > >

```
template<typename T>
friend struct std::less< global_ptr< T > >  [friend]
```

Definition at line 150 of file global_ptr.hpp.

6.101.5.7 std::less_equal< global_ptr< T > >

```
template<typename T>
friend struct std::less_equal< global_ptr< T > >  [friend]
```

Definition at line 151 of file global_ptr.hpp.

6.101.6 Member Data Documentation

6.101.6.1 rank_

```
template<typename T>
intrank_t upcxx::global_ptr< T >::rank_
```

Definition at line 166 of file global_ptr.hpp.

6.101.6.2 raw_ptr_

```
template<typename T>
T* upcxx::global_ptr< T >::raw_ptr_
```

Definition at line 167 of file global_ptr.hpp.

The documentation for this class was generated from the following file:

- global_ptr.hpp

6.102 upcxx::detail::global_ptr_ctor_internal Struct Reference

```
#include <global_ptr.hpp>
```

6.102.1 Detailed Description

Definition at line 38 of file global_ptr.hpp.

The documentation for this struct was generated from the following file:

- global_ptr.hpp

6.103 std::greater< upcxx::global_ptr< T > > Struct Template Reference

```
#include <global_ptr.hpp>
```

Public Member Functions

- constexpr bool operator() (upcxx::global_ptr< T > lhs, upcxx::global_ptr< T > rhs) const

6.103.1 Detailed Description

template<typename T>
struct std::greater< upcxx::global_ptr< T > >

Definition at line 209 of file global_ptr.hpp.

6.103.2 Member Function Documentation

6.103.2.1 operator()()

```
template<typename T >
constexpr bool std::greater< upcxx::global_ptr< T > >::operator() (
            upcxx::global_ptr< T > lhs,
            upcxx::global_ptr< T > rhs ) const  [inline]
```

Definition at line 210 of file global_ptr.hpp.

The documentation for this struct was generated from the following file:

- global_ptr.hpp

6.104 std::greater_equal< upcxx::global_ptr< T > > Struct Template Reference

```
#include <global_ptr.hpp>
```

Public Member Functions

- constexpr bool operator() (upcxx::global_ptr< T > lhs, upcxx::global_ptr< T > rhs) const

6.104.1 Detailed Description

template<typename T>
struct std::greater_equal< upcxx::global_ptr< T > >

Definition at line 218 of file global_ptr.hpp.

6.104.2 Member Function Documentation

6.104.2.1 operator()()

```
template<typename T >
constexpr bool std::greater_equal< upcxx::global_ptr< T > >::operator() (
            upcxx::global_ptr< T > lhs,
            upcxx::global_ptr< T > rhs ) const  [inline]
```

Definition at line 219 of file global_ptr.hpp.

The documentation for this struct was generated from the following file:

- global_ptr.hpp

6.105 std::hash< upcxx::digest > Struct Template Reference

`#include <digest.hpp>`

Public Member Functions

- size_t operator() (upcxx::digest x) const

6.105.1 Detailed Description

template<>
struct std::hash< upcxx::digest >

Definition at line 38 of file digest.hpp.

6.105.2 Member Function Documentation

6.105.2.1 operator()()

```
size_t std::hash< upcxx::digest >::operator() (
            upcxx::digest x ) const  [inline]
```

Definition at line 39 of file digest.hpp.

The documentation for this struct was generated from the following file:

- digest.hpp

6.106 std::hash< upcxx::dist_id< T > > Struct Template Reference

`#include <dist_object.hpp>`

Public Member Functions

- size_t operator() (upcxx::dist_id< T > id) const

6.106.1 Detailed Description

template<typename T>
struct std::hash< upcxx::dist_id< T > >

Definition at line 85 of file dist_object.hpp.

6.106.2 Member Function Documentation

6.106.2.1 operator()()

```
template<typename T >
size_t std::hash< upcxx::dist_id< T > >::operator() (
            upcxx::dist_id< T > id ) const  [inline]
```

Definition at line 86 of file dist_object.hpp.

The documentation for this struct was generated from the following file:

- dist_object.hpp

6.107 std::hash< upcxx::global_ptr< T > > Struct Template Reference

```
#include <global_ptr.hpp>
```

Public Member Functions

- std::size_t operator() (upcxx::global_ptr< T > gptr) const

6.107.1 Detailed Description

template<typename T>
struct std::hash< upcxx::global_ptr< T > >

Definition at line 227 of file global_ptr.hpp.

6.107.2 Member Function Documentation

6.107.2.1 operator()()

```
template<typename T >
std::size_t std::hash< upcxx::global_ptr< T > >::operator() (
            upcxx::global_ptr< T > gptr ) const  [inline]
```

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Definition at line 228 of file global_ptr.hpp.

The documentation for this struct was generated from the following file:

- global_ptr.hpp

6.108 upcxx::hasher_reflector< Hasher > Struct Template Reference

```
#include <reflection.hpp>
```

Public Member Functions

- template<typename T >
  void operator() (const T &x)
- template<typename T >
  void opaque (const T &x)

Public Attributes

- Hasher & h

6.108.1 Detailed Description

template<typename Hasher>
struct upcxx::hasher_reflector< Hasher >

Definition at line 104 of file reflection.hpp.

6.108.2 Member Function Documentation

6.108.2.1 opaque()

```
template<typename Hasher >
template<typename T >
void upcxx::hasher_reflector< Hasher >::opaque (
            const T & x )  [inline]
```

Definition at line 113 of file reflection.hpp.

6.108.2.2 operator()()

```
template<typename Hasher >
template<typename T >
void upcxx::hasher_reflector< Hasher >::operator() (
            const T & x )  [inline]
```

Definition at line 108 of file reflection.hpp.

6.108.3 Member Data Documentation

6.108.3.1 h

```
template<typename Hasher >
Hasher& upcxx::hasher_reflector< Hasher >::h
```

Definition at line 105 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.109 upcxx::index_sequence<... > Struct Template Reference

`#include <utility.hpp>`

6.109.1 Detailed Description

template<int...>
struct upcxx::index_sequence<... >

Definition at line 188 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.110 upcxx::integer_golden_ratio< T > Struct Template Reference

`#include <reflection.hpp>`

Static Public Attributes

- static constexpr T value = integer_golden_ratio_bits<8*sizeof(T)>::value

6.110.1 Detailed Description

template<typename T>
struct upcxx::integer_golden_ratio< T >

Definition at line 152 of file reflection.hpp.

6.110.2 Member Data Documentation

6.110.2.1 value

```
template<typename T >
constexpr T upcxx::integer_golden_ratio< T >::value = integer_golden_ratio_bits<8*sizeof(T)>↩
::value  [static]
```

Definition at line 153 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.111 upcxx::integer_golden_ratio_bits< bit_n > Struct Template Reference

`#include <reflection.hpp>`

6.111.1 Detailed Description

template<int bit_n>
struct upcxx::integer_golden_ratio_bits< bit_n >

Definition at line 142 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.112 upcxx::integer_golden_ratio_bits< 32 > Struct Template Reference

`#include <reflection.hpp>`

Static Public Attributes

- static constexpr std::uint32_t value = 0x9e3779b1u

6.112.1 Detailed Description

template<>
struct upcxx::integer_golden_ratio_bits< 32 >

Definition at line 144 of file reflection.hpp.

6.112.2 Member Data Documentation

6.112.2.1 value

`constexpr std::uint32_t upcxx::integer_golden_ratio_bits< 32 >::value = 0x9e3779b1u [static]`

Definition at line 145 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.113 upcxx::integer_golden_ratio_bits< 64 > Struct Template Reference

`#include <reflection.hpp>`

Static Public Attributes

- static constexpr std::uint64_t value = 0x9e3779b97f4a7c15u

6.113.1 Detailed Description

template<>
struct upcxx::integer_golden_ratio_bits< 64 >

Definition at line 147 of file reflection.hpp.

6.113.2 Member Data Documentation

6.113.2.1 value

`constexpr std::uint64_t upcxx::integer_golden_ratio_bits< 64 >::value = 0x9e3779b97f4a7c15u [static]`

Definition at line 148 of file reflection.hpp.

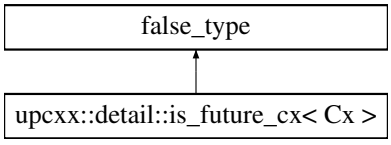
The documentation for this struct was generated from the following file:

- reflection.hpp

6.114 upcxx::detail::is_future_cx< Cx > Struct Template Reference

`#include <completion.hpp>`

Inheritance diagram for upcxx::detail::is_future_cx< Cx >:



6.114.1 Detailed Description

template<typename Cx>
struct upcxx::detail::is_future_cx< Cx >

Definition at line 64 of file completion.hpp.

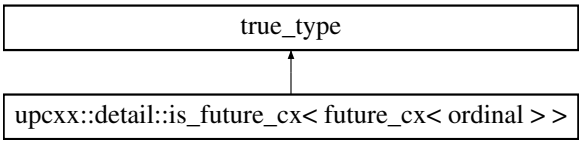
The documentation for this struct was generated from the following file:

- completion.hpp

6.115 upcxx::detail::is_future_cx< future_cx< ordinal > > Struct Template Reference

`#include <completion.hpp>`

Inheritance diagram for upcxx::detail::is_future_cx< future_cx< ordinal > >:



6.115.1 Detailed Description

template<int ordinal>
struct upcxx::detail::is_future_cx< future_cx< ordinal > >

Definition at line 66 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.116 std::less< upcxx::global_ptr< T > > Struct Template Reference

`#include <global_ptr.hpp>`

Public Member Functions

- constexpr bool operator() (upcxx::global_ptr< T > lhs, upcxx::global_ptr< T > rhs) const

6.116.1 Detailed Description

template<typename T>
struct std::less< upcxx::global_ptr< T > >

Definition at line 191 of file global_ptr.hpp.

6.116.2 Member Function Documentation

6.116.2.1 operator()()

```
template<typename T >
constexpr bool std::less< upcxx::global_ptr< T > >::operator() (
            upcxx::global_ptr< T > lhs,
            upcxx::global_ptr< T > rhs ) const  [inline]
```

Definition at line 192 of file global_ptr.hpp.

The documentation for this struct was generated from the following file:

- global_ptr.hpp

6.117 std::less_equal< upcxx::global_ptr< T > > Struct Template Reference

`#include <global_ptr.hpp>`

Public Member Functions

- constexpr bool operator() (upcxx::global_ptr< T > lhs, upcxx::global_ptr< T > rhs) const

6.117.1 Detailed Description

template<typename T>
struct std::less_equal< upcxx::global_ptr< T > >

Definition at line 200 of file global_ptr.hpp.

6.117.2 Member Function Documentation

6.117.2.1 operator()()

```
template<typename T >
constexpr bool std::less_equal< upcxx::global_ptr< T > >::operator() (
            upcxx::global_ptr< T > lhs,
            upcxx::global_ptr< T > rhs ) const  [inline]
```

Definition at line 201 of file global_ptr.hpp.

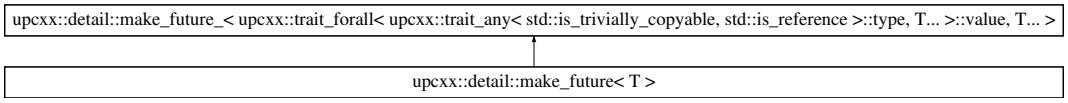
The documentation for this struct was generated from the following file:

- global_ptr.hpp

6.118 upcxx::detail::make_future< T > Struct Template Reference

`#include <make_future.hpp>`

Inheritance diagram for upcxx::detail::make_future< T >:



6.118.1 Detailed Description

template<typename ... T>
struct upcxx::detail::make_future< T >

Definition at line 40 of file make_future.hpp.

The documentation for this struct was generated from the following file:

- future/make_future.hpp

6.119 upcxx::detail::make_future_< trivial, T > Struct Template Reference

`#include <make_future.hpp>`

6.119.1 Detailed Description

template<bool trivial, typename ... T>
struct upcxx::detail::make_future_< trivial, T >

Definition at line 13 of file make_future.hpp.

The documentation for this struct was generated from the following file:

- future/make_future.hpp

6.120 upcxx::detail::make_future_< false, T... > Struct Template Reference

`#include <make_future.hpp>`

Public Member Functions

- future1< future_kind_shref< future_header_ops_result_ready >, T... > operator() (T ...values)

6.120.1 Detailed Description

template<typename ... T>
struct upcxx::detail::make_future_< false, T... >

Definition at line 27 of file make_future.hpp.

6.120.2 Member Function Documentation

6.120.2.1 operator()()

```
template<typename ...  T>
future1<future_kind_shref<future_header_ops_result_ready>,T...> upcxx::detail::make_future_<
false, T...  >::operator() (
            T ...  values )  [inline]
```

Definition at line 29 of file make_future.hpp.

The documentation for this struct was generated from the following file:

- future/make_future.hpp

6.121 upcxx::detail::make_future_< true, T... > Struct Template Reference

`#include <make_future.hpp>`

Public Member Functions

- future1< future_kind_result, T... > operator() (T ...values)

6.121.1 Detailed Description

template<typename ... T>
struct upcxx::detail::make_future_< true, T... >

Definition at line 18 of file make_future.hpp.

6.121.2 Member Function Documentation

6.121.2.1 operator()()

```
template<typename ...  T>
future1<future_kind_result, T...> upcxx::detail::make_future_< true, T...  >::operator() (
            T ...  values )  [inline]
```

Definition at line 19 of file make_future.hpp.

The documentation for this struct was generated from the following file:

- future/make_future.hpp

6.122 upcxx::detail::make_index_sequence< n, s > Struct Template Reference

```
#include <utility.hpp>
```

6.122.1 Detailed Description

template<int n, int ... s>
struct upcxx::detail::make_index_sequence< n, s >

Definition at line 194 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.123 upcxx::detail::make_index_sequence< 0, s... > Struct Template Reference

```
#include <utility.hpp>
```

Public Types

- typedef index_sequence< s... > type

6.123.1 Detailed Description

template<int ... s>
struct upcxx::detail::make_index_sequence< 0, s... >

Definition at line 197 of file utility.hpp.

6.123.2 Member Typedef Documentation

6.123.2.1 type

```
template<int ...  s>
typedef index_sequence<s...> upcxx::detail::make_index_sequence< 0, s...  >::type
```

Definition at line 198 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.124 mallinfo Struct Reference

```
#include <dl_malloc.h>
```

Public Attributes

- MALLINFO_FIELD_TYPE arena
- MALLINFO_FIELD_TYPE ordblks
- MALLINFO_FIELD_TYPE smblks
- MALLINFO_FIELD_TYPE hblks
- MALLINFO_FIELD_TYPE hblkhd
- MALLINFO_FIELD_TYPE usmblks
- MALLINFO_FIELD_TYPE fsmblks
- MALLINFO_FIELD_TYPE uordblks
- MALLINFO_FIELD_TYPE fordblks
- MALLINFO_FIELD_TYPE keepcost

6.124.1 Detailed Description

Definition at line 768 of file dl_malloc.c.

6.124.2 Member Data Documentation

6.124.2.1 arena

```
MALLINFO_FIELD_TYPE mallinfo::arena
```

Definition at line 769 of file dl_malloc.c.

6.124.2.2 fordblks

```
MALLINFO_FIELD_TYPE mallinfo::fordblks
```

Definition at line 777 of file dl_malloc.c.

6.124.2.3 fsmblks

```
MALLINFO_FIELD_TYPE mallinfo::fsmblks
```

Definition at line 775 of file dl_malloc.c.

6.124.2.4 hblkhd

```
MALLINFO_FIELD_TYPE mallinfo::hblkhd
```

Definition at line 773 of file dl_malloc.c.

6.124.2.5 hblks

```
MALLINFO_FIELD_TYPE mallinfo::hblks
```

Definition at line 772 of file dl_malloc.c.

6.124.2.6 keepcost

```
MALLINFO_FIELD_TYPE mallinfo::keepcost
```

Definition at line 778 of file dl_malloc.c.

6.124.2.7 ordblks

```
MALLINFO_FIELD_TYPE mallinfo::ordblks
```

Definition at line 770 of file dl_malloc.c.

6.124.2.8 smblks

```
MALLINFO_FIELD_TYPE mallinfo::smblks
```

Definition at line 771 of file dl_malloc.c.

6.124.2.9 uordblks

```
MALLINFO_FIELD_TYPE mallinfo::uordblks
```

Definition at line 776 of file dl_malloc.c.

6.124.2.10 usmblks

```
MALLINFO_FIELD_TYPE mallinfo::usmblks
```

Definition at line 774 of file dl_malloc.c.

The documentation for this struct was generated from the following files:

- dl_malloc.c
- dl_malloc.h

6.125 malloc_chunk Struct Reference

Public Attributes

- size_t prev_foot
- size_t head
- struct malloc_chunk * fd
- struct malloc_chunk * bk

6.125.1 Detailed Description

Definition at line 2187 of file dl_malloc.c.

6.125.2 Member Data Documentation

6.125.2.1 bk

```
struct malloc_chunk* malloc_chunk::bk
```

Definition at line 2191 of file dl_malloc.c.

6.125.2.2 fd

```
struct malloc_chunk* malloc_chunk::fd
```

Definition at line 2190 of file dl_malloc.c.

6.125.2.3 head

```
size_t malloc_chunk::head
```

Definition at line 2189 of file dl_malloc.c.

6.125.2.4 prev_foot

```
size_t malloc_chunk::prev_foot
```

Definition at line 2188 of file dl_malloc.c.

The documentation for this struct was generated from the following file:

- dl_malloc.c

6.126 malloc_params Struct Reference

Public Attributes

- size_t magic
- size_t page_size
- size_t granularity
- size_t mmap_threshold
- size_t trim_threshold
- flag_t default_mflags

6.126.1 Detailed Description

Definition at line 2618 of file dl_malloc.c.

6.126.2 Member Data Documentation

6.126.2.1 default_mflags

```
flag_t malloc_params::default_mflags
```

Definition at line 2624 of file dl_malloc.c.

6.126.2.2 granularity

```
size_t malloc_params::granularity
```

Definition at line 2621 of file dl_malloc.c.

6.126.2.3 magic

```
size_t malloc_params::magic
```

Definition at line 2619 of file dl_malloc.c.

6.126.2.4 mmap_threshold

```
size_t malloc_params::mmap_threshold
```

Definition at line 2622 of file dl_malloc.c.

6.126.2.5 page_size

```
size_t malloc_params::page_size
```

Definition at line 2620 of file dl_malloc.c.

6.126.2.6 trim_threshold

```
size_t malloc_params::trim_threshold
```

Definition at line 2623 of file dl_malloc.c.

The documentation for this struct was generated from the following file:

- dl_malloc.c

6.127 malloc_segment Struct Reference

Public Attributes

- char * base
- size_t size
- struct malloc_segment * next
- flag_t sflags

6.127.1 Detailed Description

Definition at line 2472 of file dl_malloc.c.

6.127.2 Member Data Documentation

6.127.2.1 base

```
char* malloc_segment::base
```

Definition at line 2473 of file dl_malloc.c.

6.127.2.2 next

```
struct malloc_segment* malloc_segment::next
```

Definition at line 2475 of file dl_malloc.c.

6.127.2.3 sflags

```
flag_t malloc_segment::sflags
```

Definition at line 2476 of file dl_malloc.c.

6.127.2.4 size

```
size_t malloc_segment::size
```

Definition at line 2474 of file dl_malloc.c.

The documentation for this struct was generated from the following file:

- dl_malloc.c

6.128 malloc_state Struct Reference

Public Attributes

- binmap_t smallmap
- binmap_t treemap
- size_t dvsize
- size_t topsize
- char * least_addr
- mchunkptr dv
- mchunkptr top
- size_t trim_check
- size_t release_checks
- size_t magic
- mchunkptr smallbins [(NSMALLBINS+1) *2]
- tbinptr treebins [NTREEBINS]
- size_t footprint
- size_t max_footprint
- size_t footprint_limit
- flag_t mflags
- MLOCK_T mutex
- msegment seg
- void * extp
- size_t exts

6.128.1 Detailed Description

Definition at line 2582 of file dl_malloc.c.

6.128.2 Member Data Documentation

6.128.2.1 dv

```
mchunkptr malloc_state::dv
```

Definition at line 2588 of file dl_malloc.c.

6.128.2.2 dvsize

```
size_t malloc_state::dvsize
```

Definition at line 2585 of file dl_malloc.c.

6.128.2.3 extp

```
void* malloc_state::extp
```

Definition at line 2603 of file dl_malloc.c.

6.128.2.4 exts

```
size_t malloc_state::exts
```

Definition at line 2604 of file dl_malloc.c.

6.128.2.5 footprint

```
size_t malloc_state::footprint
```

Definition at line 2595 of file dl_malloc.c.

6.128.2.6 footprint_limit

```
size_t malloc_state::footprint_limit
```

Definition at line 2597 of file dl_malloc.c.

6.128.2.7 least_addr

```
char* malloc_state::least_addr
```

Definition at line 2587 of file dl_malloc.c.

6.128.2.8 magic

```
size_t malloc_state::magic
```

Definition at line 2592 of file dl_malloc.c.

6.128.2.9 max_footprint

```
size_t malloc_state::max_footprint
```

Definition at line 2596 of file dl_malloc.c.

6.128.2.10 mflags

```
flag_t malloc_state::mflags
```

Definition at line 2598 of file dl_malloc.c.

6.128.2.11 mutex

```
MLOCK_T malloc_state::mutex
```

Definition at line 2600 of file dl_malloc.c.

6.128.2.12 release_checks

```
size_t malloc_state::release_checks
```

Definition at line 2591 of file dl_malloc.c.

6.128.2.13 seg

```
msegment malloc_state::seg
```

Definition at line 2602 of file dl_malloc.c.

6.128.2.14 smallbins

```
mchunkptr malloc_state::smallbins[(NSMALLBINS+1) *2]
```

Definition at line 2593 of file dl_malloc.c.

6.128.2.15 smallmap

```
binmap_t malloc_state::smallmap
```

Definition at line 2583 of file dl_malloc.c.

6.128.2.16 top

```
mchunkptr malloc_state::top
```

Definition at line 2589 of file dl_malloc.c.

6.128.2.17 topsize

```
size_t malloc_state::topsize
```

Definition at line 2586 of file dl_malloc.c.

6.128.2.18 treebins

```
tbinptr malloc_state::treebins[NTREEBINS]
```

Definition at line 2594 of file dl_malloc.c.

6.128.2.19 treemap

```
binmap_t malloc_state::treemap
```

Definition at line 2584 of file dl_malloc.c.

6.128.2.20 trim_check

```
size_t malloc_state::trim_check
```

Definition at line 2590 of file dl_malloc.c.

The documentation for this struct was generated from the following file:

- dl_malloc.c

6.129 malloc_tree_chunk Struct Reference

Public Attributes

- size_t prev_foot
- size_t head
- struct malloc_tree_chunk * fd
- struct malloc_tree_chunk * bk
- struct malloc_tree_chunk * child [2]
- struct malloc_tree_chunk * parent
- bindex_t index

6.129.1 Detailed Description

Definition at line 2396 of file dl_malloc.c.

6.129.2 Member Data Documentation

6.129.2.1 bk

```
struct malloc_tree_chunk* malloc_tree_chunk::bk
```

Definition at line 2401 of file dl_malloc.c.

6.129.2.2 child

```
struct malloc_tree_chunk* malloc_tree_chunk::child[2]
```

Definition at line 2403 of file dl_malloc.c.

6.129.2.3 fd

```
struct malloc_tree_chunk* malloc_tree_chunk::fd
```

Definition at line 2400 of file dl_malloc.c.

6.129.2.4 head

```
size_t malloc_tree_chunk::head
```

Definition at line 2399 of file dl_malloc.c.

6.129.2.5 index

```
bindex_t malloc_tree_chunk::index
```

Definition at line 2405 of file dl_malloc.c.

6.129.2.6 parent

```
struct malloc_tree_chunk* malloc_tree_chunk::parent
```

Definition at line 2404 of file dl_malloc.c.

6.129.2.7 prev_foot

```
size_t malloc_tree_chunk::prev_foot
```

Definition at line 2398 of file dl_malloc.c.

The documentation for this struct was generated from the following file:

- dl_malloc.c

6.130 upcxx::mod2n_hashing< T > Struct Template Reference

```
#include <reflection.hpp>
```

Public Member Functions

- std::size_t operator() (const T &x, int bit_n) const

6.130.1 Detailed Description

template<typename T>
struct upcxx::mod2n_hashing< T >

Definition at line 157 of file reflection.hpp.

6.130.2 Member Function Documentation

6.130.2.1 operator()()

```
template<typename T >
std::size_t upcxx::mod2n_hashing< T >::operator() (
            const T & x,
            int bit_n ) const  [inline]
```

Definition at line 158 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.131 upcxx::nil_cx Struct Reference

```
#include <completion.hpp>
```

6.131.1 Detailed Description

Definition at line 8 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.132 upcxx::nop_function< Sig > Struct Template Reference

`#include <utility.hpp>`

6.132.1 Detailed Description

template<typename Sig>
struct upcxx::nop_function< Sig >

Definition at line 19 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.133 upcxx::nop_function< Ret(Arg...)> Struct Template Reference

`#include <utility.hpp>`

Public Member Functions

- template<typename ... Arg1>
  Ret operator() (Arg1 &&...a) const

6.133.1 Detailed Description

template<typename Ret, typename ... Arg>
struct upcxx::nop_function< Ret(Arg...)>

Definition at line 22 of file utility.hpp.

6.133.2 Member Function Documentation

6.133.2.1 operator()()

```
template<typename Ret , typename ...  Arg>
template<typename ...  Arg1>
Ret upcxx::nop_function< Ret(Arg...)>::operator() (
            Arg1 &&...  a ) const  [inline]
```

Definition at line 24 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.134 upcxx::nop_function< void(Arg...)> Struct Template Reference

```
#include <utility.hpp>
```

Public Member Functions

- template<typename ... Arg1>
  void operator() (Arg1 &&...a) const

6.134.1 Detailed Description

template<typename ... Arg>
struct upcxx::nop_function< void(Arg...)>

Definition at line 30 of file utility.hpp.

6.134.2 Member Function Documentation

6.134.2.1 operator()()

```
template<typename ...  Arg>
template<typename ...  Arg1>
void upcxx::nop_function< void(Arg...)>::operator() (
            Arg1 &&...  a ) const  [inline]
```

Definition at line 32 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.135 upcxx::detail::os_env_parse< T > Struct Template Reference

`#include <os_env.hpp>`

Public Member Functions

- T operator() (std::string x)

6.135.1 Detailed Description

template<class T>
struct upcxx::detail::os_env_parse< T >

Definition at line 19 of file os_env.hpp.

6.135.2 Member Function Documentation

6.135.2.1 operator()()

```
template<class T >
T upcxx::detail::os_env_parse< T >::operator() (
            std::string x )  [inline]
```

Definition at line 30 of file os_env.hpp.

The documentation for this struct was generated from the following file:

- os_env.hpp

6.136 upcxx::detail::os_env_parse< std::string > Struct Template Reference

`#include <os_env.hpp>`

Public Member Functions

- std::string operator() (std::string x)

6.136.1 Detailed Description

template<>
struct upcxx::detail::os_env_parse< std::string >

Definition at line 22 of file os_env.hpp.

6.136.2 Member Function Documentation

6.136.2.1 operator()()

```
std::string upcxx::detail::os_env_parse< std::string >::operator() (
            std::string x )  [inline]
```

Definition at line 23 of file os_env.hpp.

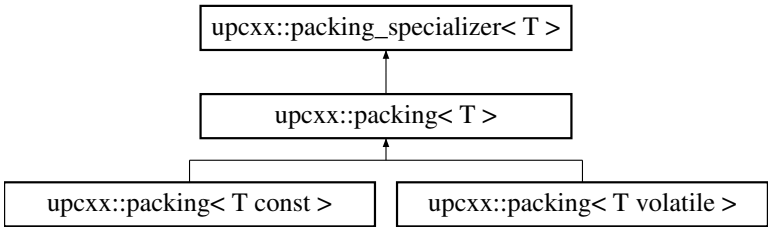
The documentation for this struct was generated from the following file:

- os_env.hpp

6.137 upcxx::packing< T > Struct Template Reference

```
#include <packing.hpp>
```

Inheritance diagram for upcxx::packing< T >:



6.137.1 Detailed Description

template<typename T>
struct upcxx::packing< T >

Definition at line 577 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.138 upcxx::packing< bound_function< Fn, B... > > Struct Template Reference

```
#include <bind.hpp>
```

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const bound_function< Fn, B... > &fn)
- static void pack (parcel_writer &w, const bound_function< Fn, B... > &fn)
- static bound_function< Fn, B... > unpack (parcel_reader &r)

6.138.1 Detailed Description

template<typename Fn, typename ... B>
struct upcxx::packing< bound_function< Fn, B... > >

Definition at line 222 of file bind.hpp.

6.138.2 Member Function Documentation

6.138.2.1 pack()

```
template<typename Fn , typename ...  B>
static void upcxx::packing< bound_function< Fn, B...  > >::pack (
             parcel_writer & w,
             const bound_function< Fn, B...  > & fn )  [inline], [static]
```

Definition at line 228 of file bind.hpp.

6.138.2.2 size_ubound()

```
template<typename Fn , typename ...  B>
static void upcxx::packing< bound_function< Fn, B...  > >::size_ubound (
             parcel_layout & ub,
             const bound_function< Fn, B...  > & fn )  [inline], [static]
```

Definition at line 223 of file bind.hpp.

6.138.2.3 unpack()

```
template<typename Fn , typename ...  B>
static bound_function<Fn,B...> upcxx::packing< bound_function< Fn, B...  > >::unpack (
             parcel_reader & r )  [inline], [static]
```

Definition at line 233 of file bind.hpp.

The documentation for this struct was generated from the following file:

- bind.hpp

6.139 upcxx::packing< std::array< T, n > > Struct Template Reference

`#include <packing.hpp>`

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const std::array< T, n > &x)
- static void pack (parcel_writer &w, const std::array< T, n > &x)
- static std::array< T, n > unpack (parcel_reader &r)

6.139.1 Detailed Description

template<typename T, std::size_t n>
struct upcxx::packing< std::array< T, n > >

Definition at line 695 of file packing.hpp.

6.139.2 Member Function Documentation

6.139.2.1 pack()

```
template<typename T , std::size_t n>
static void upcxx::packing< std::array< T, n > >::pack (
            parcel_writer & w,
            const std::array< T, n > & x )  [inline], [static]
```

Definition at line 701 of file packing.hpp.

6.139.2.2 size_ubound()

```
template<typename T , std::size_t n>
static void upcxx::packing< std::array< T, n > >::size_ubound (
            parcel_layout & ub,
            const std::array< T, n > & x )  [inline], [static]
```

Definition at line 696 of file packing.hpp.

6.139.2.3 unpack()

```
template<typename T , std::size_t n>
static std::array<T,n> upcxx::packing< std::array< T, n > >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 706 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.140 upcxx::packing< std::pair< A, B > > Struct Template Reference

```
#include <packing.hpp>
```

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const std::pair< A, B > &x)
- static void pack (parcel_writer &w, const std::pair< A, B > &x)
- static std::pair< A, B > unpack (parcel_reader &r)

6.140.1 Detailed Description

template<typename A, typename B>
struct upcxx::packing< std::pair< A, B > >

Definition at line 672 of file packing.hpp.

6.140.2 Member Function Documentation

6.140.2.1 pack()

```
template<typename A , typename B >
static void upcxx::packing< std::pair< A, B > >::pack (
            parcel_writer & w,
            const std::pair< A, B > & x )  [inline], [static]
```

Definition at line 678 of file packing.hpp.

6.140.2.2 size_ubound()

```
template<typename A , typename B >
static void upcxx::packing< std::pair< A, B > >::size_ubound (
            parcel_layout & ub,
            const std::pair< A, B > & x )  [inline], [static]
```

Definition at line 673 of file packing.hpp.

6.140.2.3 unpack()

```
template<typename A , typename B >
static std::pair<A,B> upcxx::packing< std::pair< A, B > >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 683 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.141 upcxx::packing< std::string > Struct Template Reference

```
#include <packing.hpp>
```

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const std::string &x)
- static void pack (parcel_writer &w, const std::string &x)
- static std::string unpack (parcel_reader &r)

6.141.1 Detailed Description

template<>
struct upcxx::packing< std::string >

Definition at line 724 of file packing.hpp.

6.141.2 Member Function Documentation

6.141.2.1 pack()

```
static void upcxx::packing< std::string >::pack (
            parcel_writer & w,
            const std::string & x )  [inline], [static]
```

Definition at line 731 of file packing.hpp.

6.141.2.2 size_ubound()

```
static void upcxx::packing< std::string >::size_ubound (
            parcel_layout & ub,
            const std::string & x )  [inline], [static]
```

Definition at line 725 of file packing.hpp.

6.141.2.3 unpack()

```
static std::string upcxx::packing< std::string >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 737 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.142 upcxx::packing< std::tuple< T... > > Struct Template Reference

`#include <packing.hpp>`

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const std::tuple< T... > &x)
- static void pack (parcel_writer &w, const std::tuple< T... > &x)
- template<typename Storage , int ... i>
  static std::tuple< T... > move_from_storage (Storage &storage, upcxx::index_sequence< i... >)
- static std::tuple< T... > unpack (parcel_reader &r)

6.142.1 Detailed Description

template<typename ... T>
struct upcxx::packing< std::tuple< T... > >

Definition at line 632 of file packing.hpp.

6.142.2 Member Function Documentation

6.142.2.1 move_from_storage()

```
template<typename ... T>
template<typename Storage , int ... i>
static std::tuple<T...> upcxx::packing< std::tuple< T... > >::move_from_storage (
            Storage & storage,
            upcxx::index_sequence< i... > ) [inline], [static]
```

Definition at line 642 of file packing.hpp.

6.142.2.2 pack()

```
template<typename ... T>
static void upcxx::packing< std::tuple< T... > >::pack (
            parcel_writer & w,
            const std::tuple< T... > & x ) [inline], [static]
```

Definition at line 637 of file packing.hpp.

6.142.2.3 size_ubound()

```
template<typename ... T>
static void upcxx::packing< std::tuple< T... > >::size_ubound (
            parcel_layout & ub,
            const std::tuple< T... > & x ) [inline], [static]
```

Definition at line 633 of file packing.hpp.

6.142.2.4 unpack()

```
template<typename ... T>
static std::tuple<T...> upcxx::packing< std::tuple< T... > >::unpack (
            parcel_reader & r ) [inline], [static]
```

Definition at line 651 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.143 upcxx::packing< std::unordered_map< K, V > > Struct Template Reference

`#include <packing.hpp>`

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const std::unordered_map< K, V > &xs)
- static void pack (parcel_writer &w, const std::unordered_map< K, V > &xs)
- static std::unordered_map< K, V > unpack (parcel_reader &r)

6.143.1 Detailed Description

template<typename K, typename V>
struct upcxx::packing< std::unordered_map< K, V > >

Definition at line 809 of file packing.hpp.

6.143.2 Member Function Documentation

6.143.2.1 pack()

```
template<typename K , typename V >
static void upcxx::packing< std::unordered_map< K, V > >::pack (
            parcel_writer & w,
            const std::unordered_map< K, V > & xs )  [inline], [static]
```

Definition at line 817 of file packing.hpp.

6.143.2.2 size_ubound()

```
template<typename K , typename V >
static void upcxx::packing< std::unordered_map< K, V > >::size_ubound (
            parcel_layout & ub,
            const std::unordered_map< K, V > & xs )  [inline], [static]
```

Definition at line 810 of file packing.hpp.

6.143.2.3 unpack()

```
template<typename K , typename V >
static std::unordered_map<K,V> upcxx::packing< std::unordered_map< K, V > >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 824 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.144 upcxx::packing< std::unordered_set< T > > Struct Template Reference

```
#include <packing.hpp>
```

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const std::unordered_set< T > &xs)
- static void pack (parcel_writer &w, const std::unordered_set< T > &xs)
- static std::unordered_set< T > unpack (parcel_reader &r)

6.144.1 Detailed Description

template<typename T>
struct upcxx::packing< std::unordered_set< T > >

Definition at line 780 of file packing.hpp.

6.144.2 Member Function Documentation

6.144.2.1 pack()

```
template<typename T >
static void upcxx::packing< std::unordered_set< T > >::pack (
            parcel_writer & w,
            const std::unordered_set< T > & xs )  [inline], [static]
```

Definition at line 788 of file packing.hpp.

6.144.2.2 size_ubound()

```
template<typename T >
static void upcxx::packing< std::unordered_set< T > >::size_ubound (
            parcel_layout & ub,
            const std::unordered_set< T > & xs )  [inline], [static]
```

Definition at line 781 of file packing.hpp.

6.144.2.3 unpack()

```
template<typename T >
static std::unordered_set<T> upcxx::packing< std::unordered_set< T > >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 795 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.145 upcxx::packing< std::vector< T > > Struct Template Reference

```
#include <packing.hpp>
```

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const std::vector< T > &x)
- static void pack (parcel_writer &w, const std::vector< T > &x)
- static std::vector< T > unpack (parcel_reader &r)

6.145.1 Detailed Description

template<typename T>
struct upcxx::packing< std::vector< T > >

Definition at line 751 of file packing.hpp.

6.145.2 Member Function Documentation

6.145.2.1 pack()

```
template<typename T >
static void upcxx::packing< std::vector< T > >::pack (
            parcel_writer & w,
            const std::vector< T > & x )  [inline], [static]
```

Definition at line 759 of file packing.hpp.

6.145.2.2 size_ubound()

```
template<typename T >
static void upcxx::packing< std::vector< T > >::size_ubound (
            parcel_layout & ub,
            const std::vector< T > & x )  [inline], [static]
```

Definition at line 752 of file packing.hpp.

6.145.2.3 unpack()

```
template<typename T >
static std::vector<T> upcxx::packing< std::vector< T > >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 766 of file packing.hpp.

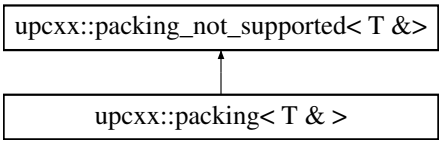
The documentation for this struct was generated from the following file:

- packing.hpp

6.146 upcxx::packing< T & > Struct Template Reference

```
#include <packing.hpp>
```

Inheritance diagram for upcxx::packing< T & >:



Additional Inherited Members

6.146.1 Detailed Description

template<typename T>
struct upcxx::packing< T & >

Definition at line 585 of file packing.hpp.

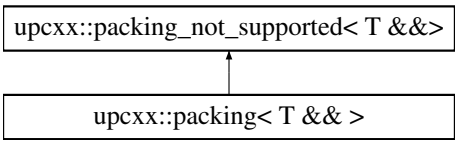
The documentation for this struct was generated from the following file:

- packing.hpp

6.147 upcxx::packing< T && > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing< T && >:



Additional Inherited Members

6.147.1 Detailed Description

template<typename T>
struct upcxx::packing< T && >

Definition at line 587 of file packing.hpp.

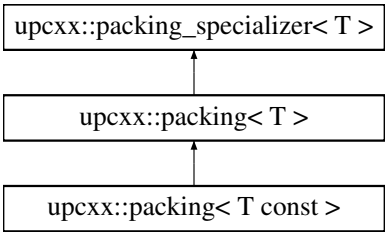
The documentation for this struct was generated from the following file:

- packing.hpp

6.148 upcxx::packing< T const > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing< T const >:



6.148.1 Detailed Description

template<typename T>
struct upcxx::packing< T const >

Definition at line 580 of file packing.hpp.

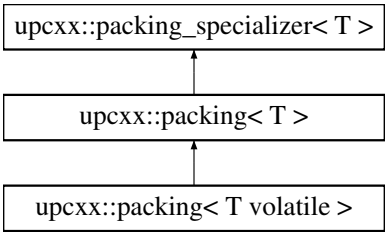
The documentation for this struct was generated from the following file:

- packing.hpp

6.149 upcxx::packing< T volatile > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing< T volatile >:



6.149.1 Detailed Description

template<typename T>
struct upcxx::packing< T volatile >

Definition at line 582 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.150 upcxx::packing_empty< T, is_default_constructible > Struct Template Reference

`#include <packing.hpp>`

6.150.1 Detailed Description

template<typename T, bool is_default_constructible = std::is_default_constructible<T>::value>
struct upcxx::packing_empty< T, is_default_constructible >

Definition at line 306 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.151 upcxx::packing_empty< T, false > Struct Template Reference

`#include <packing.hpp>`

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const T &x)
- static void pack (parcel_writer &w, const T &x)
- static T unpack (parcel_reader &r)

Static Public Attributes

- static constexpr bool is_trivial = true

6.151.1 Detailed Description

template<typename T>
struct upcxx::packing_empty< T, false >

Definition at line 318 of file packing.hpp.

6.151.2 Member Function Documentation

6.151.2.1 pack()

```
template<typename T >
static void upcxx::packing_empty< T, false >::pack (
            parcel_writer & w,
            const T & x )  [inline], [static]
```

Definition at line 322 of file packing.hpp.

6.151.2.2 size_ubound()

```
template<typename T >
static void upcxx::packing_empty< T, false >::size_ubound (
            parcel_layout & ub,
            const T & x )  [inline], [static]
```

Definition at line 321 of file packing.hpp.

6.151.2.3 unpack()

```
template<typename T >
static T upcxx::packing_empty< T, false >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 323 of file packing.hpp.

6.151.3 Member Data Documentation

6.151.3.1 is_trivial

```
template<typename T >
constexpr bool upcxx::packing_empty< T, false >::is_trivial = true  [static]
```

Definition at line 319 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.152 upcxx::packing_empty< T, true > Struct Template Reference

```
#include <packing.hpp>
```

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const T &x)
- static void pack (parcel_writer &w, const T &x)
- static T unpack (parcel_reader &r)

Static Public Attributes

- static constexpr bool is_trivial = true

6.152.1 Detailed Description

template<typename T>
struct upcxx::packing_empty< T, true >

Definition at line 309 of file packing.hpp.

6.152.2 Member Function Documentation

6.152.2.1 pack()

```
template<typename T >
static void upcxx::packing_empty< T, true >::pack (
            parcel_writer & w,
            const T & x )  [inline], [static]
```

Definition at line 313 of file packing.hpp.

6.152.2.2 size_ubound()

```
template<typename T >
static void upcxx::packing_empty< T, true >::size_ubound (
            parcel_layout & ub,
            const T & x )  [inline], [static]
```

Definition at line 312 of file packing.hpp.

6.152.2.3 unpack()

```
template<typename T >
static T upcxx::packing_empty< T, true >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 314 of file packing.hpp.

6.152.3 Member Data Documentation

6.152.3.1 is_trivial

```
template<typename T >
constexpr bool upcxx::packing_empty< T, true >::is_trivial = true  [static]
```

Definition at line 310 of file packing.hpp.

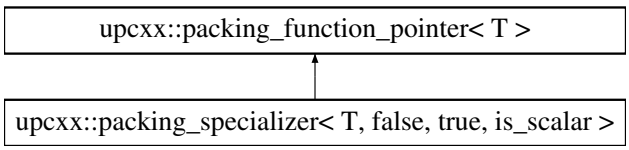
The documentation for this struct was generated from the following file:

- packing.hpp

6.153 upcxx::packing_function_pointer< T > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing_function_pointer< T >:



Static Public Member Functions

- static void size_ubound (parcel_layout &ub, T fp)
- static void pack (parcel_writer &w, T fp)
- static T unpack (parcel_reader &r)

Static Public Attributes

- static constexpr bool is_trivial = false

6.153.1 Detailed Description

template<typename T>
struct upcxx::packing_function_pointer< T >

Definition at line 521 of file packing.hpp.

6.153.2 Member Function Documentation

6.153.2.1 pack()

```
template<typename T >
static void upcxx::packing_function_pointer< T >::pack (
            parcel_writer & w,
            T fp )  [inline], [static]
```

Definition at line 533 of file packing.hpp.

6.153.2.2 size_ubound()

```
template<typename T >
static void upcxx::packing_function_pointer< T >::size_ubound (
            parcel_layout & ub,
            T fp )  [inline], [static]
```

Definition at line 529 of file packing.hpp.

6.153.2.3 unpack()

```
template<typename T >
static T upcxx::packing_function_pointer< T >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 541 of file packing.hpp.

6.153.3 Member Data Documentation

6.153.3.1 is_trivial

```
template<typename T >
constexpr bool upcxx::packing_function_pointer< T >::is_trivial = false  [static]
```

Definition at line 527 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.154 upcxx::packing_is_trivial< T, false_ > Struct Template Reference

```
#include <packing.hpp>
```

Static Public Attributes

- static constexpr bool value = false

6.154.1 Detailed Description

template<typename T, typename false_ = std::false_type>
struct upcxx::packing_is_trivial< T, false_ >

Definition at line 293 of file packing.hpp.

6.154.2 Member Data Documentation

6.154.2.1 value

```
template<typename T , typename false_ = std::false_type>
constexpr bool upcxx::packing_is_trivial< T, false_ >::value = false  [static]
```

Definition at line 294 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.155 upcxx::packing_is_trivial< T, std::integral_constant< bool, false &packing< T >::is_trivial > > Struct Template Reference

```
#include <packing.hpp>
```

Static Public Attributes

- static constexpr bool value = packing<T>::is_trivial

6.155.1 Detailed Description

template<typename T>
struct upcxx::packing_is_trivial< T, std::integral_constant< bool, false &packing< T >::is_trivial > >

Definition at line 297 of file packing.hpp.

6.155.2 Member Data Documentation

6.155.2.1 value

```
template<typename T >
constexpr bool upcxx::packing_is_trivial< T, std::integral_constant< bool, false &packing< T
>::is_trivial > >::value = packing<T>::is_trivial  [static]
```

Definition at line 298 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.156 upcxx::packing_not_supported< T > Struct Template Reference

`#include <packing.hpp>`

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const T &x)

6.156.1 Detailed Description

template<typename T>
struct upcxx::packing_not_supported< T >

Definition at line 276 of file packing.hpp.

6.156.2 Member Function Documentation

6.156.2.1 size_ubound()

```
template<typename T>
static void upcxx::packing_not_supported< T >::size_ubound (
            parcel_layout & ub,
            const T & x )  [inline], [static]
```

Definition at line 277 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.157 upcxx::packing_opaque< T, is_empty, is_trivially_copyable > Struct Template Reference

`#include <packing.hpp>`

6.157.1 Detailed Description

template<typename T, bool is_empty = std::is_empty<T>::value, bool is_trivially_copyable = std::is_trivially_copyable<T>::value>
struct upcxx::packing_opaque< T, is_empty, is_trivially_copyable >

Definition at line 353 of file packing.hpp.

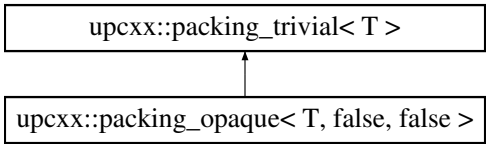
The documentation for this struct was generated from the following file:

- packing.hpp

6.158 upcxx::packing_opaque< T, false, false > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing_opaque< T, false, false >:



Additional Inherited Members

6.158.1 Detailed Description

template<typename T>
struct upcxx::packing_opaque< T, false, false >

Definition at line 365 of file packing.hpp.

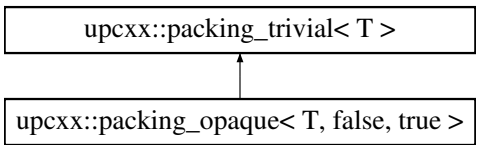
The documentation for this struct was generated from the following file:

- packing.hpp

6.159 upcxx::packing_opaque< T, false, true > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing_opaque< T, false, true >:



Additional Inherited Members

6.159.1 Detailed Description

template<typename T>
struct upcxx::packing_opaque< T, false, true >

Definition at line 360 of file packing.hpp.

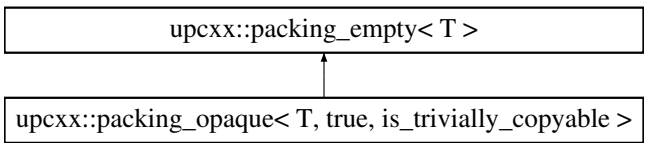
The documentation for this struct was generated from the following file:

- packing.hpp

6.160 upcxx::packing_opaque< T, true, is_trivially_copyable > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing_opaque< T, true, is_trivially_copyable >:



6.160.1 Detailed Description

template<typename T, bool is_trivially_copyable>
struct upcxx::packing_opaque< T, true, is_trivially_copyable >

Definition at line 356 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.161 upcxx::packing_pack_reflector Struct Reference

`#include <packing.hpp>`

Public Member Functions

- template<typename T >
  void operator() (const T &mbr)
- template<typename T >
  void opaque (const T &mbr)

Public Attributes

- parcel_writer & w

6.161.1 Detailed Description

Definition at line 394 of file packing.hpp.

6.161.2 Member Function Documentation

6.161.2.1 opaque()

```
template<typename T >
void upcxx::packing_pack_reflector::opaque (
             const T & mbr )  [inline]
```

Definition at line 402 of file packing.hpp.

6.161.2.2 operator()()

```
template<typename T >
void upcxx::packing_pack_reflector::operator() (
             const T & mbr )  [inline]
```

Definition at line 398 of file packing.hpp.

6.161.3 Member Data Documentation

6.161.3.1 w

```
parcel_writer& upcxx::packing_pack_reflector::w
```

Definition at line 395 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.162 upcxx::packing_reflected< T, is_default_constructible > Struct Template Reference

```
#include <packing.hpp>
```

6.162.1 Detailed Description

template<typename T, bool is_default_constructible = std::is_default_constructible<T>::value>
struct upcxx::packing_reflected< T, is_default_constructible >

Definition at line 440 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.163 upcxx::packing_reflected< T, false > Struct Template Reference

```
#include <packing.hpp>
```

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const T &x)
- static void pack (parcel_writer &w, const T &x)
- static T unpack (parcel_reader &r)

6.163.1 Detailed Description

template<typename T>
struct upcxx::packing_reflected< T, false >

Definition at line 463 of file packing.hpp.

6.163.2 Member Function Documentation

6.163.2.1 pack()

```
template<typename T >
static void upcxx::packing_reflected< T, false >::pack (
            parcel_writer & w,
            const T & x )  [inline], [static]
```

Definition at line 469 of file packing.hpp.

6.163.2.2 size_ubound()

```
template<typename T >
static void upcxx::packing_reflected< T, false >::size_ubound (
            parcel_layout & ub,
            const T & x )  [inline], [static]
```

Definition at line 464 of file packing.hpp.

6.163.2.3 unpack()

```
template<typename T >
static T upcxx::packing_reflected< T, false >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 474 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.164 upcxx::packing_reflected< T, true > Struct Template Reference

```
#include <packing.hpp>
```

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const T &x)
- static void pack (parcel_writer &w, const T &x)
- static T unpack (parcel_reader &r)

6.164.1 Detailed Description

template<typename T>
struct upcxx::packing_reflected< T, true >

Definition at line 443 of file packing.hpp.

6.164.2 Member Function Documentation

6.164.2.1 pack()

```
template<typename T >
static void upcxx::packing_reflected< T, true >::pack (
            parcel_writer & w,
            const T & x )  [inline], [static]
```

Definition at line 449 of file packing.hpp.

6.164.2.2 size_ubound()

```
template<typename T >
static void upcxx::packing_reflected< T, true >::size_ubound (
            parcel_layout & ub,
            const T & x )  [inline], [static]
```

Definition at line 444 of file packing.hpp.

6.164.2.3 unpack()

```
template<typename T >
static T upcxx::packing_reflected< T, true >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 454 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.165 upcxx::packing_specializer< T, is_empty, is_funptr, is_scalar > Struct Template Reference

```
#include <packing.hpp>
```

6.165.1 Detailed Description

template<typename T, bool is_empty = std::is_empty<T>::value, bool is_funptr = std::is_pointer<T>::value && std::is_function<typename std::remove_pointer<T>::type>::value, bool is_scalar = std::is_scalar<T>::value>
struct upcxx::packing_specializer< T, is_empty, is_funptr, is_scalar >

Definition at line 556 of file packing.hpp.

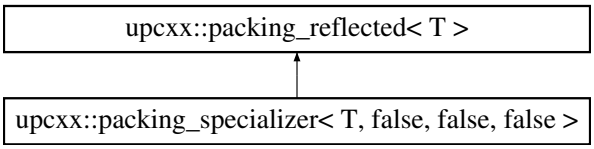
The documentation for this struct was generated from the following file:

- packing.hpp

6.166 upcxx::packing_specializer< T, false, false, false > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing_specializer< T, false, false, false >:



6.166.1 Detailed Description

template<typename T>
struct upcxx::packing_specializer< T, false, false, false >

Definition at line 571 of file packing.hpp.

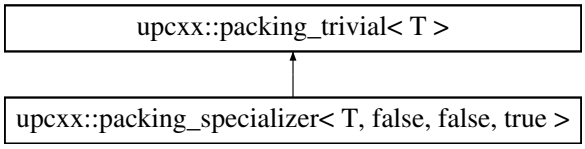
The documentation for this struct was generated from the following file:

- packing.hpp

6.167 upcxx::packing_specializer< T, false, false, true > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing_specializer< T, false, false, true >:



Additional Inherited Members

6.167.1 Detailed Description

template<typename T>
struct upcxx::packing_specializer< T, false, false, true >

Definition at line 567 of file packing.hpp.

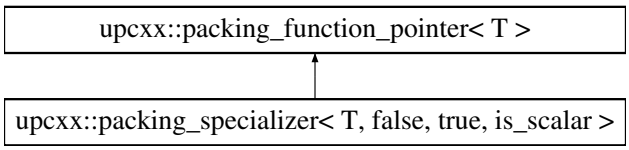
The documentation for this struct was generated from the following file:

- packing.hpp

6.168 upcxx::packing_specializer< T, false, true, is_scalar > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing_specializer< T, false, true, is_scalar >:



Additional Inherited Members

6.168.1 Detailed Description

template<typename T, bool is_scalar>
struct upcxx::packing_specializer< T, false, true, is_scalar >

Definition at line 563 of file packing.hpp.

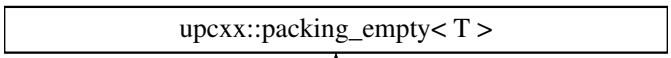
The documentation for this struct was generated from the following file:

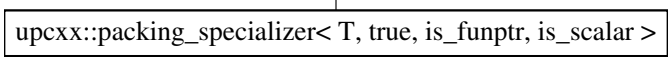
- packing.hpp

6.169 upcxx::packing_specializer< T, true, is_funptr, is_scalar > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing_specializer< T, true, is_funptr, is_scalar >:





6.169.1 Detailed Description

template<typename T, bool is_funptr, bool is_scalar>
struct upcxx::packing_specializer< T, true, is_funptr, is_scalar >

Definition at line 559 of file packing.hpp.

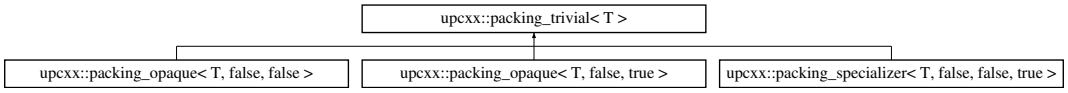
The documentation for this struct was generated from the following file:

- packing.hpp

6.170 upcxx::packing_trivial< T > Struct Template Reference

`#include <packing.hpp>`

Inheritance diagram for upcxx::packing_trivial< T >:



Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const T &x)
- static void pack (parcel_writer &w, const T &x)
- static T unpack (parcel_reader &r)

Static Public Attributes

- static constexpr bool is_trivial = true

6.170.1 Detailed Description

template<typename T>
struct upcxx::packing_trivial< T >

Definition at line 333 of file packing.hpp.

6.170.2 Member Function Documentation

6.170.2.1 pack()

```
template<typename T >
static void upcxx::packing_trivial< T >::pack (
            parcel_writer & w,
            const T & x )  [inline], [static]
```

Definition at line 339 of file packing.hpp.

6.170.2.2 size_ubound()

```
template<typename T >
static void upcxx::packing_trivial< T >::size_ubound (
            parcel_layout & ub,
            const T & x )  [inline], [static]
```

Definition at line 336 of file packing.hpp.

6.170.2.3 unpack()

```
template<typename T >
static T upcxx::packing_trivial< T >::unpack (
            parcel_reader & r )  [inline], [static]
```

Definition at line 342 of file packing.hpp.

6.170.3 Member Data Documentation

6.170.3.1 is_trivial

```
template<typename T >
constexpr bool upcxx::packing_trivial< T >::is_trivial = true  [static]
```

Definition at line 334 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.171 upcxx::detail::packing_tuple_each< n, i, T > Struct Template Reference

```
#include <packing.hpp>
```

Public Types

- typedef std::tuple_element< i, std::tuple< T... > >::type Ti

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const std::tuple< T... > &x)
- static void pack (parcel_writer &w, const std::tuple< T... > &x)
- template<typename Storage >
  static void unpack_into (parcel_reader &r, Storage &storage)
- template<typename Storage >
  static void destruct (Storage &storage)

6.171.1 Detailed Description

template<int n, int i, typename ... T>
struct upcxx::detail::packing_tuple_each< n, i, T >

Definition at line 594 of file packing.hpp.

6.171.2 Member Typedef Documentation

6.171.2.1 Ti

```
template<int n, int i, typename ...  T>
typedef std::tuple_element<i,std::tuple<T...> >::type upcxx::detail::packing_tuple_each< n,
i, T >::Ti
```

Definition at line 595 of file packing.hpp.

6.171.3 Member Function Documentation

6.171.3.1 destruct()

```
template<int n, int i, typename ...  T>
template<typename Storage >
static void upcxx::detail::packing_tuple_each< n, i, T >::destruct (
            Storage & storage )  [inline], [static]
```

Definition at line 614 of file packing.hpp.

6.171.3.2 pack()

```
template<int n, int i, typename ... T>
static void upcxx::detail::packing_tuple_each< n, i, T >::pack (
             parcel_writer & w,
             const std::tuple< T... > & x )  [inline], [static]
```

Definition at line 602 of file packing.hpp.

6.171.3.3 size_ubound()

```
template<int n, int i, typename ... T>
static void upcxx::detail::packing_tuple_each< n, i, T >::size_ubound (
             parcel_layout & ub,
             const std::tuple< T... > & x )  [inline], [static]
```

Definition at line 597 of file packing.hpp.

6.171.3.4 unpack_into()

```
template<int n, int i, typename ... T>
template<typename Storage >
static void upcxx::detail::packing_tuple_each< n, i, T >::unpack_into (
             parcel_reader & r,
             Storage & storage )  [inline], [static]
```

Definition at line 608 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.172 upcxx::detail::packing_tuple_each< n, n, T... > Struct Template Reference

```
#include <packing.hpp>
```

Static Public Member Functions

- static void size_ubound (parcel_layout &ub, const std::tuple< T... > &x)
- static void pack (parcel_writer &w, const std::tuple< T... > &x)
- template<typename Storage >
  static void unpack_into (parcel_reader &r, Storage &)
- template<typename Storage >
  static void destruct (Storage &)

6.172.1 Detailed Description

template<int n, typename ... T>
struct upcxx::detail::packing_tuple_each< n, n, T... >

Definition at line 621 of file packing.hpp.

6.172.2 Member Function Documentation

6.172.2.1 destruct()

```
template<int n, typename ...  T>
template<typename Storage >
static void upcxx::detail::packing_tuple_each< n, n, T...  >::destruct (
             Storage &  )  [inline], [static]
```

Definition at line 627 of file packing.hpp.

6.172.2.2 pack()

```
template<int n, typename ...  T>
static void upcxx::detail::packing_tuple_each< n, n, T...  >::pack (
             parcel_writer & w,
             const std::tuple< T...  > & x )  [inline], [static]
```

Definition at line 623 of file packing.hpp.

6.172.2.3 size_ubound()

```
template<int n, typename ...  T>
static void upcxx::detail::packing_tuple_each< n, n, T...  >::size_ubound (
             parcel_layout & ub,
             const std::tuple< T...  > & x )  [inline], [static]
```

Definition at line 622 of file packing.hpp.

6.172.2.4 unpack_into()

```
template<int n, typename ...  T>
template<typename Storage >
static void upcxx::detail::packing_tuple_each< n, n, T...  >::unpack_into (
             parcel_reader & r,
             Storage &  )  [inline], [static]
```

Definition at line 625 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.173 upcxx::packing_ubound_reflector Struct Reference

```
#include <packing.hpp>
```

Public Member Functions

- template<typename T >
  void operator() (const T &mbr)
- template<typename T >
  void opaque (const T &mbr)

Public Attributes

- parcel_layout & ub

6.173.1 Detailed Description

Definition at line 380 of file packing.hpp.

6.173.2 Member Function Documentation

6.173.2.1 opaque()

```
template<typename T >
void upcxx::packing_ubound_reflector::opaque (
             const T & mbr )  [inline]
```

Definition at line 388 of file packing.hpp.

6.173.2.2 operator()()

```
template<typename T >
void upcxx::packing_ubound_reflector::operator() (
             const T & mbr )  [inline]
```

Definition at line 384 of file packing.hpp.

6.173.3 Member Data Documentation

6.173.3.1 ub

```
parcel_layout& upcxx::packing_ubound_reflector::ub
```

Definition at line 381 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.174 upcxx::packing_unpack_reflector< member_assignment_not_construction > Struct Template Reference

```
#include <packing.hpp>
```

6.174.1 Detailed Description

template<bool member_assignment_not_construction>
struct upcxx::packing_unpack_reflector< member_assignment_not_construction >

Definition at line 409 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.175 upcxx::packing_unpack_reflector< false > Struct Template Reference

```
#include <packing.hpp>
```

Public Member Functions

- template<typename T >
  void operator() (T &mbr)
- template<typename T >
  void opaque (T &mbr)

Public Attributes

- parcel_reader & r

6.175.1 Detailed Description

template<>
struct upcxx::packing_unpack_reflector< false >

Definition at line 425 of file packing.hpp.

6.175.2 Member Function Documentation

6.175.2.1 opaque()

```
template<typename T >
void upcxx::packing_unpack_reflector< false >::opaque (
            T & mbr )  [inline]
```

Definition at line 433 of file packing.hpp.

6.175.2.2 operator()()

```
template<typename T >
void upcxx::packing_unpack_reflector< false >::operator() (
            T & mbr )  [inline]
```

Definition at line 429 of file packing.hpp.

6.175.3 Member Data Documentation

6.175.3.1 r

```
parcel_reader& upcxx::packing_unpack_reflector< false >::r
```

Definition at line 426 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.176 upcxx::packing_unpack_reflector< true > Struct Template Reference

```
#include <packing.hpp>
```

Public Member Functions

- template<typename T >
  void operator() (T &mbr)
- template<typename T >
  void opaque (T &mbr)

Public Attributes

- parcel_reader & r

6.176.1 Detailed Description

template<>
struct upcxx::packing_unpack_reflector< true >

Definition at line 412 of file packing.hpp.

6.176.2 Member Function Documentation

6.176.2.1 opaque()

```
template<typename T >
void upcxx::packing_unpack_reflector< true >::opaque (
            T & mbr )  [inline]
```

Definition at line 420 of file packing.hpp.

6.176.2.2 operator()()

```
template<typename T >
void upcxx::packing_unpack_reflector< true >::operator() (
             T & mbr )  [inline]
```

Definition at line 416 of file packing.hpp.

6.176.3 Member Data Documentation

6.176.3.1 r

```
parcel_reader& upcxx::packing_unpack_reflector< true >::r
```

Definition at line 413 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.177 upcxx::parcel_layout Class Reference

```
#include <packing.hpp>
```

Public Member Functions

- constexpr parcel_layout (std::size_t size=0, std::size_t align=1)
- std::size_t size () const
- std::size_t alignment () const
- std::size_t size_aligned () const
- template<std::size_t align = 1>
  std::size_t add_bytes (std::size_t size)
- std::size_t add_bytes (std::size_t size, std::size_t align)
- template<typename T >
  std::size_t add_trivial_aligned ()
- template<typename T >
  std::size_t add_trivial_unaligned ()
- std::size_t embed (parcel_layout that)

Friends

- std::ostream & operator<< (std::ostream &o, const parcel_layout &x)

6.177.1 Detailed Description

Definition at line 42 of file packing.hpp.

6.177.2 Constructor & Destructor Documentation

6.177.2.1 parcel_layout()

```
constexpr upcxx::parcel_layout::parcel_layout (
            std::size_t size = 0,
            std::size_t align = 1 )  [inline]
```

Definition at line 47 of file packing.hpp.

6.177.3 Member Function Documentation

6.177.3.1 add_bytes() [1/2]

```
template<std::size_t align = 1>
std::size_t upcxx::parcel_layout::add_bytes (
            std::size_t size )  [inline]
```

Definition at line 58 of file packing.hpp.

6.177.3.2 add_bytes() [2/2]

```
std::size_t upcxx::parcel_layout::add_bytes (
            std::size_t size,
            std::size_t align )  [inline]
```

Definition at line 65 of file packing.hpp.

6.177.3.3 add_trivial_aligned()

```
template<typename T >
std::size_t upcxx::parcel_layout::add_trivial_aligned ( )  [inline]
```

Definition at line 73 of file packing.hpp.

6.177.3.4 add_trivial_unaligned()

```
template<typename T >
std::size_t upcxx::parcel_layout::add_trivial_unaligned ( )  [inline]
```

Definition at line 77 of file packing.hpp.

6.177.3.5 alignment()

```
std::size_t upcxx::parcel_layout::alignment ( ) const  [inline]
```

Definition at line 53 of file packing.hpp.

6.177.3.6 embed()

```
std::size_t upcxx::parcel_layout::embed (
            parcel_layout that )  [inline]
```

Definition at line 81 of file packing.hpp.

6.177.3.7 size()

```
std::size_t upcxx::parcel_layout::size ( ) const  [inline]
```

Definition at line 52 of file packing.hpp.

6.177.3.8 size_aligned()

```
std::size_t upcxx::parcel_layout::size_aligned ( ) const  [inline]
```

Definition at line 55 of file packing.hpp.

6.177.4 Friends And Related Function Documentation

6.177.4.1 operator<<

```
std::ostream& operator<< (
            std::ostream & o,
            const parcel_layout & x )  [friend]
```

Definition at line 89 of file packing.hpp.

The documentation for this class was generated from the following file:

- packing.hpp

6.178 upcxx::parcel_reader Class Reference

`#include <packing.hpp>`

Public Member Functions

- parcel_reader (void const *buf, std::size_t offset=0)
- ~parcel_reader ()
- char const * buffer () const
- parcel_layout layout () const
- char const * pop (std::size_t size, std::size_t align)
- char pop_char ()
- std::uint8_t pop_uint8 ()
- std::int8_t pop_int8 ()
- template<typename T >
  T const & pop_trivial_aligned ()
- template<typename T >
  T const * pop_trivial_aligned (std::size_t n)
- template<typename T >
  T pop_trivial_unaligned ()
- template<typename T >
  char const * pop_trivial_unaligned (std::size_t n)

6.178.1 Detailed Description

Definition at line 187 of file packing.hpp.

6.178.2 Constructor & Destructor Documentation

6.178.2.1 parcel_reader()

```
upcxx::parcel_reader::parcel_reader (
            void const * buf,
            std::size_t offset = 0 )  [inline]
```

Definition at line 192 of file packing.hpp.

6.178.2.2 ~parcel_reader()

```
upcxx::parcel_reader::~parcel_reader ( )  [inline]
```

Definition at line 196 of file packing.hpp.

6.178.3 Member Function Documentation

6.178.3.1 buffer()

```
char const* upcxx::parcel_reader::buffer ( ) const  [inline]
```

Definition at line 200 of file packing.hpp.

6.178.3.2 layout()

```
parcel_layout upcxx::parcel_reader::layout ( ) const  [inline]
```

Definition at line 201 of file packing.hpp.

6.178.3.3 pop()

```
char const* upcxx::parcel_reader::pop (
            std::size_t size,
            std::size_t align )  [inline]
```

Definition at line 203 of file packing.hpp.

6.178.3.4 pop_char()

```
char upcxx::parcel_reader::pop_char ( )  [inline]
```

Definition at line 208 of file packing.hpp.

6.178.3.5 pop_int8()

```
std::int8_t upcxx::parcel_reader::pop_int8 ( )  [inline]
```

Definition at line 218 of file packing.hpp.

6.178.3.6 pop_trivial_aligned() [1/2]

```
template<typename T >
T const& upcxx::parcel_reader::pop_trivial_aligned ( )  [inline]
```

Definition at line 225 of file packing.hpp.

6.178.3.7 pop_trivial_aligned() [2/2]

```
template<typename T >
T const* upcxx::parcel_reader::pop_trivial_aligned (
             std::size_t n )  [inline]
```

Definition at line 230 of file packing.hpp.

6.178.3.8 pop_trivial_unaligned() [1/2]

```
template<typename T >
T upcxx::parcel_reader::pop_trivial_unaligned ( )  [inline]
```

Definition at line 236 of file packing.hpp.

6.178.3.9 pop_trivial_unaligned() [2/2]

```
template<typename T >
char const* upcxx::parcel_reader::pop_trivial_unaligned (
             std::size_t n )  [inline]
```

Definition at line 248 of file packing.hpp.

6.178.3.10 pop_uint8()

```
std::uint8_t upcxx::parcel_reader::pop_uint8 ( )  [inline]
```

Definition at line 213 of file packing.hpp.

The documentation for this class was generated from the following file:

- packing.hpp

6.179 upcxx::parcel_writer Struct Reference

```
#include <packing.hpp>
```

Public Member Functions

- parcel_writer (void *buf, std::size_t offset=0)
- char * buffer () const
- parcel_layout layout () const
- std::size_t size () const
- std::size_t alignment () const
- char * put (std::size_t size, std::size_t align)
- char * put_char (char x)
- std::uint8_t * put_uint8 (std::uint8_t x)
- std::int8_t * put_int8 (std::int8_t x)
- template<typename T >
  T * put_trivial_aligned (const T &x)
- template<typename T >
  T * put_trivial_aligned (const T *x, std::size_t n)
- template<typename T >
  void * put_trivial_unaligned (const T &x)
- template<typename T >
  void * put_trivial_unaligned (const T *x, std::size_t n)

Public Attributes

- char *__restrict buf_
- parcel_layout lay_

6.179.1 Detailed Description

Definition at line 99 of file packing.hpp.

6.179.2 Constructor & Destructor Documentation

6.179.2.1 parcel_writer()

```
upcxx::parcel_writer::parcel_writer (
            void * buf,
            std::size_t offset = 0 )  [inline]
```

Definition at line 104 of file packing.hpp.

6.179.3 Member Function Documentation

6.179.3.1 alignment()

```
std::size_t upcxx::parcel_writer::alignment ( ) const  [inline]
```

Definition at line 113 of file packing.hpp.

6.179.3.2 buffer()

```
char* upcxx::parcel_writer::buffer ( ) const  [inline]
```

Definition at line 109 of file packing.hpp.

6.179.3.3 layout()

```
parcel_layout upcxx::parcel_writer::layout ( ) const  [inline]
```

Definition at line 110 of file packing.hpp.

6.179.3.4 put()

```
char* upcxx::parcel_writer::put (
            std::size_t size,
            std::size_t align )  [inline]
```

Definition at line 115 of file packing.hpp.

6.179.3.5 put_char()

```
char* upcxx::parcel_writer::put_char (
            char x )  [inline]
```

Definition at line 120 of file packing.hpp.

6.179.3.6 put_int8()

```
std::int8_t* upcxx::parcel_writer::put_int8 (
            std::int8_t x )  [inline]
```

Definition at line 130 of file packing.hpp.

6.179.3.7 put_trivial_aligned() [1/2]

```
template<typename T >
T* upcxx::parcel_writer::put_trivial_aligned (
            const T & x )  [inline]
```

Definition at line 137 of file packing.hpp.

6.179.3.8 put_trivial_aligned() [2/2]

```
template<typename T >
T* upcxx::parcel_writer::put_trivial_aligned (
            const T * x,
            std::size_t n )  [inline]
```

Definition at line 145 of file packing.hpp.

6.179.3.9 put_trivial_unaligned() [1/2]

```
template<typename T >
void* upcxx::parcel_writer::put_trivial_unaligned (
            const T & x )  [inline]
```

Definition at line 158 of file packing.hpp.

6.179.3.10 put_trivial_unaligned() [2/2]

```
template<typename T >
void* upcxx::parcel_writer::put_trivial_unaligned (
            const T * x,
            std::size_t n )  [inline]
```

Definition at line 165 of file packing.hpp.

6.179.3.11 put_uint8()

```
std::uint8_t* upcxx::parcel_writer::put_uint8 (
            std::uint8_t x )  [inline]
```

Definition at line 125 of file packing.hpp.

6.179.3.12 size()

```
std::size_t upcxx::parcel_writer::size ( ) const  [inline]
```

Definition at line 112 of file packing.hpp.

6.179.4 Member Data Documentation

6.179.4.1 buf_

```
char* __restrict upcxx::parcel_writer::buf_
```

Definition at line 100 of file packing.hpp.

6.179.4.2 lay_

```
parcel_layout upcxx::parcel_writer::lay_
```

Definition at line 101 of file packing.hpp.

The documentation for this struct was generated from the following file:

- packing.hpp

6.180 upcxx::print_proxy< T > Struct Template Reference

`#include <reflection.hpp>`

Public Attributes

- T const & subject

Friends

- std::ostream & operator<< (std::ostream &o, print_proxy &me)

6.180.1 Detailed Description

template<typename T>
struct upcxx::print_proxy< T >

Definition at line 252 of file reflection.hpp.

6.180.2 Friends And Related Function Documentation

6.180.2.1 operator<<

```
template<typename T >
std::ostream& operator<< (
            std::ostream & o,
            print_proxy< T > & me )  [friend]
```

Definition at line 255 of file reflection.hpp.

6.180.3 Member Data Documentation

6.180.3.1 subject

```
template<typename T >
T const& upcxx::print_proxy< T >::subject
```

Definition at line 253 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.181 upcxx::print_reflector Struct Reference

`#include <reflection.hpp>`

Public Member Functions

- template<typename T >
  void opaque (const T &x)
- template<typename T >
  void operator() (const T &x)

Public Attributes

- std::ostream & o
- bool comma

6.181.1 Detailed Description

Definition at line 235 of file reflection.hpp.

6.181.2 Member Function Documentation

6.181.2.1 opaque()

```
template<typename T >
void upcxx::print_reflector::opaque (
            const T & x )  [inline]
```

Definition at line 240 of file reflection.hpp.

6.181.2.2 operator()()

```
template<typename T >
void upcxx::print_reflector::operator() (
            const T & x )  [inline]
```

Definition at line 246 of file reflection.hpp.

6.181.3 Member Data Documentation

6.181.3.1 comma

```
bool upcxx::print_reflector::comma
```

Definition at line 237 of file reflection.hpp.

6.181.3.2 o

```
std::ostream& upcxx::print_reflector::o
```

Definition at line 236 of file reflection.hpp.

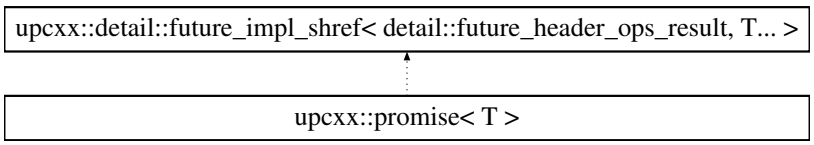
The documentation for this struct was generated from the following file:

- reflection.hpp

6.182 upcxx::promise< T > Class Template Reference

```
#include <promise.hpp>
```

Inheritance diagram for upcxx::promise< T >:



6.182.1 Detailed Description

template<typename ... T>
class upcxx::promise< T >

Definition at line 11 of file promise.hpp.

The documentation for this class was generated from the following file:

- future/promise.hpp

6.183 upcxx::promise_cx< T > Struct Template Reference

```
#include <completion.hpp>
```

Public Attributes

- promise< T... > & pro_

6.183.1 Detailed Description

template<typename ... T>
struct upcxx::promise_cx< T >

Definition at line 20 of file completion.hpp.

6.183.2 Member Data Documentation

6.183.2.1 pro_

```
template<typename ...  T>
promise<T...>& upcxx::promise_cx< T >::pro_
```

Definition at line 21 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.184 upcxx::detail::promise_like< Fu > Struct Template Reference

```
#include <promise.hpp>
```

6.184.1 Detailed Description

template<typename Fu>
struct upcxx::detail::promise_like< Fu >

Definition at line 19 of file promise.hpp.

The documentation for this struct was generated from the following file:

- future/promise.hpp

6.185 upcxx::detail::promise_like< future1< Kind, T... > > Struct Template Reference

```
#include <promise.hpp>
```

Public Types

- using type = promise< T... >

6.185.1 Detailed Description

template<typename Kind, typename ... T>
struct upcxx::detail::promise_like< future1< Kind, T... > >

Definition at line 21 of file promise.hpp.

6.185.2 Member Typedef Documentation

6.185.2.1 type

```
template<typename Kind , typename ...  T>
using upcxx::detail::promise_like< future1< Kind, T...  > >::type = promise<T...>
```

Definition at line 22 of file promise.hpp.

The documentation for this struct was generated from the following file:

- future/promise.hpp

6.186 upcxx::reflection< Subject > Struct Template Reference

```
#include <reflection.hpp>
```

Public Member Functions

- template<typename Reflector , typename Subject1 >
  void operator() (Reflector &re, Subject1 &&subj)

6.186.1 Detailed Description

template<typename Subject>
struct upcxx::reflection< Subject >

Definition at line 42 of file reflection.hpp.

6.186.2 Member Function Documentation

6.186.2.1 operator()()

```
template<typename Subject >
template<typename Reflector , typename Subject1 >
void upcxx::reflection< Subject >::operator() (
            Reflector & re,
            Subject1 && subj )  [inline]
```

Definition at line 44 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.187 upcxx::reflection< std::array< T, n > > Struct Template Reference

```
#include <reflection.hpp>
```

Public Member Functions

- template<typename Re , typename Array >
  void operator() (Re &re, Array &&x) const

6.187.1 Detailed Description

template<typename T, std::size_t n>
struct upcxx::reflection< std::array< T, n > >

Definition at line 221 of file reflection.hpp.

6.187.2 Member Function Documentation

6.187.2.1 operator()()

```
template<typename T , std::size_t n>
template<typename Re , typename Array >
void upcxx::reflection< std::array< T, n > >::operator() (
            Re & re,
            Array && x ) const  [inline]
```

Definition at line 223 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.188 upcxx::reflection< std::pair< A, B > > Struct Template Reference

`#include <reflection.hpp>`

Public Member Functions

- template<typename Re , typename Pair >
  void operator() (Re &re, Pair &&x) const

6.188.1 Detailed Description

template<typename A, typename B>
struct upcxx::reflection< std::pair< A, B > >

Definition at line 208 of file reflection.hpp.

6.188.2 Member Function Documentation

6.188.2.1 operator()()

```
template<typename A , typename B >
template<typename Re , typename Pair >
void upcxx::reflection< std::pair< A, B > >::operator() (
            Re & re,
            Pair && x ) const  [inline]
```

Definition at line 210 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.189 upcxx::reflection< std::tuple< Ts... > > Struct Template Reference

`#include <reflection.hpp>`

Public Member Functions

- template<typename Re , typename Tup1 >
  void operator() (Re &re, Tup1 &&x) const

6.189.1 Detailed Description

template<typename ... Ts>
struct upcxx::reflection< std::tuple< Ts... > >

Definition at line 196 of file reflection.hpp.

6.189.2 Member Function Documentation

6.189.2.1 operator()()

```
template<typename ...  Ts>
template<typename Re , typename Tup1 >
void upcxx::reflection< std::tuple< Ts...  > >::operator() (
            Re & re,
            Tup1 && x ) const  [inline]
```

Definition at line 198 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.190 upcxx::reflection_tuple< Tup, i, n > Struct Template Reference

`#include <reflection.hpp>`

Public Member Functions

- template<typename Re , typename Tup1 >
  void operator() (Re &re, Tup1 &&x) const

6.190.1 Detailed Description

template<typename Tup, int i, int n>
struct upcxx::reflection_tuple< Tup, i, n >

Definition at line 181 of file reflection.hpp.

6.190.2 Member Function Documentation

6.190.2.1 operator()()

```
template<typename Tup , int i, int n>
template<typename Re , typename Tup1 >
void upcxx::reflection_tuple< Tup, i, n >::operator() (
            Re & re,
            Tup1 && x ) const  [inline]
```

Definition at line 183 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.191 upcxx::reflection_tuple< Tup, n, n > Struct Template Reference

```
#include <reflection.hpp>
```

Public Member Functions

- template<typename Re , typename Tup1 >
  void operator() (Re &re, Tup1 &&x) const

6.191.1 Detailed Description

template<typename Tup, int n>
struct upcxx::reflection_tuple< Tup, n, n >

Definition at line 189 of file reflection.hpp.

6.191.2 Member Function Documentation

6.191.2.1 operator()()

```
template<typename Tup , int n>
template<typename Re , typename Tup1 >
void upcxx::reflection_tuple< Tup, n, n >::operator() (
            Re & re,
            Tup1 && x ) const  [inline]
```

Definition at line 191 of file reflection.hpp.

The documentation for this struct was generated from the following file:

- reflection.hpp

6.192 upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_function Struct Reference

`#include <impl_mapped.hpp>`

Public Types

- typedef apply_futured_as_future_return_t< Fn(FuArg)> fn_return_t

Public Member Functions

- result_lrefs_function (fn_return_t result)
- result_lrefs_function (const result_lrefs_function &that)
- result_lrefs_function & operator= (const result_lrefs_function &that)
- result_lrefs_function (result_lrefs_function &&that)
- result_lrefs_function & operator= (result_lrefs_function &&that)
- auto operator() () const -> decltype(getter_())

Public Attributes

- decltype(std::declval< fn_return_t >().impl_.result_lrefs_getter()) typedef fn_return_getter_t
- fn_return_t result_
- fn_return_getter_t getter_

6.192.1 Detailed Description

template<typename FuArg, typename Fn, typename ... T>
struct upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_function

Definition at line 38 of file impl_mapped.hpp.

6.192.2 Member Typedef Documentation

6.192.2.1 fn_return_t

```
template<typename FuArg , typename Fn , typename ...  T>
typedef apply_futured_as_future_return_t<Fn(FuArg)> upcxx::detail::future_impl_mapped< FuArg,
Fn, T >::result_lrefs_function::fn_return_t
```

Definition at line 39 of file impl_mapped.hpp.

6.192.3 Constructor & Destructor Documentation

6.192.3.1 result_lrefs_function() [1/3]

```
template<typename FuArg , typename Fn , typename ...  T>
upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_function::result_lrefs_↩
function (
            fn_return_t result )  [inline]
```

Definition at line 45 of file impl_mapped.hpp.

6.192.3.2 result_lrefs_function() [2/3]

```
template<typename FuArg , typename Fn , typename ...  T>
upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_function::result_lrefs_↩
function (
            const result_lrefs_function & that )  [inline]
```

Definition at line 50 of file impl_mapped.hpp.

6.192.3.3 result_lrefs_function() [3/3]

```
template<typename FuArg , typename Fn , typename ...  T>
upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_function::result_lrefs_↩
function (
            result_lrefs_function && that )  [inline]
```

Definition at line 60 of file impl_mapped.hpp.

6.192.4 Member Function Documentation

6.192.4.1 operator()()

```
template<typename FuArg , typename Fn , typename ...  T>
auto upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_function::operator() ( )
const -> decltype(getter_())   [inline]
```

Definition at line 70 of file impl_mapped.hpp.

6.192.4.2 operator=() [1/2]

```
template<typename FuArg , typename Fn , typename ... T>
result_lrefs_function& upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_↩
function::operator= (
            const result_lrefs_function & that )  [inline]
```

Definition at line 54 of file impl_mapped.hpp.

6.192.4.3 operator=() [2/2]

```
template<typename FuArg , typename Fn , typename ... T>
result_lrefs_function& upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_↩
function::operator= (
            result_lrefs_function && that )  [inline]
```

Definition at line 64 of file impl_mapped.hpp.

6.192.5 Member Data Documentation

6.192.5.1 fn_return_getter_t

```
template<typename FuArg , typename Fn , typename ... T>
decltype(std::declval<fn_return_t>().impl_.result_lrefs_getter()) typedef upcxx::detail↩
::future_impl_mapped< FuArg, Fn, T >::result_lrefs_function::fn_return_getter_t
```

Definition at line 40 of file impl_mapped.hpp.

6.192.5.2 getter_

```
template<typename FuArg , typename Fn , typename ... T>
fn_return_getter_t upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_function↩
::getter_
```

Definition at line 43 of file impl_mapped.hpp.

6.192.5.3 result_

```
template<typename FuArg , typename Fn , typename ...  T>
fn_return_t upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_function::result↩
_
```

Definition at line 42 of file impl_mapped.hpp.

The documentation for this struct was generated from the following file:

- future/impl_mapped.hpp

6.193 upcxx::detail::rget_byval< T > Struct Template Reference

```
#include <rget.hpp>
```

6.193.1 Detailed Description

template<typename T>
struct upcxx::detail::rget_byval< T >

Definition at line 11 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.194 upcxx::detail::rget_futures_of< Mode, R, O > Struct Template Reference

```
#include <rget.hpp>
```

Public Types

- using return_type = void

Public Member Functions

- rget_futures_of (rget_states< Mode, R, O > &st)
- void operator() ()

6.194.1 Detailed Description

template<typename Mode, typename R, typename O>
struct upcxx::detail::rget_futures_of< Mode, R, O >

Definition at line 126 of file rget.hpp.

6.194.2 Member Typedef Documentation

6.194.2.1 return_type

```
template<typename Mode, typename R, typename O>
using upcxx::detail::rget_futures_of< Mode, R, O >::return_type = void
```

Definition at line 127 of file rget.hpp.

6.194.3 Constructor & Destructor Documentation

6.194.3.1 rget_futures_of()

```
template<typename Mode, typename R, typename O>
upcxx::detail::rget_futures_of< Mode, R, O >::rget_futures_of (
            rget_states< Mode, R, O > & st )  [inline]
```

Definition at line 129 of file rget.hpp.

6.194.4 Member Function Documentation

6.194.4.1 operator()()

```
template<typename Mode, typename R, typename O>
void upcxx::detail::rget_futures_of< Mode, R, O >::operator() ( )  [inline]
```

Definition at line 131 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.195 upcxx::detail::rget_futures_of< rget_byref, R, future_cx< 0 > > Struct Template Reference

```
#include <rget.hpp>
```

Public Types

- using return_type = future<>

Public Member Functions

- rget_futures_of (rget_states< rget_byref, R, future_cx< 0 >> &st)
- future operator() ()

Public Attributes

- future fut_

6.195.1 Detailed Description

template<typename R>
struct upcxx::detail::rget_futures_of< rget_byref, R, future_cx< 0 > >

Definition at line 135 of file rget.hpp.

6.195.2 Member Typedef Documentation

6.195.2.1 return_type

```
template<typename R >
using upcxx::detail::rget_futures_of< rget_byref, R, future_cx< 0 > >::return_type = future<>
```

Definition at line 136 of file rget.hpp.

6.195.3 Constructor & Destructor Documentation

6.195.3.1 rget_futures_of()

```
template<typename R >
upcxx::detail::rget_futures_of< rget_byref, R, future_cx< 0 > >::rget_futures_of (
            rget_states< rget_byref, R, future_cx< 0 >> & st )  [inline]
```

Definition at line 140 of file rget.hpp.

6.195.4 Member Function Documentation

6.195.4.1 operator()()

```
template<typename R >
future upcxx::detail::rget_futures_of< rget_byref, R, future_cx< 0 > >::operator() ( )  [inline]
```

Definition at line 144 of file rget.hpp.

6.195.5 Member Data Documentation

6.195.5.1 fut_

```
template<typename R >
future upcxx::detail::rget_futures_of< rget_byref, R, future_cx< 0 > >::fut_
```

Definition at line 138 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.196 upcxx::detail::rget_futures_of< rget_byval< T >, R, future_cx< 0 > > Struct Template Reference

```
#include <rget.hpp>
```

Public Types

- using return_type = future< T >

Public Member Functions

- rget_futures_of (rget_states< rget_byval< T >, R, future_cx< 0 >> &st)
- future< T > operator() ()

Public Attributes

- future< T > fut_

6.196.1 Detailed Description

template<typename T, typename R>
struct upcxx::detail::rget_futures_of< rget_byval< T >, R, future_cx< 0 > >

Definition at line 148 of file rget.hpp.

6.196.2 Member Typedef Documentation

6.196.2.1 return_type

```
template<typename T , typename R >
using upcxx::detail::rget_futures_of< rget_byval< T >, R, future_cx< 0 > >::return_type =
future<T>
```

Definition at line 149 of file rget.hpp.

6.196.3 Constructor & Destructor Documentation

6.196.3.1 rget_futures_of()

```
template<typename T , typename R >
upcxx::detail::rget_futures_of< rget_byval< T >, R, future_cx< 0 > >::rget_futures_of (
            rget_states< rget_byval< T >, R, future_cx< 0 >> & st )  [inline]
```

Definition at line 153 of file rget.hpp.

6.196.4 Member Function Documentation

6.196.4.1 operator()()

```
template<typename T , typename R >
future<T> upcxx::detail::rget_futures_of< rget_byval< T >, R, future_cx< 0 > >::operator()
( )  [inline]
```

Definition at line 157 of file rget.hpp.

6.196.5 Member Data Documentation

6.196.5.1 fut_

```
template<typename T , typename R >
future<T> upcxx::detail::rget_futures_of< rget_byval< T >, R, future_cx< 0 > >::fut_
```

Definition at line 151 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.197 upcxx::detail::rget_state_operxn< Mode, Cx > Struct Template Reference

```
#include <rget.hpp>
```

6.197.1 Detailed Description

template<typename Mode, typename Cx>
struct upcxx::detail::rget_state_operxn< Mode, Cx >

Definition at line 14 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.198 upcxx::detail::rget_state_operxn< rget_byref, future_cx< ordinal > > Struct Template Reference

```
#include <rget.hpp>
```

Public Member Functions

- rget_state_operxn (future_cx< ordinal >)
- void completed ()

Public Attributes

- promise pro

6.198.1 Detailed Description

template<int ordinal>
struct upcxx::detail::rget_state_operxn< rget_byref, future_cx< ordinal > >

Definition at line 32 of file rget.hpp.

6.198.2 Constructor & Destructor Documentation

6.198.2.1 rget_state_operxn()

```
template<int ordinal>
upcxx::detail::rget_state_operxn< rget_byref, future_cx< ordinal > >::rget_state_operxn (
            future_cx< ordinal > ) [inline]
```

Definition at line 35 of file rget.hpp.

6.198.3 Member Function Documentation

6.198.3.1 completed()

```
template<int ordinal>
void upcxx::detail::rget_state_operxn< rget_byref, future_cx< ordinal > >::completed ( )
[inline]
```

Definition at line 37 of file rget.hpp.

6.198.4 Member Data Documentation

6.198.4.1 pro

```
template<int ordinal>
promise upcxx::detail::rget_state_operxn< rget_byref, future_cx< ordinal > >::pro
```

Definition at line 33 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.199 upcxx::detail::rget_state_operxn< rget_byref, nil_cx > Struct Template Reference

`#include <rget.hpp>`

Public Member Functions

- rget_state_operxn (nil_cx)
- void completed ()

6.199.1 Detailed Description

template<>
struct upcxx::detail::rget_state_operxn< rget_byref, nil_cx >

Definition at line 19 of file rget.hpp.

6.199.2 Constructor & Destructor Documentation

6.199.2.1 rget_state_operxn()

```
upcxx::detail::rget_state_operxn< rget_byref, nil_cx >::rget_state_operxn (
            nil_cx  )  [inline]
```

Definition at line 20 of file rget.hpp.

6.199.3 Member Function Documentation

6.199.3.1 completed()

```
void upcxx::detail::rget_state_operxn< rget_byref, nil_cx >::completed ( )  [inline]
```

Definition at line 22 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.200 upcxx::detail::rget_state_operxn< rget_byref, promise_cx<> > Struct Template Reference

`#include <rget.hpp>`

Public Member Functions

- rget_state_operxn (promise_cx<> &cx)
- void completed ()

Public Attributes

- promise * pro

6.200.1 Detailed Description

template<>
struct upcxx::detail::rget_state_operxn< rget_byref, promise_cx<> >

Definition at line 64 of file rget.hpp.

6.200.2 Constructor & Destructor Documentation

6.200.2.1 rget_state_operxn()

```
upcxx::detail::rget_state_operxn< rget_byref, promise_cx<> >::rget_state_operxn (
            promise_cx<> & cx )  [inline]
```

Definition at line 67 of file rget.hpp.

6.200.3 Member Function Documentation

6.200.3.1 completed()

```
void upcxx::detail::rget_state_operxn< rget_byref, promise_cx<> >::completed ( )  [inline]
```

Definition at line 71 of file rget.hpp.

6.200.4 Member Data Documentation

6.200.4.1 pro

```
promise* upcxx::detail::rget_state_operxn< rget_byref, promise_cx<> >::pro
```

Definition at line 65 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.201 upcxx::detail::rget_state_operxn< rget_byval< T >, future_cx< ordinal > > Struct Template Reference

```
#include <rget.hpp>
```

Public Member Functions

- rget_state_operxn (future_cx< ordinal >)
- void completed (T *buf_d)

Public Attributes

- promise< T > pro

6.201.1 Detailed Description

template<typename T, int ordinal>
struct upcxx::detail::rget_state_operxn< rget_byval< T >, future_cx< ordinal > >

Definition at line 43 of file rget.hpp.

6.201.2 Constructor & Destructor Documentation

6.201.2.1 rget_state_operxn()

```
template<typename T , int ordinal>
upcxx::detail::rget_state_operxn< rget_byval< T >, future_cx< ordinal > >::rget_state_operxn
(
            future_cx< ordinal >  )  [inline]
```

Definition at line 46 of file rget.hpp.

6.201.3 Member Function Documentation

6.201.3.1 completed()

```
template<typename T , int ordinal>
void upcxx::detail::rget_state_operxn< rget_byval< T >, future_cx< ordinal > >::completed (
            T * buf_d )  [inline]
```

Definition at line 48 of file rget.hpp.

6.201.4 Member Data Documentation

6.201.4.1 pro

```
template<typename T , int ordinal>
promise<T> upcxx::detail::rget_state_operxn< rget_byval< T >, future_cx< ordinal > >::pro
```

Definition at line 44 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.202 upcxx::detail::rget_state_operxn< rget_byval< T >, nil_cx > Struct Template Reference

```
#include <rget.hpp>
```

Public Member Functions

- rget_state_operxn (nil_cx)
- void completed (T *buffer)

6.202.1 Detailed Description

template<typename T>
struct upcxx::detail::rget_state_operxn< rget_byval< T >, nil_cx >

Definition at line 25 of file rget.hpp.

6.202.2 Constructor & Destructor Documentation

6.202.2.1 rget_state_operxn()

```
template<typename T >
upcxx::detail::rget_state_operxn< rget_byval< T >, nil_cx >::rget_state_operxn (
            nil_cx  )  [inline]
```

Definition at line 26 of file rget.hpp.

6.202.3 Member Function Documentation

6.202.3.1 completed()

```
template<typename T >
void upcxx::detail::rget_state_operxn< rget_byval< T >, nil_cx >::completed (
            T * buffer )  [inline]
```

Definition at line 28 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.203 upcxx::detail::rget_state_operxn< rget_byval< T >, promise_cx< T > > Struct Template Reference

```
#include <rget.hpp>
```

Public Member Functions

- rget_state_operxn (promise_cx<> &cx)
- void completed (T *buf_d)

Public Attributes

- promise< T > * pro

6.203.1 Detailed Description

template<typename T>
struct upcxx::detail::rget_state_operxn< rget_byval< T >, promise_cx< T > >

Definition at line 76 of file rget.hpp.

6.203.2 Constructor & Destructor Documentation

6.203.2.1 rget_state_operxn()

```
template<typename T >
upcxx::detail::rget_state_operxn< rget_byval< T >, promise_cx< T > >::rget_state_operxn (
            promise_cx<> & cx )  [inline]
```

Definition at line 79 of file rget.hpp.

6.203.3 Member Function Documentation

6.203.3.1 completed()

```
template<typename T >
void upcxx::detail::rget_state_operxn< rget_byval< T >, promise_cx< T > >::completed (
            T * buf_d )  [inline]
```

Definition at line 83 of file rget.hpp.

6.203.4 Member Data Documentation

6.203.4.1 pro

```
template<typename T >
promise<T>* upcxx::detail::rget_state_operxn< rget_byval< T >, promise_cx< T > >::pro
```

Definition at line 77 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.204 upcxx::detail::rget_state_remote< Cx > Struct Template Reference

`#include <rget.hpp>`

6.204.1 Detailed Description

template<typename Cx>
struct upcxx::detail::rget_state_remote< Cx >

Definition at line 16 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.205 upcxx::detail::rget_state_remote< nil_cx > Struct Template Reference

`#include <rget.hpp>`

Public Member Functions

- rget_state_remote (nil_cx)
- void completed (intrank_t owner)

6.205.1 Detailed Description

template<>
struct upcxx::detail::rget_state_remote< nil_cx >

Definition at line 93 of file rget.hpp.

6.205.2 Constructor & Destructor Documentation

6.205.2.1 rget_state_remote()

```
upcxx::detail::rget_state_remote< nil_cx >::rget_state_remote (
            nil_cx  ) [inline]
```

Definition at line 94 of file rget.hpp.

6.205.3 Member Function Documentation

6.205.3.1 completed()

```
void upcxx::detail::rget_state_remote< nil_cx >::completed (
            intrank_t owner )  [inline]
```

Definition at line 96 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.206 upcxx::detail::rget_state_remote< rpc_cx< Fn > > Struct Template Reference

```
#include <rget.hpp>
```

Public Member Functions

- rget_state_remote (rpc_cx< Fn > &cx)
- void completed (intrank_t owner)

Public Attributes

- Fn fn

6.206.1 Detailed Description

template<typename Fn>
struct upcxx::detail::rget_state_remote< rpc_cx< Fn > >

Definition at line 100 of file rget.hpp.

6.206.2 Constructor & Destructor Documentation

6.206.2.1 rget_state_remote()

```
template<typename Fn >
upcxx::detail::rget_state_remote< rpc_cx< Fn > >::rget_state_remote (
            rpc_cx< Fn > & cx )  [inline]
```

Definition at line 103 of file rget.hpp.

6.206.3 Member Function Documentation

6.206.3.1 completed()

```
template<typename Fn >
void upcxx::detail::rget_state_remote< rpc_cx< Fn > >::completed (
            intrank_t owner )  [inline]
```

Definition at line 107 of file rget.hpp.

6.206.4 Member Data Documentation

6.206.4.1 fn

```
template<typename Fn >
Fn upcxx::detail::rget_state_remote< rpc_cx< Fn > >::fn
```

Definition at line 101 of file rget.hpp.

The documentation for this struct was generated from the following file:

- rget.hpp

6.207 upcxx::detail::rget_states< Mode, R, O > Struct Template Reference

```
#include <rget.hpp>
```

Public Member Functions

- rget_states (intrank_t owner, completions< nil_cx, R, O > &&cxs)

Public Attributes

- intrank_t owner
- rget_state_remote< R > r
- rget_state_operxn< Mode, O > o

6.207.1 Detailed Description

template<typename Mode, typename R, typename O>
struct upcxx::detail::rget_states< Mode, R, O >

Definition at line 113 of file rget.hpp.

6.207.2 Constructor & Destructor Documentation

6.207.2.1 rget_states()

```
template<typename Mode, typename R, typename O>
upcxx::detail::rget_states< Mode, R, O >::rget_states (
            intrank_t owner,
            completions< nil_cx, R, O > && cxs )  [inline]
```

Definition at line 118 of file rget.hpp.

6.207.3 Member Data Documentation

6.207.3.1 o

```
template<typename Mode, typename R, typename O>
rget_state_operxn<Mode,O> upcxx::detail::rget_states< Mode, R, O >::o
```

Definition at line 116 of file rget.hpp.

6.207.3.2 owner

```
template<typename Mode, typename R, typename O>
intrank_t upcxx::detail::rget_states< Mode, R, O >::owner
```

Definition at line 114 of file rget.hpp.

6.207.3.3 r

```
template<typename Mode, typename R, typename O>
rget_state_remote<R> upcxx::detail::rget_states< Mode, R, O >::r
```

Definition at line 115 of file rget.hpp.

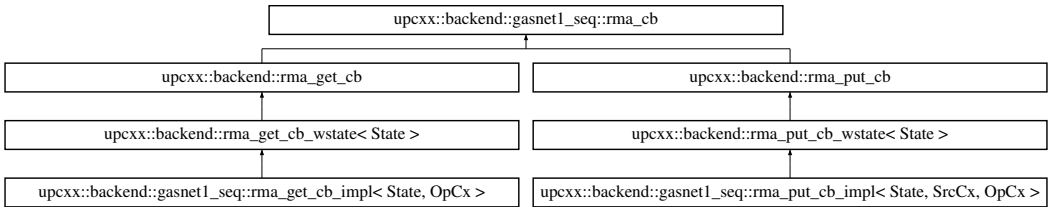
The documentation for this struct was generated from the following file:

- rget.hpp

6.208 upcxx::backend::gasnet1_seq::rma_cb Struct Reference

```
#include <backend.hpp>
```

Inheritance diagram for upcxx::backend::gasnet1_seq::rma_cb:



Public Member Functions

- virtual void fire_and_delete ()=0

Public Attributes

- rma_cb * next
- std::uintptr_t handle

6.208.1 Detailed Description

Definition at line 56 of file backend.hpp.

6.208.2 Member Function Documentation

6.208.2.1 fire_and_delete()

```
virtual void upcxx::backend::gasnet1_seq::rma_cb::fire_and_delete ( )  [pure virtual]
```

6.208.3 Member Data Documentation

6.208.3.1 handle

```
std::uintptr_t upcxx::backend::gasnet1_seq::rma_cb::handle
```

Definition at line 58 of file backend.hpp.

6.208.3.2 next

```
rma_cb* upcxx::backend::gasnet1_seq::rma_cb::next
```

Definition at line 57 of file backend.hpp.

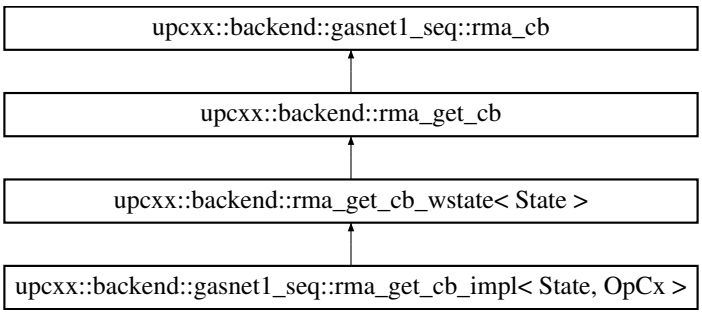
The documentation for this struct was generated from the following file:

- backend/gasnet1_seq/backend.hpp

6.209 upcxx::backend::rma_get_cb Struct Reference

```
#include <backend.hpp>
```

Inheritance diagram for upcxx::backend::rma_get_cb:



Additional Inherited Members

6.209.1 Detailed Description

Definition at line 161 of file backend.hpp.

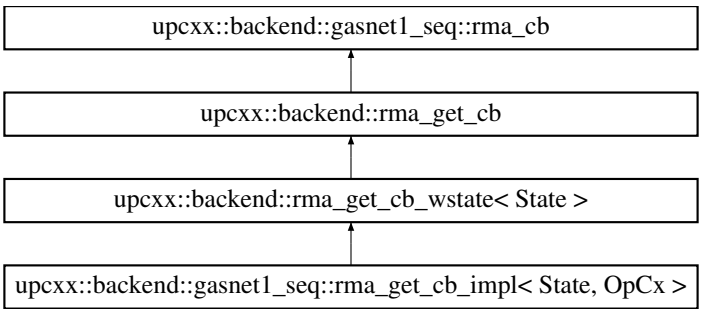
The documentation for this struct was generated from the following file:

- backend/gasnet1_seq/backend.hpp

6.210 upcxx::backend::gasnet1_seq::rma_get_cb_impl< State, OpCx > Struct Template Reference

`#include <backend.hpp>`

Inheritance diagram for upcxx::backend::gasnet1_seq::rma_get_cb_impl< State, OpCx >:



Public Member Functions

- rma_get_cb_impl (State &&state, OpCx &&op_cx)

Public Attributes

- OpCx op_cx

6.210.1 Detailed Description

template<typename State, typename OpCx>
struct upcxx::backend::gasnet1_seq::rma_get_cb_impl< State, OpCx >

Definition at line 197 of file backend.hpp.

6.210.2 Constructor & Destructor Documentation

6.210.2.1 rma_get_cb_impl()

```
template<typename State , typename OpCx >
upcxx::backend::gasnet1_seq::rma_get_cb_impl< State, OpCx >::rma_get_cb_impl (
            State && state,
            OpCx && op_cx ) [inline]
```

Definition at line 200 of file backend.hpp.

6.210.3 Member Data Documentation

6.210.3.1 op_cx

```
template<typename State , typename OpCx >
OpCx upcxx::backend::gasnet1_seq::rma_get_cb_impl< State, OpCx >::op_cx
```

Definition at line 198 of file backend.hpp.

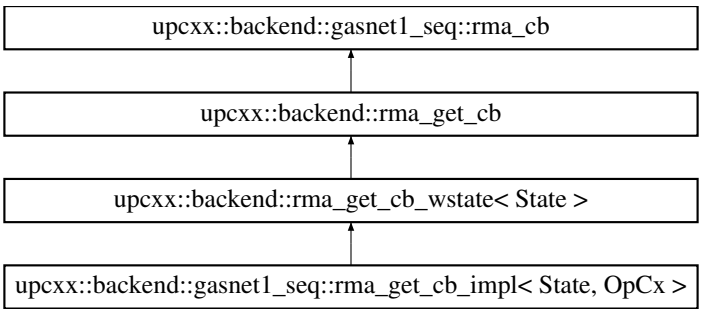
The documentation for this struct was generated from the following file:

- backend/gasnet1_seq/backend.hpp

6.211 upcxx::backend::rma_get_cb_wstate< State > Struct Template Reference

```
#include <backend.hpp>
```

Inheritance diagram for upcxx::backend::rma_get_cb_wstate< State >:



Public Member Functions

- rma_get_cb_wstate (State &&st)

Public Attributes

- State state

6.211.1 Detailed Description

template<typename State>
struct upcxx::backend::rma_get_cb_wstate< State >

Definition at line 169 of file backend.hpp.

6.211.2 Constructor & Destructor Documentation

6.211.2.1 rma_get_cb_wstate()

```
template<typename State >
upcxx::backend::rma_get_cb_wstate< State >::rma_get_cb_wstate (
            State && st )  [inline]
```

Definition at line 171 of file backend.hpp.

6.211.3 Member Data Documentation

6.211.3.1 state

```
template<typename State >
State upcxx::backend::rma_get_cb_wstate< State >::state
```

Definition at line 170 of file backend.hpp.

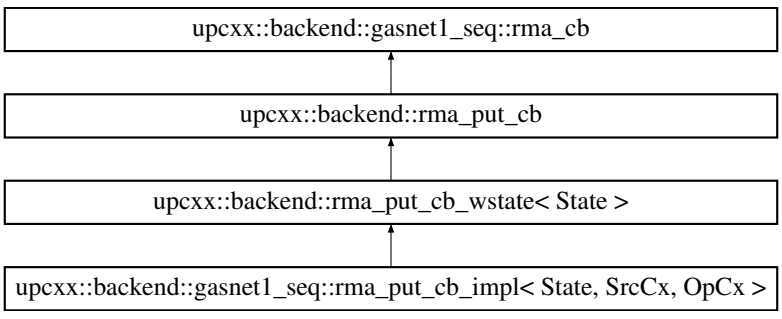
The documentation for this struct was generated from the following file:

- backend/gasnet1_seq/backend.hpp

6.212 upcxx::backend::rma_put_cb Struct Reference

```
#include <backend.hpp>
```

Inheritance diagram for upcxx::backend::rma_put_cb:



Additional Inherited Members

6.212.1 Detailed Description

Definition at line 160 of file backend.hpp.

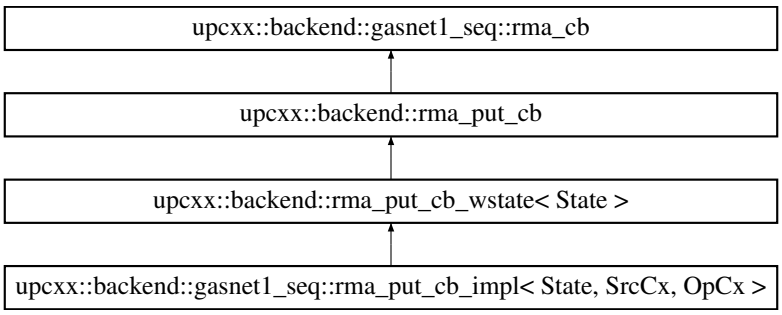
The documentation for this struct was generated from the following file:

- backend/gasnet1_seq/backend.hpp

6.213 upcxx::backend::gasnet1_seq::rma_put_cb_impl< State, SrcCx, OpCx > Struct Template Reference

`#include <backend.hpp>`

Inheritance diagram for upcxx::backend::gasnet1_seq::rma_put_cb_impl< State, SrcCx, OpCx >:



Public Member Functions

- rma_put_cb_impl (State &&state, SrcCx &&src_cx, OpCx &&op_cx)

Public Attributes

- SrcCx src_cx
- OpCx op_cx
- src_cx {std::move(src_cx)}

6.213.1 Detailed Description

template<typename State, typename SrcCx, typename OpCx>
struct upcxx::backend::gasnet1_seq::rma_put_cb_impl< State, SrcCx, OpCx >

Definition at line 179 of file backend.hpp.

6.213.2 Constructor & Destructor Documentation

6.213.2.1 rma_put_cb_impl()

```
template<typename State , typename SrcCx , typename OpCx >
upcxx::backend::gasnet1_seq::rma_put_cb_impl< State, SrcCx, OpCx >::rma_put_cb_impl (
            State && state,
            SrcCx && src_cx,
            OpCx && op_cx )  [inline]
```

Definition at line 183 of file backend.hpp.

6.213.3 Member Data Documentation

6.213.3.1 op_cx

```
template<typename State , typename SrcCx , typename OpCx >
OpCx upcxx::backend::gasnet1_seq::rma_put_cb_impl< State, SrcCx, OpCx >::op_cx
```

Definition at line 181 of file backend.hpp.

6.213.3.2 src_cx [1/2]

```
template<typename State , typename SrcCx , typename OpCx >
SrcCx upcxx::backend::gasnet1_seq::rma_put_cb_impl< State, SrcCx, OpCx >::src_cx
```

Definition at line 180 of file backend.hpp.

6.213.3.3 src_cx [2/2]

```
template<typename State , typename SrcCx , typename OpCx >
upcxx::backend::gasnet1_seq::rma_put_cb_impl< State, SrcCx, OpCx >::src_cx {std::move(src_cx)}
```

Definition at line 185 of file backend.hpp.

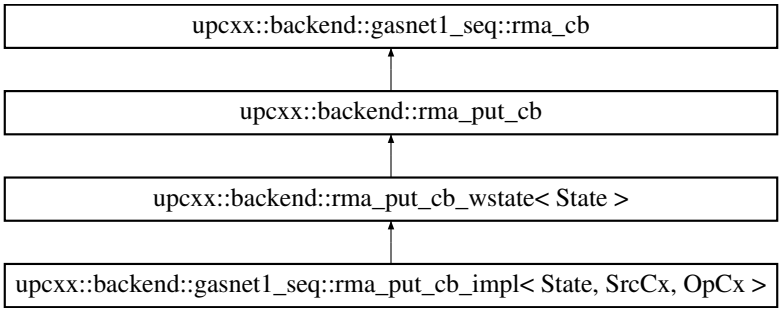
The documentation for this struct was generated from the following file:

- backend/gasnet1_seq/backend.hpp

6.214 upcxx::backend::rma_put_cb_wstate< State > Struct Template Reference

`#include <backend.hpp>`

Inheritance diagram for upcxx::backend::rma_put_cb_wstate< State >:



Public Member Functions

- rma_put_cb_wstate (State &&st)

Public Attributes

- State state

6.214.1 Detailed Description

template<typename State>
struct upcxx::backend::rma_put_cb_wstate< State >

Definition at line 164 of file backend.hpp.

6.214.2 Constructor & Destructor Documentation

6.214.2.1 rma_put_cb_wstate()

```
template<typename State >
upcxx::backend::rma_put_cb_wstate< State >::rma_put_cb_wstate (
            State && st )  [inline]
```

Definition at line 166 of file backend.hpp.

6.214.3 Member Data Documentation

6.214.3.1 state

```
template<typename State >
State upcxx::backend::rma_put_cb_wstate< State >::state
```

Definition at line 165 of file backend.hpp.

The documentation for this struct was generated from the following file:

- backend/gasnet1_seq/backend.hpp

6.215 upcxx::rpc_cx< Fn > Struct Template Reference

```
#include <completion.hpp>
```

Public Member Functions

- rpc_cx (Fn fn)

Public Attributes

- Fn fn_

6.215.1 Detailed Description

template<typename Fn>
struct upcxx::rpc_cx< Fn >

Definition at line 11 of file completion.hpp.

6.215.2 Constructor & Destructor Documentation

6.215.2.1 rpc_cx()

```
template<typename Fn>
upcxx::rpc_cx< Fn >::rpc_cx (
            Fn fn )  [inline]
```

Definition at line 13 of file completion.hpp.

6.215.3 Member Data Documentation

6.215.3.1 fn_

```
template<typename Fn>
Fn upcxx::rpc_cx< Fn >::fn_
```

Definition at line 12 of file completion.hpp.

The documentation for this struct was generated from the following file:

- completion.hpp

6.216 upcxx::detail::rpc_recipient_after< Pro > Struct Template Reference

```
#include <rpc.hpp>
```

Public Member Functions

- template<typename ... Args>
  void operator() (Args &&...args)

Public Attributes

- intrank_t initiator_
- Pro * pro_

6.216.1 Detailed Description

template<typename Pro>
struct upcxx::detail::rpc_recipient_after< Pro >

Definition at line 25 of file rpc.hpp.

6.216.2 Member Function Documentation

6.216.2.1 operator()()

```
template<typename Pro >
template<typename ...  Args>
void upcxx::detail::rpc_recipient_after< Pro >::operator() (
             Args &&...  args )  [inline]
```

Definition at line 30 of file rpc.hpp.

6.216.3 Member Data Documentation

6.216.3.1 initiator_

```
template<typename Pro >
intrank_t upcxx::detail::rpc_recipient_after< Pro >::initiator_
```

Definition at line 26 of file rpc.hpp.

6.216.3.2 pro_

```
template<typename Pro >
Pro* upcxx::detail::rpc_recipient_after< Pro >::pro_
```

Definition at line 27 of file rpc.hpp.

The documentation for this struct was generated from the following file:

- rpc.hpp

6.217 upcxx::detail::rpc_return< ValidType, Fn, Args > Struct Template Reference

```
#include <rpc.hpp>
```

Public Types

- using type = typename detail::future_from_tuple_t< detail::future_kind_shref< detail::future_header_ops_result >, typename decltype(upcxx::apply_tupled_as_future(upcxx::bind(std::declval< Fn && >(), std::declval< Args && >()...), std::tuple<>{}))::results_type >

6.217.1 Detailed Description

template<typename ValidType, typename Fn, typename ... Args>
struct upcxx::detail::rpc_return< ValidType, Fn, Args >

Definition at line 53 of file rpc.hpp.

6.217.2 Member Typedef Documentation

6.217.2.1 type

```
template<typename ValidType , typename Fn , typename ...  Args>
using upcxx::detail::rpc_return< ValidType, Fn, Args >::type = typename detail::future_from↩
_tuple_t< detail::future_kind_shref<detail::future_header_ops_result>, typename decltype(
upcxx::apply_tupled_as_future( upcxx::bind(std::declval<Fn&&>(), std::declval<Args&&>()...),
std::tuple<>{} ) )::results_type >
```

Definition at line 62 of file rpc.hpp.

The documentation for this struct was generated from the following file:

- rpc.hpp

6.218 upcxx::detail::rput_byval< T > Struct Template Reference

```
#include <rput.hpp>
```

6.218.1 Detailed Description

template<typename T>
struct upcxx::detail::rput_byval< T >

Definition at line 11 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.219 upcxx::detail::rput_futures_of< S, R, O > Struct Template Reference

```
#include <rput.hpp>
```

Public Types

- using return_type = void

Public Member Functions

- template<typename Mode >
  rput_futures_of (rput_states< Mode, S, R, O > &st)
- void operator() ()

6.219.1 Detailed Description

template<typename S, typename R, typename O>
struct upcxx::detail::rput_futures_of< S, R, O >

Definition at line 98 of file rput.hpp.

6.219.2 Member Typedef Documentation

6.219.2.1 return_type

```
template<typename S, typename R, typename O>
using upcxx::detail::rput_futures_of< S, R, O >::return_type = void
```

Definition at line 99 of file rput.hpp.

6.219.3 Constructor & Destructor Documentation

6.219.3.1 rput_futures_of()

```
template<typename S, typename R, typename O>
template<typename Mode >
upcxx::detail::rput_futures_of< S, R, O >::rput_futures_of (
            rput_states< Mode, S, R, O > & st )  [inline]
```

Definition at line 102 of file rput.hpp.

6.219.4 Member Function Documentation

6.219.4.1 operator()()

```
template<typename S, typename R, typename O>
void upcxx::detail::rput_futures_of< S, R, O >::operator() ( )  [inline]
```

Definition at line 104 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.220 upcxx::detail::rput_futures_of< future_cx< S_ord >, R, future_cx< O_ord > > Struct Template Reference

`#include <rput.hpp>`

Public Types

- using return_type = std::tuple< future<>, future<> >

Public Member Functions

- template<typename Mode >
  rput_futures_of (rput_states< Mode, future_cx< S_ord >, R, future_cx< O_ord >> &st)
- std::tuple< future<>, future<> > operator() ()

Public Attributes

- future s_
- future o_

6.220.1 Detailed Description

template<int S_ord, typename R, int O_ord>
struct upcxx::detail::rput_futures_of< future_cx< S_ord >, R, future_cx< O_ord > >

Definition at line 136 of file rput.hpp.

6.220.2 Member Typedef Documentation

6.220.2.1 return_type

```
template<int S_ord, typename R , int O_ord>
using upcxx::detail::rput_futures_of< future_cx< S_ord >, R, future_cx< O_ord > >::return_↩
type = std::tuple<future<>,future<> >
```

Definition at line 137 of file rput.hpp.

6.220.3 Constructor & Destructor Documentation

6.220.3.1 rput_futures_of()

```
template<int S_ord, typename R , int O_ord>
template<typename Mode >
upcxx::detail::rput_futures_of< future_cx< S_ord >, R, future_cx< O_ord > >::rput_futures_of
(
            rput_states< Mode, future_cx< S_ord >, R, future_cx< O_ord >> & st )  [inline]
```

Definition at line 142 of file rput.hpp.

6.220.4 Member Function Documentation

6.220.4.1 operator()()

```
template<int S_ord, typename R , int O_ord>
std::tuple<future<>, future<> > upcxx::detail::rput_futures_of< future_cx< S_ord >, R,
future_cx< O_ord > >::operator() ( )  [inline]
```

Definition at line 147 of file rput.hpp.

6.220.5 Member Data Documentation

6.220.5.1 o_

```
template<int S_ord, typename R , int O_ord>
future upcxx::detail::rput_futures_of< future_cx< S_ord >, R, future_cx< O_ord > >::o_
```

Definition at line 139 of file rput.hpp.

6.220.5.2 s_

```
template<int S_ord, typename R , int O_ord>
future upcxx::detail::rput_futures_of< future_cx< S_ord >, R, future_cx< O_ord > >::s_
```

Definition at line 139 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.221 upcxx::detail::rput_futures_of< future_cx< S_ord >, R, O > Struct Template Reference

`#include <rput.hpp>`

Public Types

- using return_type = future<>

Public Member Functions

- template<typename Mode >
  rput_futures_of (rput_states< Mode, future_cx< S_ord >, R, O > &st)
- future operator() ()

Public Attributes

- future fut_

6.221.1 Detailed Description

template<typename R, typename O, int S_ord>
struct upcxx::detail::rput_futures_of< future_cx< S_ord >, R, O >

Definition at line 108 of file rput.hpp.

6.221.2 Member Typedef Documentation

6.221.2.1 return_type

```
template<typename R , typename O , int S_ord>
using upcxx::detail::rput_futures_of< future_cx< S_ord >, R, O >::return_type = future<>
```

Definition at line 109 of file rput.hpp.

6.221.3 Constructor & Destructor Documentation

6.221.3.1 rput_futures_of()

```
template<typename R , typename O , int S_ord>
template<typename Mode >
upcxx::detail::rput_futures_of< future_cx< S_ord >, R, O >::rput_futures_of (
            rput_states< Mode, future_cx< S_ord >, R, O > & st )  [inline]
```

Definition at line 114 of file rput.hpp.

6.221.4 Member Function Documentation

6.221.4.1 operator()()

```
template<typename R , typename O , int S_ord>
future upcxx::detail::rput_futures_of< future_cx< S_ord >, R, O >::operator() ( )  [inline]
```

Definition at line 118 of file rput.hpp.

6.221.5 Member Data Documentation

6.221.5.1 fut_

```
template<typename R , typename O , int S_ord>
future upcxx::detail::rput_futures_of< future_cx< S_ord >, R, O >::fut_
```

Definition at line 111 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.222 upcxx::detail::rput_futures_of< S, R, future_cx< O_ord > > Struct Template Reference

```
#include <rput.hpp>
```

Public Types

- using return_type = future<>

Public Member Functions

- template<typename Mode >
  rput_futures_of (rput_states< Mode, S, R, future_cx< O_ord >> &st)
- future operator() ()

Public Attributes

- future fut_

6.222.1 Detailed Description

template<typename S, typename R, int O_ord>
struct upcxx::detail::rput_futures_of< S, R, future_cx< O_ord > >

Definition at line 122 of file rput.hpp.

6.222.2 Member Typedef Documentation

6.222.2.1 return_type

```
template<typename S , typename R , int O_ord>
using upcxx::detail::rput_futures_of< S, R, future_cx< O_ord > >::return_type = future<>
```

Definition at line 123 of file rput.hpp.

6.222.3 Constructor & Destructor Documentation

6.222.3.1 rput_futures_of()

```
template<typename S , typename R , int O_ord>
template<typename Mode >
upcxx::detail::rput_futures_of< S, R, future_cx< O_ord > >::rput_futures_of (
            rput_states< Mode, S, R, future_cx< O_ord >> & st )  [inline]
```

Definition at line 128 of file rput.hpp.

6.222.4 Member Function Documentation

6.222.4.1 operator()()

```
template<typename S , typename R , int O_ord>
future upcxx::detail::rput_futures_of< S, R, future_cx< O_ord > >::operator() ( )  [inline]
```

Definition at line 132 of file rput.hpp.

6.222.5 Member Data Documentation

6.222.5.1 fut_

```
template<typename S , typename R , int O_ord>
future upcxx::detail::rput_futures_of< S, R, future_cx< O_ord > >::fut_
```

Definition at line 125 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.223 upcxx::detail::rput_state_here< Cx > Struct Template Reference

```
#include <rput.hpp>
```

6.223.1 Detailed Description

template<typename Cx>
struct upcxx::detail::rput_state_here< Cx >

Definition at line 14 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.224 upcxx::detail::rput_state_here< future_cx< ordinal > > Struct Template Reference

```
#include <rput.hpp>
```

Public Member Functions

- rput_state_here (future_cx< ordinal >)
- void completed ()

Public Attributes

- promise pro

6.224.1 Detailed Description

template<int ordinal>
struct upcxx::detail::rput_state_here< future_cx< ordinal > >

Definition at line 26 of file rput.hpp.

6.224.2 Constructor & Destructor Documentation

6.224.2.1 rput_state_here()

```
template<int ordinal>
upcxx::detail::rput_state_here< future_cx< ordinal > >::rput_state_here (
            future_cx< ordinal > ) [inline]
```

Definition at line 29 of file rput.hpp.

6.224.3 Member Function Documentation

6.224.3.1 completed()

```
template<int ordinal>
void upcxx::detail::rput_state_here< future_cx< ordinal > >::completed ( ) [inline]
```

Definition at line 31 of file rput.hpp.

6.224.4 Member Data Documentation

6.224.4.1 pro

```
template<int ordinal>
promise upcxx::detail::rput_state_here< future_cx< ordinal > >::pro
```

Definition at line 27 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.225 upcxx::detail::rput_state_here< nil_cx > Struct Template Reference

```
#include <rput.hpp>
```

Public Member Functions

- rput_state_here (nil_cx)
- void completed ()

6.225.1 Detailed Description

template<>
struct upcxx::detail::rput_state_here< nil_cx >

Definition at line 19 of file rput.hpp.

6.225.2 Constructor & Destructor Documentation

6.225.2.1 rput_state_here()

```
upcxx::detail::rput_state_here< nil_cx >::rput_state_here (
            nil_cx  )  [inline]
```

Definition at line 20 of file rput.hpp.

6.225.3 Member Function Documentation

6.225.3.1 completed()

```
void upcxx::detail::rput_state_here< nil_cx >::completed ( )  [inline]
```

Definition at line 22 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.226 upcxx::detail::rput_state_here< promise_cx<> > Struct Template Reference

```
#include <rput.hpp>
```

Public Member Functions

- rput_state_here (promise_cx<> &cx)
- void completed ()

Public Attributes

- promise * pro

6.226.1 Detailed Description

template<>
struct upcxx::detail::rput_state_here< promise_cx<> >

Definition at line 37 of file rput.hpp.

6.226.2 Constructor & Destructor Documentation

6.226.2.1 rput_state_here()

```
upcxx::detail::rput_state_here< promise_cx<> >::rput_state_here (
            promise_cx<> & cx )  [inline]
```

Definition at line 40 of file rput.hpp.

6.226.3 Member Function Documentation

6.226.3.1 completed()

```
void upcxx::detail::rput_state_here< promise_cx<> >::completed ( )  [inline]
```

Definition at line 44 of file rput.hpp.

6.226.4 Member Data Documentation

6.226.4.1 pro

```
promise* upcxx::detail::rput_state_here< promise_cx<> >::pro
```

Definition at line 38 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.227 upcxx::detail::rput_state_remote< Cx > Struct Template Reference

```
#include <rput.hpp>
```

6.227.1 Detailed Description

template<typename Cx>
struct upcxx::detail::rput_state_remote< Cx >

Definition at line 16 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.228 upcxx::detail::rput_state_remote< nil_cx > Struct Template Reference

```
#include <rput.hpp>
```

Public Member Functions

- rput_state_remote (nil_cx)
- void completed (intrank_t target)

6.228.1 Detailed Description

template<>
struct upcxx::detail::rput_state_remote< nil_cx >

Definition at line 50 of file rput.hpp.

6.228.2 Constructor & Destructor Documentation

6.228.2.1 rput_state_remote()

```
upcxx::detail::rput_state_remote< nil_cx >::rput_state_remote (
            nil_cx  )  [inline]
```

Definition at line 51 of file rput.hpp.

6.228.3 Member Function Documentation

6.228.3.1 completed()

```
void upcxx::detail::rput_state_remote< nil_cx >::completed (
            intrank_t target )  [inline]
```

Definition at line 53 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.229 upcxx::detail::rput_state_remote< rpc_cx< Fn > > Struct Template Reference

```
#include <rput.hpp>
```

Public Member Functions

- rput_state_remote (rpc_cx< Fn > &&cx)
- void completed (intrank_t target)

Public Attributes

- Fn fn

6.229.1 Detailed Description

template<typename Fn>
struct upcxx::detail::rput_state_remote< rpc_cx< Fn > >

Definition at line 57 of file rput.hpp.

6.229.2 Constructor & Destructor Documentation

6.229.2.1 rput_state_remote()

```
template<typename Fn >
upcxx::detail::rput_state_remote< rpc_cx< Fn > >::rput_state_remote (
            rpc_cx< Fn > && cx )  [inline]
```

Definition at line 60 of file rput.hpp.

6.229.3 Member Function Documentation

6.229.3.1 completed()

```
template<typename Fn >
void upcxx::detail::rput_state_remote< rpc_cx< Fn > >::completed (
            intrank_t target )  [inline]
```

Definition at line 64 of file rput.hpp.

6.229.4 Member Data Documentation

6.229.4.1 fn

```
template<typename Fn >
Fn upcxx::detail::rput_state_remote< rpc_cx< Fn > >::fn
```

Definition at line 58 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.230 upcxx::detail::rput_states< Mode, S, R, O > Struct Template Reference

`#include <rput.hpp>`

6.230.1 Detailed Description

template<typename Mode, typename S, typename R, typename O>
struct upcxx::detail::rput_states< Mode, S, R, O >

Definition at line 70 of file rput.hpp.

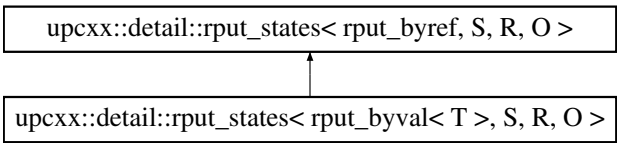
The documentation for this struct was generated from the following file:

- rput.hpp

6.231 upcxx::detail::rput_states< rput_byref, S, R, O > Struct Template Reference

`#include <rput.hpp>`

Inheritance diagram for upcxx::detail::rput_states< rput_byref, S, R, O >:



Public Member Functions

- rput_states (intrank_t target, completions< S, R, O > &&cxs)

Public Attributes

- intrank_t target
- rput_state_here< S > s
- rput_state_remote< R > r
- rput_state_here< O > o

6.231.1 Detailed Description

template<typename S, typename R, typename O>
struct upcxx::detail::rput_states< rput_byref, S, R, O >

Definition at line 73 of file rput.hpp.

6.231.2 Constructor & Destructor Documentation

6.231.2.1 rput_states()

```
template<typename S , typename R , typename O >
upcxx::detail::rput_states< rput_byref, S, R, O >::rput_states (
            intrank_t target,
            completions< S, R, O > && cxs )  [inline]
```

Definition at line 79 of file rput.hpp.

6.231.3 Member Data Documentation

6.231.3.1 o

```
template<typename S , typename R , typename O >
rput_state_here<O> upcxx::detail::rput_states< rput_byref, S, R, O >::o
```

Definition at line 77 of file rput.hpp.

6.231.3.2 r

```
template<typename S , typename R , typename O >
rput_state_remote<R> upcxx::detail::rput_states< rput_byref, S, R, O >::r
```

Definition at line 76 of file rput.hpp.

6.231.3.3 s

```
template<typename S , typename R , typename O >
rput_state_here<S> upcxx::detail::rput_states< rput_byref, S, R, O >::s
```

Definition at line 75 of file rput.hpp.

6.231.3.4 target

```
template<typename S , typename R , typename O >
intrank_t upcxx::detail::rput_states< rput_byref, S, R, O >::target
```

Definition at line 74 of file rput.hpp.

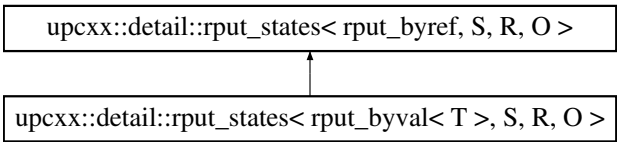
The documentation for this struct was generated from the following file:

- rput.hpp

6.232 upcxx::detail::rput_states< rput_byval< T >, S, R, O > Struct Template Reference

```
#include <rput.hpp>
```

Inheritance diagram for upcxx::detail::rput_states< rput_byval< T >, S, R, O >:



Public Member Functions

- rput_states (T &&value, intrank_t target, completions< S, R, O > &&cxs)

Public Attributes

- T buffer

6.232.1 Detailed Description

template<typename T, typename S, typename R, typename O>
struct upcxx::detail::rput_states< rput_byval< T >, S, R, O >

Definition at line 88 of file rput.hpp.

6.232.2 Constructor & Destructor Documentation

6.232.2.1 rput_states()

```
template<typename T , typename S , typename R , typename O >
upcxx::detail::rput_states< rput_byval< T >, S, R, O >::rput_states (
            T && value,
            intrank_t target,
            completions< S, R, O > && cxs )  [inline]
```

Definition at line 91 of file rput.hpp.

6.232.3 Member Data Documentation

6.232.3.1 buffer

```
template<typename T , typename S , typename R , typename O >
T upcxx::detail::rput_states< rput_byval< T >, S, R, O >::buffer
```

Definition at line 89 of file rput.hpp.

The documentation for this struct was generated from the following file:

- rput.hpp

6.233 upcxx::trait_all< Tr > Struct Template Reference

```
#include <utility.hpp>
```

6.233.1 Detailed Description

template<template< typename... > class ... Tr>
struct upcxx::trait_all< Tr >

Definition at line 157 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.234 upcxx::trait_all< Tr0, Trs... > Struct Template Reference

```
#include <utility.hpp>
```

Classes

- struct type

6.234.1 Detailed Description

template<template< typename... > class Tr0, template< typename... > class ... Trs>
struct upcxx::trait_all< Tr0, Trs... >

Definition at line 167 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.235 upcxx::trait_all<> Struct Template Reference

`#include <utility.hpp>`

Public Types

- template<typename T >
  using type = std::true_type

6.235.1 Detailed Description

template<>
struct upcxx::trait_all<>

Definition at line 160 of file utility.hpp.

6.235.2 Member Typedef Documentation

6.235.2.1 type

```
template<typename T >
using upcxx::trait_all<>::type = std::true_type
```

Definition at line 162 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.236 upcxx::trait_any< Tr > Struct Template Reference

`#include <utility.hpp>`

6.236.1 Detailed Description

template<template< typename... > class ... Tr>
struct upcxx::trait_any< Tr >

Definition at line 136 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.237 upcxx::trait_any< Tr0, Trs... > Struct Template Reference

`#include <utility.hpp>`

Classes

- struct type

6.237.1 Detailed Description

template<template< typename... > class Tr0, template< typename... > class ... Trs>
struct upcxx::trait_any< Tr0, Trs... >

Definition at line 146 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.238 upcxx::trait_any<> Struct Template Reference

`#include <utility.hpp>`

Public Types

- template<typename T >
  using type = std::false_type

6.238.1 Detailed Description

template<>
struct upcxx::trait_any<>

Definition at line 139 of file utility.hpp.

6.238.2 Member Typedef Documentation

6.238.2.1 type

```
template<typename T >
using upcxx::trait_any<>::type = std::false_type
```

Definition at line 141 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.239 upcxx::trait_forall< Test, T > Struct Template Reference

```
#include <utility.hpp>
```

6.239.1 Detailed Description

template<template< typename... > class Test, typename ... T>
struct upcxx::trait_forall< Test, T >

Definition at line 115 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.240 upcxx::trait_forall< Test > Struct Template Reference

```
#include <utility.hpp>
```

Static Public Attributes

- static constexpr bool value = true

6.240.1 Detailed Description

template<template< typename... > class Test>
struct upcxx::trait_forall< Test >

Definition at line 117 of file utility.hpp.

6.240.2 Member Data Documentation

6.240.2.1 value

```
template<template< typename...  > class Test>
constexpr bool upcxx::trait_forall< Test >::value = true  [static]
```

Definition at line 118 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.241 upcxx::trait_forall< Test, T, Ts... > Struct Template Reference

```
#include <utility.hpp>
```

Static Public Attributes

- static constexpr bool value = Test<T>::value && trait_forall<Test,Ts...>::value

6.241.1 Detailed Description

template<template< typename... > class Test, typename T, typename ... Ts>
struct upcxx::trait_forall< Test, T, Ts... >

Definition at line 121 of file utility.hpp.

6.241.2 Member Data Documentation

6.241.2.1 value

```
template<template< typename... > class Test, typename T , typename ... Ts>
constexpr bool upcxx::trait_forall< Test, T, Ts... >::value = Test<T>::value && trait_↩
forall<Test,Ts...>::value [static]
```

Definition at line 122 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.242 upcxx::trait_forall_tupled< Test, Tuple > Struct Template Reference

```
#include <utility.hpp>
```

6.242.1 Detailed Description

template<template< typename... > class Test, typename Tuple>
struct upcxx::trait_forall_tupled< Test, Tuple >

Definition at line 126 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.243 upcxx::trait_forall_tupled< Test, std::tuple< T... > > Struct Template Reference

```
#include <utility.hpp>
```

Static Public Attributes

- static constexpr bool value = trait_forall<Test, T...>::value

6.243.1 Detailed Description

template<template< typename... > class Test, typename ... T>
struct upcxx::trait_forall_tupled< Test, std::tuple< T... > >

Definition at line 128 of file utility.hpp.

6.243.2 Member Data Documentation

6.243.2.1 value

```
template<template< typename...  > class Test, typename ...  T>
constexpr bool upcxx::trait_forall_tupled< Test, std::tuple< T...  > >::value = trait_↩
forall<Test, T...>::value  [static]
```

Definition at line 129 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.244 upcxx::detail::tuple_get_or_void< i, TupRef, in_range > Struct Template Reference

```
#include <utility.hpp>
```

Public Member Functions

- auto operator() (TupRef t) -> decltype(std::get< i >(t))

6.244.1 Detailed Description

template<int i, typename TupRef, bool in_range = (0 <= i && i < std::tuple_size<typename std::decay<TupRef>::type>::value)>
struct upcxx::detail::tuple_get_or_void< i, TupRef, in_range >

Definition at line 237 of file utility.hpp.

6.244.2 Member Function Documentation

6.244.2.1 operator()()

```
template<int i, typename TupRef , bool in_range = ( 0 <= i && i < std::tuple_size<typename
std::decay<TupRef>::type>::value )>
auto upcxx::detail::tuple_get_or_void< i, TupRef, in_range >::operator() (
             TupRef t ) -> decltype(std::get<i>(t))   [inline]
```

Definition at line 238 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.245 upcxx::detail::tuple_get_or_void< i, TupRef, false > Struct Template Reference

`#include <utility.hpp>`

Public Member Functions

- void operator() (TupRef t)

6.245.1 Detailed Description

template<int i, typename TupRef>
struct upcxx::detail::tuple_get_or_void< i, TupRef, false >

Definition at line 245 of file utility.hpp.

6.245.2 Member Function Documentation

6.245.2.1 operator()()

```
template<int i, typename TupRef >
void upcxx::detail::tuple_get_or_void< i, TupRef, false >::operator() (
             TupRef t )  [inline]
```

Definition at line 246 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.246 upcxx::detail::tuple_rvals_get< i, Tup > Struct Template Reference

`#include <utility.hpp>`

6.246.1 Detailed Description

template<int i, typename Tup>
struct upcxx::detail::tuple_rvals_get< i, Tup >

Definition at line 336 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.247 upcxx::detail::tuple_rvals_get< Tup &&, i, Ti & > Struct Template Reference

`#include <utility.hpp>`

Public Member Functions

- Ti & operator() (Tup &&tup) const

6.247.1 Detailed Description

template<int i, typename Tup>
struct upcxx::detail::tuple_rvals_get< Tup &&, i, Ti & >

Definition at line 380 of file utility.hpp.

6.247.2 Member Function Documentation

6.247.2.1 operator()()

```
template<int i, typename Tup >
Ti& upcxx::detail::tuple_rvals_get< Tup &&, i, Ti & >::operator() (
             Tup && tup ) const  [inline]
```

Definition at line 381 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.248 upcxx::detail::tuple_rvals_get< Tup &&, i, Ti && > Struct Template Reference

`#include <utility.hpp>`

Public Member Functions

- Ti && operator() (Tup &&tup) const

6.248.1 Detailed Description

template<int i, typename Tup>
struct upcxx::detail::tuple_rvals_get< Tup &&, i, Ti && >

Definition at line 386 of file utility.hpp.

6.248.2 Member Function Documentation

6.248.2.1 operator()()

```
template<int i, typename Tup >
Ti&& upcxx::detail::tuple_rvals_get< Tup &&, i, Ti && >::operator() (
             Tup && tup ) const  [inline]
```

Definition at line 387 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.249 upcxx::detail::tuple_rvals_get< Tup &&, i, Ti > Struct Template Reference

```
#include <utility.hpp>
```

Public Member Functions

- Ti operator() (Tup &&tup) const

6.249.1 Detailed Description

template<int i, typename Tup>
struct upcxx::detail::tuple_rvals_get< Tup &&, i, Ti >

Definition at line 392 of file utility.hpp.

6.249.2 Member Function Documentation

6.249.2.1 operator()()

```
template<int i, typename Tup >
Ti upcxx::detail::tuple_rvals_get< Tup &&, i, Ti >::operator() (
             Tup && tup ) const  [inline]
```

Definition at line 393 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.250 upcxx::detail::tuple_rvals_get< Tup &, i, Ti & > Struct Template Reference

`#include <utility.hpp>`

Public Member Functions

- Ti & operator() (Tup &tup) const

6.250.1 Detailed Description

template<int i, typename Tup>
struct upcxx::detail::tuple_rvals_get< Tup &, i, Ti & >

Definition at line 340 of file utility.hpp.

6.250.2 Member Function Documentation

6.250.2.1 operator()()

```
template<int i, typename Tup >
Ti& upcxx::detail::tuple_rvals_get< Tup &, i, Ti & >::operator() (
             Tup & tup ) const  [inline]
```

Definition at line 341 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.251 upcxx::detail::tuple_rvals_get< Tup &, i, Ti && > Struct Template Reference

`#include <utility.hpp>`

Public Member Functions

- Ti && operator() (Tup &tup) const

6.251.1 Detailed Description

template<int i, typename Tup>
struct upcxx::detail::tuple_rvals_get< Tup &, i, Ti && >

Definition at line 346 of file utility.hpp.

6.251.2 Member Function Documentation

6.251.2.1 operator()()

```
template<int i, typename Tup >
Ti&& upcxx::detail::tuple_rvals_get< Tup &, i, Ti && >::operator() (
             Tup & tup ) const  [inline]
```

Definition at line 347 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.252 upcxx::detail::tuple_rvals_get< Tup &, i, Ti > Struct Template Reference

```
#include <utility.hpp>
```

Public Member Functions

- Ti && operator() (Tup &tup) const

6.252.1 Detailed Description

template<int i, typename Tup>
struct upcxx::detail::tuple_rvals_get< Tup &, i, Ti >

Definition at line 352 of file utility.hpp.

6.252.2 Member Function Documentation

6.252.2.1 operator()()

```
template<int i, typename Tup >
Ti&& upcxx::detail::tuple_rvals_get< Tup &, i, Ti >::operator() (
             Tup & tup ) const  [inline]
```

Definition at line 353 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.253 upcxx::detail::tuple_rvals_get< Tup const &, i, Ti & > Struct Template Reference

`#include <utility.hpp>`

Public Member Functions

- Ti & operator() (Tup const &tup) const

6.253.1 Detailed Description

template<int i, typename Tup>
struct upcxx::detail::tuple_rvals_get< Tup const &, i, Ti & >

Definition at line 360 of file utility.hpp.

6.253.2 Member Function Documentation

6.253.2.1 operator()()

```
template<int i, typename Tup >
Ti& upcxx::detail::tuple_rvals_get< Tup const &, i, Ti & >::operator() (
            Tup const & tup ) const  [inline]
```

Definition at line 361 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.254 upcxx::detail::tuple_rvals_get< Tup const &, i, Ti && > Struct Template Reference

`#include <utility.hpp>`

Public Member Functions

- Ti && operator() (Tup const &tup) const

6.254.1 Detailed Description

template<int i, typename Tup>
struct upcxx::detail::tuple_rvals_get< Tup const &, i, Ti && >

Definition at line 366 of file utility.hpp.

6.254.2 Member Function Documentation

6.254.2.1 operator()()

```
template<int i, typename Tup >
Ti&& upcxx::detail::tuple_rvals_get< Tup const &, i, Ti && >::operator() (
             Tup const & tup ) const  [inline]
```

Definition at line 367 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.255 upcxx::detail::tuple_rvals_get< Tup const &, i, Ti > Struct Template Reference

```
#include <utility.hpp>
```

Public Member Functions

- Ti const & operator() (Tup const &tup) const

6.255.1 Detailed Description

template<int i, typename Tup>
struct upcxx::detail::tuple_rvals_get< Tup const &, i, Ti >

Definition at line 372 of file utility.hpp.

6.255.2 Member Function Documentation

6.255.2.1 operator()()

```
template<int i, typename Tup >
Ti const& upcxx::detail::tuple_rvals_get< Tup const &, i, Ti >::operator() (
             Tup const & tup ) const  [inline]
```

Definition at line 373 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.256 upcxx::tuple_types_into< Tuple, Into > Struct Template Reference

`#include <utility.hpp>`

6.256.1 Detailed Description

template<typename Tuple, template< typename... > class Into>
struct upcxx::tuple_types_into< Tuple, Into >

Definition at line 177 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.257 upcxx::tuple_types_into< std::tuple< T... >, Into > Struct Template Reference

`#include <utility.hpp>`

Public Types

- typedef Into< T... > type

6.257.1 Detailed Description

template<typename ... T, template< typename... > class Into>
struct upcxx::tuple_types_into< std::tuple< T... >, Into >

Definition at line 179 of file utility.hpp.

6.257.2 Member Typedef Documentation

6.257.2.1 type

```
template<typename ...  T, template< typename...  > class Into>
typedef Into<T...> upcxx::tuple_types_into< std::tuple< T...  >, Into >::type
```

Definition at line 180 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.258 upcxx::trait_all< Tr0, Trs... >::type< T > Struct Template Reference

`#include <utility.hpp>`

Static Public Attributes

- static constexpr bool value = Tr0<T>::value && trait_all<Trs...>::template type<T>::value

6.258.1 Detailed Description

template<template< typename... > class Tr0, template< typename... > class ... Trs>
template<typename T>
struct upcxx::trait_all< Tr0, Trs... >::type< T >

Definition at line 169 of file utility.hpp.

6.258.2 Member Data Documentation

6.258.2.1 value

```
template<template< typename... > class Tr0, template< typename... > class ... Trs>
template<typename T >
constexpr bool upcxx::trait_all< Tr0, Trs... >::type< T >::value = Tr0<T>::value && trait↩
_all<Trs...>::template type<T>::value [static]
```

Definition at line 170 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

6.259 upcxx::trait_any< Tr0, Trs... >::type< T > Struct Template Reference

`#include <utility.hpp>`

Static Public Attributes

- static constexpr bool value = Tr0<T>::value || trait_any<Trs...>::template type<T>::value

6.259.1 Detailed Description

template<template< typename... > class Tr0, template< typename... > class ... Trs>
template<typename T>
struct upcxx::trait_any< Tr0, Trs... >::type< T >

Definition at line 148 of file utility.hpp.

6.259.2 Member Data Documentation

6.259.2.1 value

```
template<template< typename... > class Tr0, template< typename... > class ... Trs>
template<typename T >
constexpr bool upcxx::trait_any< Tr0, Trs... >::type< T >::value = Tr0<T>::value || trait_↩
any<Trs...>::template type<T>::value [static]
```

Definition at line 149 of file utility.hpp.

The documentation for this struct was generated from the following file:

- utility.hpp

Chapter 7

File Documentation

7.1 allocate.hpp File Reference

```
#include <upcxx/backend.hpp>
#include <upcxx/diagnostic.hpp>
#include <upcxx/global_ptr.hpp>
#include <algorithm>
#include <cmath>
#include <cstdint>
#include <cstddef>
#include <new>
#include <type_traits>
```

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename T , std::size_t alignment = alignof(T)>
  global_ptr< T > upcxx::allocate (std::size_t n=1)
- template<typename T >
  void upcxx::deallocate (global_ptr< T > gptr)
- template<bool throws, typename T , typename ... Args>
  global_ptr< T > upcxx::detail::new_ (Args &&...args)
- template<typename T , typename ... Args>
  global_ptr< T > upcxx::new_ (Args &&...args)
- template<typename T , typename ... Args>
  global_ptr< T > upcxx::new_ (const std::nothrow_t &tag, Args &&...args)
- template<bool throws, typename T >
  global_ptr< T > upcxx::detail::new_array (std::size_t n)
- template<typename T >
  global_ptr< T > upcxx::new_array (std::size_t n)
- template<typename T >
  global_ptr< T > upcxx::new_array (std::size_t n, const std::nothrow_t &tag)
- template<typename T >
  void upcxx::delete_ (global_ptr< T > gptr)
- template<typename T >
  void upcxx::delete_array (global_ptr< T > gptr)

7.2 allreduce.hpp File Reference

```
#include <upcxx/backend.hpp>
#include <upcxx/dist_object.hpp>
#include <upcxx/rpc.hpp>
```

Classes

- struct upcxx::detail::allreduce_state< T, Op >

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename T1 , typename BinaryOp , typename T = typename std::decay<T1>::type>
  future< T > upcxx::allreduce (T1 &&value, BinaryOp op)

7.3 atomic.hpp File Reference

```
#include <atomic>
#include <upcxx/backend.hpp>
#include <upcxx/global_ptr.hpp>
#include <upcxx/rpc.hpp>
```

Namespaces

- upcxx

Functions

- template<typename T >
  future< T > upcxx::atomic_get (global_ptr< T > p, std::memory_order order)
- template<typename T >
  future upcxx::atomic_put (global_ptr< T > p, T val, std::memory_order order)
- template<typename T >
  future< T > upcxx::atomic_fetch_add (global_ptr< T > p, T val, std::memory_order order)

7.4 backend/gasnet1_seq/backend.cpp File Reference

```
#include <upcxx/os_env.hpp>
#include <upcxx/backend/gasnet1_seq/backend.hpp>
#include <cstring>
#include <gasnet.h>
#include <unistd.h>
#include <upcxx/dl_malloc.h>
```

Enumerations

- enum

7.4.1 Enumeration Type Documentation

7.4.1.1 anonymous enum

```
anonymous enum
```

Definition at line 45 of file backend.cpp.

7.5 backend/gasnet1_seq/backend.hpp File Reference

```
#include <upcxx/backend.hpp>
#include <upcxx/command.hpp>
#include <cstdint>
#include <cstdlib>
```

Classes

- struct upcxx::backend::gasnet1_seq::action
- struct upcxx::backend::gasnet1_seq::rma_cb
- struct upcxx::backend::gasnet1_seq::action_impl< Fn >
- struct upcxx::backend::rma_put_cb
- struct upcxx::backend::rma_get_cb
- struct upcxx::backend::rma_put_cb_wstate< State >
- struct upcxx::backend::rma_get_cb_wstate< State >
- struct upcxx::backend::gasnet1_seq::rma_put_cb_impl< State, SrcCx, OpCx >
- struct upcxx::backend::gasnet1_seq::rma_get_cb_impl< State, OpCx >

Namespaces

- upcxx
- upcxx::backend
- upcxx::backend::gasnet1_seq

Functions

- void upcxx::backend::gasnet1_seq::send_am_eager_restricted (intrank_t recipient, void *command_buf, std::size_t buf_size, std::size_t buf_align)
- template<typename Fn >
  void upcxx::backend::gasnet1_seq::send_am_restricted (intrank_t recipient, Fn &&fn)
- void upcxx::backend::gasnet1_seq::send_am_eager_queued (progress_level level, intrank_t recipient, void *command_buf, std::size_t buf_size, std::size_t buf_align)
- void upcxx::backend::gasnet1_seq::send_am_rdzv (progress_level level, intrank_t recipient, void *command_buf, std::size_t buf_size, std::size_t buf_align)
- template<typename Fn1 >
  void upcxx::backend::during_user (Fn1 &&fn)
- void upcxx::backend::during_user (promise<> &&pro)
- void upcxx::backend::during_user (promise<> *pro)
- template<typename Fn1 >
  void upcxx::backend::during_level (progress_level level, Fn1 &&fn)
- template<upcxx::progress_level level, typename Fn >
  void upcxx::backend::send_am (intrank_t recipient, Fn &&fn)
- template<typename State , typename SrcCx , typename OpCx >
  rma_put_cb_wstate< State > * upcxx::backend::make_rma_put_cb (State state, SrcCx src_cx, OpCx op↩_cx)
- template<typename State , typename OpCx >
  rma_get_cb_wstate< State > * upcxx::backend::make_rma_get_cb (State state, OpCx op_cx)

Variables

- std::size_t upcxx::backend::gasnet1_seq::am_size_rdzv_cutover
- bool upcxx::backend::gasnet1_seq::in_user_progress_ = false
- action * upcxx::backend::gasnet1_seq::user_actions_head_ = nullptr
- action ** upcxx::backend::gasnet1_seq::user_actions_tailp_ = &gasnet1_seq::user_actions_head_

7.6 backend.hpp File Reference

```
#include <upcxx/future.hpp>
#include <upcxx/packing.hpp>
#include <cstddef>
#include <cstdint>
```

Classes

- struct upcxx::backend::rma_put_cb_wstate< State >
- struct upcxx::backend::rma_get_cb_wstate< State >

Namespaces

- upcxx
- upcxx::backend

Macros

- #define gasnet1_seq 100

Typedefs

- typedef int upcxx::intrank_t
- typedef unsigned int upcxx::uintrank_t

Enumerations

- enum upcxx::progress_level { upcxx::progress_level::internal, upcxx::progress_level::user }

Functions

- void upcxx::init ()
- void upcxx::finalize ()
- intrank_t upcxx::rank_n ()
- intrank_t upcxx::rank_me ()
- void * upcxx::allocate (std::size_t size, std::size_t alignment=alignof(std::max_align_t))
- void upcxx::deallocate (void *p)
- void upcxx::progress (progress_level lev=progress_level::user)
- void upcxx::barrier ()
- template<typename Fn >
  void upcxx::backend::during_user (Fn &&fn)
- void upcxx::backend::during_user (promise<> &&pro)
- void upcxx::backend::during_user (promise<> *pro)
- template<typename Fn >
  void upcxx::backend::during_level (progress_level level, Fn &&fn)
- template<upcxx::progress_level level, typename Fn >
  void upcxx::backend::send_am (intrank_t recipient, Fn &&fn)
- template<typename State , typename SrcCx , typename OpCx >
  rma_put_cb_wstate< State > * upcxx::backend::make_rma_put_cb (State state, SrcCx src_cx, OpCx op↩
  _cx)
- void upcxx::backend::rma_put (intrank_t rank_d, void *buf_d, void *buf_s, std::size_t buf_size, rma_put_cb *cb)
- template<typename State , typename OpCx >
  rma_get_cb_wstate< State > * upcxx::backend::make_rma_get_cb (State state, OpCx op_cx)
- void upcxx::backend::rma_get (void *buf_d, intrank_t rank_s, void *buf_s, std::size_t buf_size, rma_get_cb *cb)

Variables

- intrank_t upcxx::backend::rank_n
- intrank_t upcxx::backend::rank_me

7.6.1 Macro Definition Documentation

7.6.1.1 gasnet1_seq

```
#define gasnet1_seq 100
```

Definition at line 110 of file backend.hpp.

7.7 bind.hpp File Reference

```
#include <upcxx/future.hpp>
#include <upcxx/packing.hpp>
#include <upcxx/utility.hpp>
#include <tuple>
#include <type_traits>
#include <utility>
```

Classes

- struct upcxx::binding< T >
- struct upcxx::binding_is_trivial< T, trivial >
- struct upcxx::binding_is_trivial< T, std::integral_constant< bool, binding< T >::is_trivial > >
- struct upcxx::binding< T & >
- struct upcxx::binding< T && >
- struct upcxx::binding< T const >
- struct upcxx::binding< T volatile >
- struct upcxx::detail::bound_function_base< Fn, BndTup, all_trivial >
- struct upcxx::detail::bound_function_base< Fn, std::tuple< B... >, true >
- struct upcxx::detail::bound_function_base< Fn, std::tuple< B... >, false >
- struct upcxx::detail::bound_function_base< Fn, std::tuple< B... >, false >::applicator< Arg >
- struct upcxx::bound_function< Fn, B >
- struct upcxx::packing< bound_function< Fn, B... > >
- struct upcxx::detail::bind< FnDecayed >
- struct upcxx::detail::bind< bound_function< Fn0, B0... > >

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename Fn , typename ... B>
  auto upcxx::bind (Fn &&fn, B &&...b) -> decltype(detail::bind< typename std::decay< Fn >::type >()(std↩
  ::forward< Fn >(fn), std::forward< B >(b)...))
- template<typename Fn >
  Fn && upcxx::bind (Fn &&fn)
- template<typename ... P, int ... heads, int tail>
  auto upcxx::detail::bind_last (std::tuple< P... > parms, upcxx::index_sequence< heads... >, std::integral↩
  _constant< int, tail >) -> decltype(detail::bind< typename std::decay< typename std::tuple_element< tail, std::tuple< P... >>::type >::type >()(std::move(std::get< tail >(parms)), std::move(std::get< heads >(parms))...))
- template<typename ... P>
  auto upcxx::bind_last (P &&...parm) -> decltype(detail::bind_last(std::tuple< P &&... >
- template<typename Fn >
  Fn && upcxx::bind_last (Fn &&fn)

7.8 broadcast.hpp File Reference

```
#include <upcxx/backend.hpp>
#include <upcxx/dist_object.hpp>
#include <upcxx/rpc.hpp>
```

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename T >
  void upcxx::detail::broadcast_receive (T const &value, intrank_t rank_ub, dist_id< promise< T >> id)
- template<typename T1 , typename T = typename std::decay<T1>::type>
  future< T > upcxx::broadcast (T1 &&value, intrank_t root)

7.9 command.hpp File Reference

```
#include <upcxx/diagnostic.hpp>
#include <upcxx/future.hpp>
#include <upcxx/packing.hpp>
```

Classes

- struct upcxx::commanding< Fn >

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename Fn >
  void upcxx::command_size_ubound (parcel_layout &ub, Fn &&fn)
- template<typename Fn >
  void upcxx::command_pack (parcel_writer &w, std::size_t size_ub, Fn &&fn)
- future upcxx::command_execute (parcel_reader &r)
- template<typename Fn >
  future upcxx::detail::command_executor (parcel_reader &r)
- template<typename Fn1 >
  void upcxx::command_size_ubound (parcel_layout &ub, Fn1 &&fn)
- template<typename Fn1 >
  void upcxx::command_pack (parcel_writer &w, std::size_t size_ub, Fn1 &&fn)

7.10 completion.hpp File Reference

```
#include <upcxx/bind.hpp>
#include <upcxx/future.hpp>
```

Classes

- struct upcxx::nil_cx
- struct upcxx::rpc_cx< Fn >
- struct upcxx::future_cx< ordinal >
- struct upcxx::promise_cx< T >
- struct upcxx::detail::disjoin_cx< A, B, B_ord_bump >
- struct upcxx::detail::disjoin_cx< A, nil_cx, B_ord_bump >
- struct upcxx::detail::disjoin_cx< nil_cx, B, B_ord_bump >
- struct upcxx::detail::disjoin_cx< nil_cx, future_cx< B_ord_old >, B_ord_bump >
- struct upcxx::detail::disjoin_cx< nil_cx, nil_cx, B_ord0 >
- struct upcxx::detail::is_future_cx< Cx >
- struct upcxx::detail::is_future_cx< future_cx< ordinal > >
- struct upcxx::completions< SourceCx, RemoteCx, OpxnCx >

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename AS , typename AR , typename AO , typename BS , typename BR , typename BO >
  completions< typename detail::disjoin_cx< AS, BS, completions< AS, AR, AO >::future_n >::type, typename detail::disjoin_cx< AR, BR, completions< AS, AR, AO >::future_n >::type, typename detail::disjoin_cx< AO, BO, completions< AS, AR, AO >::future_n >::type > upcxx::operator| (completions< AS, AR, AO > a, completions< BS, BR, BO > b)
- template<typename ... T>
  completions< promise_cx< T... >, nil_cx, nil_cx > upcxx::source_cx_as_promise (promise< T... > &pro)
- template<typename ... T>
  completions< nil_cx, nil_cx, promise_cx< T... > > upcxx::operxn_cx_as_promise (promise< T... > &pro)
- template<typename Fn , typename ... Args>
  auto upcxx::remote_cx_as_rpc (Fn &&fn, Args &&...args) -> completions< nil_cx, rpc_cx< decltype(upcxx::bind(std::forward< Fn >(fn), std::forward< Args >(args)...))>, nil_cx >

Variables

- constexpr completions< future_cx< 0 >, nil_cx, nil_cx > upcxx::source_cx_as_future = {}
- constexpr completions< nil_cx, nil_cx, future_cx< 0 > > upcxx::operxn_cx_as_future = {}

7.11 diagnostic.cpp File Reference

```
#include <upcxx/diagnostic.hpp>
#include <iostream>
#include <sstream>
#include <sys/types.h>
#include <unistd.h>
#include <signal.h>
```

Namespaces

- upcxx

Variables

- bool upcxx::dbgbrk_spin_init = false
- bool upcxx::dbgbrk_spin = true

7.12 diagnostic.hpp File Reference

```
#include <sstream>
```

Namespaces

- upcxx

Macros

- #define UPCXX_ASSERT_1(ok)
- #define UPCXX_ASSERT_2(ok, ios_msg)
- #define UPCXX_ASSERT_DISPATCH(_1, _2, NAME, ...) NAME
- #define UPCXX_ASSERT(...) UPCXX_ASSERT_DISPATCH(__VA_ARGS__, UPCXX_ASSERT_2, UPC↩XX_ASSERT_1)(__VA_ARGS__)
- #define UPCXX_ASSERT_ALWAYS(...) UPCXX_ASSERT_DISPATCH(__VA_ARGS__, UPCXX_ASSER↩T_2, UPCXX_ASSERT_1)(__VA_ARGS__)
- #define UPCXX_INVOKE_UB() ::upcxx::assert_failed(__FILE__, __LINE__)

Functions

- void upcxx::dbgbrk ()
- void upcxx::assert_failed (const char *file, int line, const char *msg=nullptr)

7.12.1 Macro Definition Documentation

7.12.1.1 UPCXX_ASSERT

```
#define UPCXX_ASSERT(
              ...  ) UPCXX_ASSERT_DISPATCH(__VA_ARGS__, UPCXX_ASSERT_2, UPCXX_ASSERT_1)(__VA_↩
ARGS__)
```

Definition at line 30 of file diagnostic.hpp.

7.12.1.2 UPCXX_ASSERT_1

```
#define UPCXX_ASSERT_1(
              ok )
```

Value:

```
do { \
    if(!(ok)) \
      ::upcxx::assert_failed(__FILE__, __LINE__); \
  } while(0);
```

Definition at line 11 of file diagnostic.hpp.

7.12.1.3 UPCXX_ASSERT_2

```
#define UPCXX_ASSERT_2(
              ok,
              ios_msg )
```

Value:

```
do { \
    if(!(ok)) { \
      ::std::stringstream ss; \
      ss << ios_msg; \
      ::upcxx::assert_failed(__FILE__, __LINE__, ss.str().c_str()); \
    } \
  } while(0);
```

Definition at line 17 of file diagnostic.hpp.

7.12.1.4 UPCXX_ASSERT_ALWAYS

```
#define UPCXX_ASSERT_ALWAYS(
              ...  ) UPCXX_ASSERT_DISPATCH(__VA_ARGS__, UPCXX_ASSERT_2, UPCXX_ASSERT_1)(__VA_↩
ARGS__)
```

Definition at line 33 of file diagnostic.hpp.

7.12.1.5 UPCXX_ASSERT_DISPATCH

```
#define UPCXX_ASSERT_DISPATCH(
              _1,
              _2,
              NAME,
              ...  ) NAME
```

Definition at line 26 of file diagnostic.hpp.

7.12.1.6 UPCXX_INVOKE_UB

```
#define UPCXX_INVOKE_UB( ) ::upcxx::assert_failed(__FILE__, __LINE__)
```

Definition at line 36 of file diagnostic.hpp.

7.13 digest.cpp File Reference

```
#include <upcxx/digest.hpp>
```

7.14 digest.hpp File Reference

```
#include <cstdint>
#include <functional>
#include <iostream>
```

Classes

- struct upcxx::digest
- struct std::hash< upcxx::digest >

Namespaces

- upcxx
- std

Functions

- std::ostream & upcxx::operator<< (std::ostream &o, digest x)

7.15 dist_object.cpp File Reference

```
#include <upcxx/dist_object.hpp>
```

7.16 dist_object.hpp File Reference

```
#include <upcxx/bind.hpp>
#include <upcxx/digest.hpp>
#include <upcxx/future.hpp>
#include <upcxx/rpc.hpp>
#include <upcxx/utility.hpp>
#include <cstdint>
#include <unordered_map>
```

Classes

- struct upcxx::dist_id< T >
- class upcxx::dist_object< T >
- struct upcxx::dist_id< T >
- struct std::hash< upcxx::dist_id< T > >
- class upcxx::dist_object< T >
- struct upcxx::binding< dist_object< T > & >
- struct upcxx::binding< dist_object< T > && >

Namespaces

- upcxx
- upcxx::detail
- std

Macros

- #define COMPARATOR(op)

Functions

- template<typename T >
  promise< dist_object< T > & > * upcxx::detail::dist_promise (digest id)
- template<typename T >
  std::ostream & upcxx::operator<< (std::ostream &o, dist_id< T > x)

Variables

- std::unordered_map< digest, void * > upcxx::detail::dist_master_promises
- std::uint64_t upcxx::detail::dist_master_id_bump = 0

7.16.1 Macro Definition Documentation

7.16.1.1 COMPARATOR

```
#define COMPARATOR(
                op )
```

Value:

```
friend bool operator op(dist_id a, dist_id b) {\
        return a.dig_ op b.dig_; \
      }
```

Definition at line 64 of file dist_object.hpp.

7.17 dl_malloc.c File Reference

```
#include <sys/types.h>
#include <stdio.h>
#include <errno.h>
#include <time.h>
#include <stdlib.h>
#include <string.h>
#include <sys/mman.h>
#include <fcntl.h>
#include <unistd.h>
#include <sched.h>
#include <pthread.h>
#include <sys/param.h>
```

Classes

- struct mallinfo
- struct malloc_chunk
- struct malloc_tree_chunk
- struct malloc_segment
- struct malloc_state
- struct malloc_params

Macros

- #define ONLY_MSPACES 1
- #define DLMALLOC_VERSION 20806
- #define DLMALLOC_EXPORT extern
- #define MAX_SIZE_T (∼(size_t)0)
- #define USE_LOCKS
- #define USE_SPIN_LOCKS 0
- #define MSPACES 1
- #define MALLOC_ALIGNMENT ((size_t)(2 ∗ sizeof(void ∗)))
- #define FOOTERS 0
- #define ABORT abort()
- #define ABORT_ON_ASSERT_FAILURE 1
- #define PROCEED_ON_ERROR 0
- #define INSECURE 0
- #define MALLOC_INSPECT_ALL 0
- #define HAVE_MMAP 1
- #define MMAP_CLEARS 1
- #define HAVE_MREMAP 0
- #define MALLOC_FAILURE_ACTION errno = ENOMEM;
- #define HAVE_MORECORE 0
- #define MORECORE_CONTIGUOUS 0
- #define DEFAULT_GRANULARITY ((size_t)64U ∗ (size_t)1024U)
- #define DEFAULT_TRIM_THRESHOLD ((size_t)2U ∗ (size_t)1024U ∗ (size_t)1024U)
- #define DEFAULT_MMAP_THRESHOLD ((size_t)256U ∗ (size_t)1024U)
- #define MAX_RELEASE_CHECK_RATE 4095
- #define USE_BUILTIN_FFS 0
- #define USE_DEV_RANDOM 0
- #define NO_MALLINFO 0
- #define MALLINFO_FIELD_TYPE size_t
- #define NO_MALLOC_STATS 0
- #define NO_SEGMENT_TRAVERSAL 0
- #define M_TRIM_THRESHOLD (-1)
- #define M_GRANULARITY (-2)
- #define M_MMAP_THRESHOLD (-3)
- #define _STRUCT_MALLINFO
- #define STRUCT_MALLINFO_DECLARED 1
- #define NOINLINE
- #define FORCEINLINE
- #define assert(x)
- #define DEBUG 0
- #define LOCK_AT_FORK 0
- #define malloc_getpagesize ((size_t)4096U)
- #define SIZE_T_SIZE (sizeof(size_t))
- #define SIZE_T_BITSIZE (sizeof(size_t) << 3)

- #define SIZE_T_ZERO ((size_t)0)
- #define SIZE_T_ONE ((size_t)1)
- #define SIZE_T_TWO ((size_t)2)
- #define SIZE_T_FOUR ((size_t)4)
- #define TWO_SIZE_T_SIZES (SIZE_T_SIZE<<1)
- #define FOUR_SIZE_T_SIZES (SIZE_T_SIZE<<2)
- #define SIX_SIZE_T_SIZES (FOUR_SIZE_T_SIZES+TWO_SIZE_T_SIZES)
- #define HALF_MAX_SIZE_T (MAX_SIZE_T / 2U)
- #define CHUNK_ALIGN_MASK (MALLOC_ALIGNMENT - SIZE_T_ONE)
- #define is_aligned(A) (((size_t)((A)) & (CHUNK_ALIGN_MASK)) == 0)
- #define align_offset(A)
- #define MFAIL ((void*)(MAX_SIZE_T))
- #define CMFAIL ((char*)(MFAIL)) /* defined for convenience */
- #define MUNMAP_DEFAULT(a, s) munmap((a), (s))
- #define MMAP_PROT (PROT_READ|PROT_WRITE)
- #define MMAP_FLAGS (MAP_PRIVATE)
- #define MMAP_DEFAULT(s)
- #define DIRECT_MMAP_DEFAULT(s) MMAP_DEFAULT(s)
- #define CALL_MORECORE(S) MFAIL
- #define USE_MMAP_BIT (SIZE_T_ONE)
- #define CALL_MMAP(s) MMAP_DEFAULT(s)
- #define CALL_MUNMAP(a, s) MUNMAP_DEFAULT((a), (s))
- #define CALL_DIRECT_MMAP(s) DIRECT_MMAP_DEFAULT(s)
- #define CALL_MREMAP(addr, osz, nsz, mv) MFAIL
- #define USE_NONCONTIGUOUS_BIT (4U)
- #define EXTERN_BIT (8U)
- #define MLOCK_T pthread_mutex_t
- #define ACQUIRE_LOCK(lk) pthread_mutex_lock(lk)
- #define RELEASE_LOCK(lk) pthread_mutex_unlock(lk)
- #define TRY_LOCK(lk) (!pthread_mutex_trylock(lk))
- #define INITIAL_LOCK(lk) pthread_init_lock(lk)
- #define DESTROY_LOCK(lk) pthread_mutex_destroy(lk)
- #define USE_LOCK_BIT (2U)
- #define ACQUIRE_MALLOC_GLOBAL_LOCK() ACQUIRE_LOCK(&malloc_global_mutex);
- #define RELEASE_MALLOC_GLOBAL_LOCK() RELEASE_LOCK(&malloc_global_mutex);
- #define MCHUNK_SIZE (sizeof(mchunk))
- #define CHUNK_OVERHEAD (SIZE_T_SIZE)
- #define MMAP_CHUNK_OVERHEAD (TWO_SIZE_T_SIZES)
- #define MMAP_FOOT_PAD (FOUR_SIZE_T_SIZES)
- #define MIN_CHUNK_SIZE ((MCHUNK_SIZE + CHUNK_ALIGN_MASK) & ~CHUNK_ALIGN_MASK)
- #define chunk2mem(p) ((void*)((char*)(p) + TWO_SIZE_T_SIZES))
- #define mem2chunk(mem) ((mchunkptr)((char*)(mem) - TWO_SIZE_T_SIZES))
- #define align_as_chunk(A) (mchunkptr)((A) + align_offset(chunk2mem(A)))
- #define MAX_REQUEST ((-MIN_CHUNK_SIZE) << 2)
- #define MIN_REQUEST (MIN_CHUNK_SIZE - CHUNK_OVERHEAD - SIZE_T_ONE)
- #define pad_request(req) (((req) + CHUNK_OVERHEAD + CHUNK_ALIGN_MASK) & ~CHUNK_ALIGN_↩ MASK)
- #define request2size(req) (((req) < MIN_REQUEST)? MIN_CHUNK_SIZE : pad_request(req))
- #define PINUSE_BIT (SIZE_T_ONE)
- #define CINUSE_BIT (SIZE_T_TWO)
- #define FLAG4_BIT (SIZE_T_FOUR)
- #define INUSE_BITS (PINUSE_BIT|CINUSE_BIT)
- #define FLAG_BITS (PINUSE_BIT|CINUSE_BIT|FLAG4_BIT)
- #define FENCEPOST_HEAD (INUSE_BITS|SIZE_T_SIZE)
- #define cinuse(p) ((p)->head & CINUSE_BIT)

- #define pinuse(p) ((p)->head & PINUSE_BIT)
- #define flag4inuse(p) ((p)->head & FLAG4_BIT)
- #define is_inuse(p) (((p)->head & INUSE_BITS) != PINUSE_BIT)
- #define is_mmapped(p) (((p)->head & INUSE_BITS) == 0)
- #define chunksize(p) ((p)->head & ∼(FLAG_BITS))
- #define clear_pinuse(p) ((p)->head &= ∼PINUSE_BIT)
- #define set_flag4(p) ((p)->head |= FLAG4_BIT)
- #define clear_flag4(p) ((p)->head &= ∼FLAG4_BIT)
- #define chunk_plus_offset(p, s) ((mchunkptr)(((char∗)(p)) + (s)))
- #define chunk_minus_offset(p, s) ((mchunkptr)(((char∗)(p)) - (s)))
- #define next_chunk(p) ((mchunkptr)(((char∗)(p)) + ((p)->head & ∼FLAG_BITS)))
- #define prev_chunk(p) ((mchunkptr)(((char∗)(p)) - ((p)->prev_foot)))
- #define next_pinuse(p) ((next_chunk(p)->head) & PINUSE_BIT)
- #define get_foot(p, s) (((mchunkptr)((char∗)(p) + (s)))->prev_foot)
- #define set_foot(p, s) (((mchunkptr)((char∗)(p) + (s)))->prev_foot = (s))
- #define set_size_and_pinuse_of_free_chunk(p, s) ((p)->head = (s|PINUSE_BIT), set_foot(p, s))
- #define set_free_with_pinuse(p, s, n) (clear_pinuse(n), set_size_and_pinuse_of_free_chunk(p, s))
- #define overhead_for(p) (is_mmapped(p)? MMAP_CHUNK_OVERHEAD : CHUNK_OVERHEAD)
- #define calloc_must_clear(p) (!is_mmapped(p))
- #define leftmost_child(t) ((t)->child[0] != 0? (t)->child[0] : (t)->child[1])
- #define is_mmapped_segment(S) ((S)->sflags & USE_MMAP_BIT)
- #define is_extern_segment(S) ((S)->sflags & EXTERN_BIT)
- #define NSMALLBINS (32U)
- #define NTREEBINS (32U)
- #define SMALLBIN_SHIFT (3U)
- #define SMALLBIN_WIDTH (SIZE_T_ONE << SMALLBIN_SHIFT)
- #define TREEBIN_SHIFT (8U)
- #define MIN_LARGE_SIZE (SIZE_T_ONE << TREEBIN_SHIFT)
- #define MAX_SMALL_SIZE (MIN_LARGE_SIZE - SIZE_T_ONE)
- #define MAX_SMALL_REQUEST (MAX_SMALL_SIZE - CHUNK_ALIGN_MASK - CHUNK_OVERHEAD)
- #define ensure_initialization() (void)(mparams.magic != 0 || init_mparams())
- #define is_initialized(M) ((M)->top != 0)
- #define use_lock(M) ((M)->mflags & USE_LOCK_BIT)
- #define enable_lock(M) ((M)->mflags |= USE_LOCK_BIT)
- #define disable_lock(M)
- #define use_mmap(M) ((M)->mflags & USE_MMAP_BIT)
- #define enable_mmap(M) ((M)->mflags |= USE_MMAP_BIT)
- #define disable_mmap(M) ((M)->mflags &= ∼USE_MMAP_BIT)
- #define use_noncontiguous(M) ((M)->mflags & USE_NONCONTIGUOUS_BIT)
- #define disable_contiguous(M) ((M)->mflags |= USE_NONCONTIGUOUS_BIT)
- #define set_lock(M, L)
- #define page_align(S) (((S) + (mparams.page_size - SIZE_T_ONE)) & ∼(mparams.page_size - SIZE_T_↩ ONE))
- #define granularity_align(S)
- #define mmap_align(S) page_align(S)
- #define SYS_ALLOC_PADDING (TOP_FOOT_SIZE + MALLOC_ALIGNMENT)
- #define is_page_aligned(S) (((size_t)(S) & (mparams.page_size - SIZE_T_ONE)) == 0)
- #define is_granularity_aligned(S) (((size_t)(S) & (mparams.granularity - SIZE_T_ONE)) == 0)
- #define segment_holds(S, A) ((char∗)(A) >= S->base && (char∗)(A) < S->base + S->size)
- #define should_trim(M, s) ((s) > (M)->trim_check)
- #define TOP_FOOT_SIZE (align_offset(chunk2mem(0))+pad_request(sizeof(struct malloc_segment))+MI↩ N_CHUNK_SIZE)
- #define PREACTION(M) ((use_lock(M))? ACQUIRE_LOCK(&(M)->mutex) : 0)
- #define POSTACTION(M) { if (use_lock(M)) RELEASE_LOCK(&(M)->mutex); }
- #define CORRUPTION_ERROR_ACTION(m) ABORT

- #define USAGE_ERROR_ACTION(m, p) ABORT
- #define check_free_chunk(M, P)
- #define check_inuse_chunk(M, P)
- #define check_malloced_chunk(M, P, N)
- #define check_mmapped_chunk(M, P)
- #define check_malloc_state(M)
- #define check_top_chunk(M, P)
- #define is_small(s) (((s) >> SMALLBIN_SHIFT) < NSMALLBINS)
- #define small_index(s) (bindex_t)((s) >> SMALLBIN_SHIFT)
- #define small_index2size(i) ((i) << SMALLBIN_SHIFT)
- #define MIN_SMALL_INDEX (small_index(MIN_CHUNK_SIZE))
- #define smallbin_at(M, i) ((sbinptr)((char*)&((M)->smallbins[(i)<<1])))
- #define treebin_at(M, i) (&((M)->treebins[i]))
- #define compute_tree_index(S, I)
- #define bit_for_tree_index(i) (i == NTREEBINS-1)? (SIZE_T_BITSIZE-1) : (((i) >> 1) + TREEBIN_SHIFT - 2)
- #define leftshift_for_tree_index(i)
- #define minsize_for_tree_index(i)
- #define idx2bit(i) ((binmap_t)(1) << (i))
- #define mark_smallmap(M, i) ((M)->smallmap |= idx2bit(i))
- #define clear_smallmap(M, i) ((M)->smallmap &= ~idx2bit(i))
- #define smallmap_is_marked(M, i) ((M)->smallmap & idx2bit(i))
- #define mark_treemap(M, i) ((M)->treemap |= idx2bit(i))
- #define clear_treemap(M, i) ((M)->treemap &= ~idx2bit(i))
- #define treemap_is_marked(M, i) ((M)->treemap & idx2bit(i))
- #define least_bit(x) ((x) & -(x))
- #define left_bits(x) ((x<<1) | -(x<<1))
- #define same_or_left_bits(x) ((x) | -(x))
- #define compute_bit2idx(X, I)
- #define ok_address(M, a) ((char*)(a) >= (M)->least_addr)
- #define ok_next(p, n) ((char*)(p) < (char*)(n))
- #define ok_inuse(p) is_inuse(p)
- #define ok_pinuse(p) pinuse(p)
- #define ok_magic(M) (1)
- #define RTCHECK(e) (e)
- #define mark_inuse_foot(M, p, s)
- #define set_inuse(M, p, s)
- #define set_inuse_and_pinuse(M, p, s)
- #define set_size_and_pinuse_of_inuse_chunk(M, p, s) ((p)->head = (s|PINUSE_BIT|CINUSE_BIT))
- #define insert_small_chunk(M, P, S)
- #define unlink_small_chunk(M, P, S)
- #define unlink_first_small_chunk(M, B, P, I)
- #define replace_dv(M, P, S)
- #define insert_large_chunk(M, X, S)
- #define unlink_large_chunk(M, X)
- #define insert_chunk(M, P, S)
- #define unlink_chunk(M, P, S)
- #define internal_malloc(m, b) mspace_malloc(m, b)
- #define internal_free(m, mem) mspace_free(m,mem);

Typedefs

- typedef void * mspace
- typedef struct malloc_chunk mchunk
- typedef struct malloc_chunk * mchunkptr
- typedef struct malloc_chunk * sbinptr
- typedef unsigned int bindex_t
- typedef unsigned int binmap_t
- typedef unsigned int flag_t
- typedef struct malloc_tree_chunk tchunk
- typedef struct malloc_tree_chunk * tchunkptr
- typedef struct malloc_tree_chunk * tbinptr
- typedef struct malloc_segment msegment
- typedef struct malloc_segment * msegmentptr
- typedef struct malloc_state * mstate

Functions

- DLMALLOC_EXPORT mspace create_mspace (size_t capacity, int locked)
- DLMALLOC_EXPORT size_t destroy_mspace (mspace msp)
- DLMALLOC_EXPORT mspace create_mspace_with_base (void *base, size_t capacity, int locked)
- DLMALLOC_EXPORT int mspace_track_large_chunks (mspace msp, int enable)
- DLMALLOC_EXPORT void * mspace_malloc (mspace msp, size_t bytes)
- DLMALLOC_EXPORT void mspace_free (mspace msp, void *mem)
- DLMALLOC_EXPORT void * mspace_realloc (mspace msp, void *mem, size_t newsize)
- DLMALLOC_EXPORT void * mspace_calloc (mspace msp, size_t n_elements, size_t elem_size)
- DLMALLOC_EXPORT void * mspace_memalign (mspace msp, size_t alignment, size_t bytes)
- DLMALLOC_EXPORT void ** mspace_independent_calloc (mspace msp, size_t n_elements, size_t elem_size, void *chunks[])
- DLMALLOC_EXPORT void ** mspace_independent_comalloc (mspace msp, size_t n_elements, size_t sizes[], void *chunks[])
- DLMALLOC_EXPORT size_t mspace_footprint (mspace msp)
- DLMALLOC_EXPORT size_t mspace_max_footprint (mspace msp)
- DLMALLOC_EXPORT struct mallinfo mspace_mallinfo (mspace msp)
- DLMALLOC_EXPORT size_t mspace_usable_size (const void *mem)
- DLMALLOC_EXPORT void mspace_malloc_stats (mspace msp)
- DLMALLOC_EXPORT int mspace_trim (mspace msp, size_t pad)
- DLMALLOC_EXPORT int mspace_mallopt (int, int)
- void * mspace_realloc_in_place (mspace msp, void *oldmem, size_t bytes)
- size_t mspace_bulk_free (mspace msp, void *array[], size_t nelem)
- size_t mspace_footprint_limit (mspace msp)
- size_t mspace_set_footprint_limit (mspace msp, size_t bytes)

7.17.1 Macro Definition Documentation

7.17.1.1 _STRUCT_MALLINFO

```
#define _STRUCT_MALLINFO
```

Definition at line 766 of file dl_malloc.c.

7.17.1.2 ABORT

```
#define ABORT abort()
```

Definition at line 627 of file dl_malloc.c.

7.17.1.3 ABORT_ON_ASSERT_FAILURE

```
#define ABORT_ON_ASSERT_FAILURE 1
```

Definition at line 630 of file dl_malloc.c.

7.17.1.4 ACQUIRE_LOCK

```
#define ACQUIRE_LOCK(
              lk ) pthread_mutex_lock(lk)
```

Definition at line 2007 of file dl_malloc.c.

7.17.1.5 ACQUIRE_MALLOC_GLOBAL_LOCK

```
#define ACQUIRE_MALLOC_GLOBAL_LOCK( ) ACQUIRE_LOCK(&malloc_global_mutex);
```

Definition at line 2041 of file dl_malloc.c.

7.17.1.6 align_as_chunk

```
#define align_as_chunk(
              A ) (mchunkptr)((A) + align_offset(chunk2mem(A)))
```

Definition at line 2224 of file dl_malloc.c.

7.17.1.7 align_offset

```
#define align_offset(
              A )
```

Value:

```
((((size_t)(A) & CHUNK_ALIGN_MASK) == 0)? 0 :\
  ((MALLOC_ALIGNMENT - ((size_t)(A) & CHUNK_ALIGN_MASK)) &
      CHUNK_ALIGN_MASK))
```

Definition at line 1624 of file dl_malloc.c.

7.17.1.8 assert

```
#define assert(
              x )
```

Definition at line 1455 of file dl_malloc.c.

7.17.1.9 bit_for_tree_index

```
#define bit_for_tree_index(
              i ) (i == NTREEBINS-1)?  (SIZE_T_BITSIZE-1) :  (((i) >> 1) + TREEBIN_SHIFT - 2)
```

Definition at line 2903 of file dl_malloc.c.

7.17.1.10 CALL_DIRECT_MMAP

```
#define CALL_DIRECT_MMAP(
              s ) DIRECT_MMAP_DEFAULT(s)
```

Definition at line 1744 of file dl_malloc.c.

7.17.1.11 CALL_MMAP

```
#define CALL_MMAP(
              s ) MMAP_DEFAULT(s)
```

Definition at line 1734 of file dl_malloc.c.

7.17.1.12 CALL_MORECORE

```
#define CALL_MORECORE(
              S ) MFAIL
```

Define CALL_MORECORE

Definition at line 1722 of file dl_malloc.c.

7.17.1.13 CALL_MREMAP

```
#define CALL_MREMAP(
              addr,
              osz,
              nsz,
              mv ) MFAIL
```

Define CALL_MREMAP

Definition at line 1767 of file dl_malloc.c.

7.17.1.14 CALL_MUNMAP

```
#define CALL_MUNMAP(
              a,
              s ) MUNMAP_DEFAULT((a), (s))
```

Definition at line 1739 of file dl_malloc.c.

7.17.1.15 calloc_must_clear

```
#define calloc_must_clear(
              p ) (!is_mmapped(p))
```

Definition at line 2300 of file dl_malloc.c.

7.17.1.16 check_free_chunk

```
#define check_free_chunk(
              M,
              P )
```

Definition at line 2798 of file dl_malloc.c.

7.17.1.17 check_inuse_chunk

```
#define check_inuse_chunk(
              M,
              P )
```

Definition at line 2799 of file dl_malloc.c.

7.17.1.18 check_malloc_state

```
#define check_malloc_state(
              M )
```

Definition at line 2802 of file dl_malloc.c.

7.17.1.19 check_malloced_chunk

```
#define check_malloced_chunk(
              M,
              P,
              N )
```

Definition at line 2800 of file dl_malloc.c.

7.17.1.20 check_mmapped_chunk

```
#define check_mmapped_chunk(
              M,
              P )
```

Definition at line 2801 of file dl_malloc.c.

7.17.1.21 check_top_chunk

```
#define check_top_chunk(
              M,
              P )
```

Definition at line 2803 of file dl_malloc.c.

7.17.1.22 chunk2mem

```
#define chunk2mem(
              p ) ((void*)((char*)(p) + TWO_SIZE_T_SIZES))
```

Definition at line 2221 of file dl_malloc.c.

7.17.1.23 CHUNK_ALIGN_MASK

```
#define CHUNK_ALIGN_MASK (MALLOC_ALIGNMENT - SIZE_T_ONE)
```

Definition at line 1618 of file dl_malloc.c.

7.17.1.24 chunk_minus_offset

```
#define chunk_minus_offset(
              p,
              s ) ((mchunkptr)(((char*)(p)) - (s)))
```

Definition at line 2273 of file dl_malloc.c.

7.17.1.25 CHUNK_OVERHEAD

```
#define CHUNK_OVERHEAD (SIZE_T_SIZE)
```

Definition at line 2208 of file dl_malloc.c.

7.17.1.26 chunk_plus_offset

```
#define chunk_plus_offset(
              p,
              s ) ((mchunkptr)(((char*)(p)) + (s)))
```

Definition at line 2272 of file dl_malloc.c.

7.17.1.27 chunksize

```
#define chunksize(
              p ) ((p)->head & ~(FLAG_BITS))
```

Definition at line 2265 of file dl_malloc.c.

7.17.1.28 cinuse

```
#define cinuse(
              p ) ((p)->head & CINUSE_BIT)
```

Definition at line 2259 of file dl_malloc.c.

7.17.1.29 CINUSE_BIT

```
#define CINUSE_BIT (SIZE_T_TWO)
```

Definition at line 2250 of file dl_malloc.c.

7.17.1.30 clear_flag4

```
#define clear_flag4(
              p ) ((p)->head &= ~FLAG4_BIT)
```

Definition at line 2269 of file dl_malloc.c.

7.17.1.31 clear_pinuse

```
#define clear_pinuse(
              p ) ((p)->head &= ~PINUSE_BIT)
```

Definition at line 2267 of file dl_malloc.c.

7.17.1.32 clear_smallmap

```
#define clear_smallmap(
              M,
              i ) ((M)->smallmap &= ~idx2bit(i))
```

Definition at line 2924 of file dl_malloc.c.

7.17.1.33 clear_treemap

```
#define clear_treemap(
              M,
              i ) ((M)->treemap &= ~idx2bit(i))
```

Definition at line 2928 of file dl_malloc.c.

7.17.1.34 CMFAIL

```
#define CMFAIL ((char*)(MFAIL)) /* defined for convenience */
```

Definition at line 1639 of file dl_malloc.c.

7.17.1.35 compute_bit2idx

```
#define compute_bit2idx(
              X,
              I )
```

Value:

```
{\
  unsigned int Y = X - 1;\
  unsigned int K = Y >> (16-4) & 16;\
  unsigned int N = K;        Y >>= K;\
  N += K = Y >> (8-3) &  8;  Y >>= K;\
  N += K = Y >> (4-2) &  4;  Y >>= K;\
  N += K = Y >> (2-1) &  2;  Y >>= K;\
  N += K = Y >> (1-0) &  1;  Y >>= K;\
  I = (bindex_t)(N + Y);\
}
```

Definition at line 2970 of file dl_malloc.c.

7.17.1.36 compute_tree_index

```
#define compute_tree_index(
              S,
              I )
```

Value:

```
{\
  size_t X = S >> TREEBIN_SHIFT;\
  if (X == 0)\
    I = 0;\
  else if (X > 0xFFFF)\
    I = NTREEBINS-1;\
  else {\
    unsigned int Y = (unsigned int)X;\
    unsigned int N = ((Y - 0x100) >> 16) & 8;\
    unsigned int K = (((Y <<= N) - 0x1000) >> 16) & 4;\
    N += K;\
    N += K = (((Y <<= K) - 0x4000) >> 16) & 2;\
    K = 14 - N + ((Y <<= K) >> 15);\
    I = (K << 1) + ((S >> (K + (TREEBIN_SHIFT-1)) & 1));\
  }\
}
```

Definition at line 2883 of file dl_malloc.c.

7.17.1.37 CORRUPTION_ERROR_ACTION

```
#define CORRUPTION_ERROR_ACTION(
              m ) ABORT
```

Definition at line 2784 of file dl_malloc.c.

7.17.1.38 DEBUG

```
#define DEBUG 0
```

Definition at line 1457 of file dl_malloc.c.

7.17.1.39 DEFAULT_GRANULARITY

```
#define DEFAULT_GRANULARITY ((size_t)64U * (size_t)1024U)
```

Definition at line 680 of file dl_malloc.c.

7.17.1.40 DEFAULT_MMAP_THRESHOLD

```
#define DEFAULT_MMAP_THRESHOLD ((size_t)256U * (size_t)1024U)
```

Definition at line 692 of file dl_malloc.c.

7.17.1.41 DEFAULT_TRIM_THRESHOLD

```
#define DEFAULT_TRIM_THRESHOLD ((size_t)2U * (size_t)1024U * (size_t)1024U)
```

Definition at line 685 of file dl_malloc.c.

7.17.1.42 DESTROY_LOCK

```
#define DESTROY_LOCK(
              lk ) pthread_mutex_destroy(lk)
```

Definition at line 2011 of file dl_malloc.c.

7.17.1.43 DIRECT_MMAP_DEFAULT

```
#define DIRECT_MMAP_DEFAULT(
              s ) MMAP_DEFAULT(s)
```

Definition at line 1665 of file dl_malloc.c.

7.17.1.44 disable_contiguous

```
#define disable_contiguous(
              M ) ((M)->mflags |= USE_NONCONTIGUOUS_BIT)
```

Definition at line 2664 of file dl_malloc.c.

7.17.1.45 disable_lock

```
#define disable_lock(
              M )
```

Definition at line 2652 of file dl_malloc.c.

7.17.1.46 disable_mmap

```
#define disable_mmap(
              M ) ((M)->mflags &= ~USE_MMAP_BIT)
```

Definition at line 2658 of file dl_malloc.c.

7.17.1.47 DLMALLOC_EXPORT

```
#define DLMALLOC_EXPORT extern
```

Definition at line 533 of file dl_malloc.c.

7.17.1.48 DLMALLOC_VERSION

```
#define DLMALLOC_VERSION 20806
```

Definition at line 529 of file dl_malloc.c.

7.17.1.49 enable_lock

```
#define enable_lock(
              M ) ((M)->mflags |= USE_LOCK_BIT)
```

Definition at line 2648 of file dl_malloc.c.

7.17.1.50 enable_mmap

```
#define enable_mmap(
              M ) ((M)->mflags |= USE_MMAP_BIT)
```

Definition at line 2656 of file dl_malloc.c.

7.17.1.51 ensure_initialization

```
#define ensure_initialization( ) (void)(mparams.magic != 0 || init_mparams())
```

Definition at line 2630 of file dl_malloc.c.

7.17.1.52 EXTERN_BIT

```
#define EXTERN_BIT (8U)
```

Definition at line 1774 of file dl_malloc.c.

7.17.1.53 FENCEPOST_HEAD

```
#define FENCEPOST_HEAD (INUSE_BITS|SIZE_T_SIZE)
```

Definition at line 2256 of file dl_malloc.c.

7.17.1.54 FLAG4_BIT

```
#define FLAG4_BIT (SIZE_T_FOUR)
```

Definition at line 2251 of file dl_malloc.c.

7.17.1.55 flag4inuse

```
#define flag4inuse(
              p ) ((p)->head & FLAG4_BIT)
```

Definition at line 2261 of file dl_malloc.c.

7.17.1.56 FLAG_BITS

```
#define FLAG_BITS (PINUSE_BIT|CINUSE_BIT|FLAG4_BIT)
```

Definition at line 2253 of file dl_malloc.c.

7.17.1.57 FOOTERS

```
#define FOOTERS 0
```

Definition at line 624 of file dl_malloc.c.

7.17.1.58 FORCEINLINE

```
#define FORCEINLINE
```

Definition at line 813 of file dl_malloc.c.

7.17.1.59 FOUR_SIZE_T_SIZES

```
#define FOUR_SIZE_T_SIZES (SIZE_T_SIZE<<2)
```

Definition at line 1613 of file dl_malloc.c.

7.17.1.60 get_foot

```
#define get_foot(
              p,
              s ) (((mchunkptr)((char*)(p) + (s)))->prev_foot)
```

Definition at line 2283 of file dl_malloc.c.

7.17.1.61 granularity_align

```
#define granularity_align(
              S )
```

Value:

```
(((S) + (mparams.granularity - SIZE_T_ONE))\
   & ~(mparams.granularity - SIZE_T_ONE))
```

Definition at line 2676 of file dl_malloc.c.

7.17.1.62 HALF_MAX_SIZE_T

```
#define HALF_MAX_SIZE_T (MAX_SIZE_T / 2U)
```

Definition at line 1615 of file dl_malloc.c.

7.17.1.63 HAVE_MMAP

```
#define HAVE_MMAP 1
```

Definition at line 643 of file dl_malloc.c.

7.17.1.64 HAVE_MORECORE

```
#define HAVE_MORECORE 0
```

Definition at line 663 of file dl_malloc.c.

7.17.1.65 HAVE_MREMAP

```
#define HAVE_MREMAP 0
```

Definition at line 655 of file dl_malloc.c.

7.17.1.66 idx2bit

```
#define idx2bit(
              i ) ((binmap_t)(1) << (i))
```

Definition at line 2920 of file dl_malloc.c.

7.17.1.67 INITIAL_LOCK

```
#define INITIAL_LOCK(
              lk ) pthread_init_lock(lk)
```

Definition at line 2010 of file dl_malloc.c.

7.17.1.68 INSECURE

```
#define INSECURE 0
```

Definition at line 637 of file dl_malloc.c.

7.17.1.69 insert_chunk

```
#define insert_chunk(
              M,
              P,
              S )
```

Value:

```
if (is_small(S)) insert_small_chunk(M, P, S)\
  else { tchunkptr TP = (tchunkptr)(P); insert_large_chunk(M, TP, S); }
```

Definition at line 3791 of file dl_malloc.c.

7.17.1.70 insert_large_chunk

```
#define insert_large_chunk(
              M,
              X,
              S )
```

Definition at line 3650 of file dl_malloc.c.

7.17.1.71 insert_small_chunk

```
#define insert_small_chunk(
              M,
              P,
              S )
```

Value:

```
{\
  bindex_t I  = small_index(S);\
  mchunkptr B = smallbin_at(M, I);\
  mchunkptr F = B;\
  assert(S >= MIN_CHUNK_SIZE);\
  if (!smallmap_is_marked(M, I))\
    mark_smallmap(M, I);\
  else if (RTCHECK(ok_address(M, B->fd)))\
    F = B->fd;\
  else {\
    CORRUPTION_ERROR_ACTION(M);\
  }\
  B->fd = P;\
  F->bk = P;\
  P->fd = F;\
  P->bk = B;\
}
```

Definition at line 3572 of file dl_malloc.c.

7.17.1.72 internal_free

```
#define internal_free(
              m,
              mem ) mspace_free(m,mem);
```

Definition at line 3804 of file dl_malloc.c.

7.17.1.73 internal_malloc

```
#define internal_malloc(
              m,
              b ) mspace_malloc(m, b)
```

Definition at line 3803 of file dl_malloc.c.

7.17.1.74 INUSE_BITS

```
#define INUSE_BITS (PINUSE_BIT|CINUSE_BIT)
```

Definition at line 2252 of file dl_malloc.c.

7.17.1.75 is_aligned

```
#define is_aligned(
              A ) (((size_t)((A)) & (CHUNK_ALIGN_MASK)) == 0)
```

Definition at line 1621 of file dl_malloc.c.

7.17.1.76 is_extern_segment

```
#define is_extern_segment(
              S ) ((S)->sflags & EXTERN_BIT)
```

Definition at line 2480 of file dl_malloc.c.

7.17.1.77 is_granularity_aligned

```
#define is_granularity_aligned(
              S ) (((size_t)(S) & (mparams.granularity - SIZE_T_ONE)) == 0)
```

Definition at line 2693 of file dl_malloc.c.

7.17.1.78 is_initialized

```
#define is_initialized(
              M ) ((M)->top != 0)
```

Definition at line 2641 of file dl_malloc.c.

7.17.1.79 is_inuse

```
#define is_inuse(
              p ) (((p)->head & INUSE_BITS) != PINUSE_BIT)
```

Definition at line 2262 of file dl_malloc.c.

7.17.1.80 is_mmapped

```
#define is_mmapped(
              p ) (((p)->head & INUSE_BITS) == 0)
```

Definition at line 2263 of file dl_malloc.c.

7.17.1.81 is_mmapped_segment

```
#define is_mmapped_segment(
              S ) ((S)->sflags & USE_MMAP_BIT)
```

Definition at line 2479 of file dl_malloc.c.

7.17.1.82 is_page_aligned

```
#define is_page_aligned(
              S ) (((size_t)(S) & (mparams.page_size - SIZE_T_ONE)) == 0)
```

Definition at line 2691 of file dl_malloc.c.

7.17.1.83 is_small

```
#define is_small(
              s ) (((s) >> SMALLBIN_SHIFT) < NSMALLBINS)
```

Definition at line 2829 of file dl_malloc.c.

7.17.1.84 least_bit

```
#define least_bit(
              x ) ((x) & -(x))
```

Definition at line 2932 of file dl_malloc.c.

7.17.1.85 left_bits

```
#define left_bits(
              x ) ((x<<1) | -(x<<1))
```

Definition at line 2935 of file dl_malloc.c.

7.17.1.86 leftmost_child

```
#define leftmost_child(
              t ) ((t)->child[0] != 0?  (t)->child[0] :  (t)->child[1])
```

Definition at line 2413 of file dl_malloc.c.

7.17.1.87 leftshift_for_tree_index

```
#define leftshift_for_tree_index(
              i )
```

Value:

```
((i == NTREEBINS-1)? 0 : \
    ((SIZE_T_BITSIZE-SIZE_T_ONE) - (((i) >> 1) +
      TREEBIN_SHIFT - 2)))
```

Definition at line 2907 of file dl_malloc.c.

7.17.1.88 LOCK_AT_FORK

```
#define LOCK_AT_FORK 0
```

Definition at line 1531 of file dl_malloc.c.

7.17.1.89 M_GRANULARITY

```
#define M_GRANULARITY (-2)
```

Definition at line 731 of file dl_malloc.c.

7.17.1.90 M_MMAP_THRESHOLD

```
#define M_MMAP_THRESHOLD (-3)
```

Definition at line 732 of file dl_malloc.c.

7.17.1.91 M_TRIM_THRESHOLD

```
#define M_TRIM_THRESHOLD (-1)
```

Definition at line 730 of file dl_malloc.c.

7.17.1.92 MALLINFO_FIELD_TYPE

```
#define MALLINFO_FIELD_TYPE size_t
```

Definition at line 714 of file dl_malloc.c.

7.17.1.93 MALLOC_ALIGNMENT

```
#define MALLOC_ALIGNMENT ((size_t)(2 * sizeof(void *)))
```

Definition at line 621 of file dl_malloc.c.

7.17.1.94 MALLOC_FAILURE_ACTION

```
#define MALLOC_FAILURE_ACTION errno = ENOMEM;
```

Definition at line 659 of file dl_malloc.c.

7.17.1.95 malloc_getpagesize

```
#define malloc_getpagesize ((size_t)4096U)
```

Definition at line 1589 of file dl_malloc.c.

7.17.1.96 MALLOC_INSPECT_ALL

```
#define MALLOC_INSPECT_ALL 0
```

Definition at line 640 of file dl_malloc.c.

7.17.1.97 mark_inuse_foot

```
#define mark_inuse_foot(
              M,
              p,
              s )
```

Definition at line 3051 of file dl_malloc.c.

7.17.1.98 mark_smallmap

```
#define mark_smallmap(
              M,
              i ) ((M)->smallmap |= idx2bit(i))
```

Definition at line 2923 of file dl_malloc.c.

7.17.1.99 mark_treemap

```
#define mark_treemap(
              M,
              i ) ((M)->treemap |= idx2bit(i))
```

Definition at line 2927 of file dl_malloc.c.

7.17.1.100 MAX_RELEASE_CHECK_RATE

```
#define MAX_RELEASE_CHECK_RATE 4095
```

Definition at line 699 of file dl_malloc.c.

7.17.1.101 MAX_REQUEST

```
#define MAX_REQUEST ((-MIN_CHUNK_SIZE) << 2)
```

Definition at line 2227 of file dl_malloc.c.

7.17.1.102 MAX_SIZE_T

```
#define MAX_SIZE_T (~(size_t)0)
```

Definition at line 588 of file dl_malloc.c.

7.17.1.103 MAX_SMALL_REQUEST

```
#define MAX_SMALL_REQUEST (MAX_SMALL_SIZE - CHUNK_ALIGN_MASK - CHUNK_OVERHEAD)
```

Definition at line 2580 of file dl_malloc.c.

7.17.1.104 MAX_SMALL_SIZE

```
#define MAX_SMALL_SIZE (MIN_LARGE_SIZE - SIZE_T_ONE)
```

Definition at line 2579 of file dl_malloc.c.

7.17.1.105 MCHUNK_SIZE

```
#define MCHUNK_SIZE (sizeof(mchunk))
```

Definition at line 2203 of file dl_malloc.c.

7.17.1.106 mem2chunk

```
#define mem2chunk(
              mem ) ((mchunkptr)((char*)(mem) - TWO_SIZE_T_SIZES))
```

Definition at line 2222 of file dl_malloc.c.

7.17.1.107 MFAIL

```
#define MFAIL ((void*)(MAX_SIZE_T))
```

Definition at line 1638 of file dl_malloc.c.

7.17.1.108 MIN_CHUNK_SIZE

```
#define MIN_CHUNK_SIZE ((MCHUNK_SIZE + CHUNK_ALIGN_MASK) & ~CHUNK_ALIGN_MASK)
```

Definition at line 2217 of file dl_malloc.c.

7.17.1.109 MIN_LARGE_SIZE

```
#define MIN_LARGE_SIZE (SIZE_T_ONE << TREEBIN_SHIFT)
```

Definition at line 2578 of file dl_malloc.c.

7.17.1.110 MIN_REQUEST

```
#define MIN_REQUEST (MIN_CHUNK_SIZE - CHUNK_OVERHEAD - SIZE_T_ONE)
```

Definition at line 2228 of file dl_malloc.c.

7.17.1.111 MIN_SMALL_INDEX

```
#define MIN_SMALL_INDEX (small_index(MIN_CHUNK_SIZE))
```

Definition at line 2832 of file dl_malloc.c.

7.17.1.112 minsize_for_tree_index

```
#define minsize_for_tree_index(
              i )
```

Value:

```
((SIZE_T_ONE << (((i) >> 1) + TREEBIN_SHIFT)) |  \
   (((size_t)((i) & SIZE_T_ONE)) << (((i) >> 1) + TREEBIN_SHIFT - 1)))
```

Definition at line 2912 of file dl_malloc.c.

7.17.1.113 MLOCK_T

```
#define MLOCK_T pthread_mutex_t
```

Definition at line 2006 of file dl_malloc.c.

7.17.1.114 mmap_align

```
#define mmap_align(
              S ) page_align(S)
```

Definition at line 2685 of file dl_malloc.c.

7.17.1.115 MMAP_CHUNK_OVERHEAD

```
#define MMAP_CHUNK_OVERHEAD (TWO_SIZE_T_SIZES)
```

Definition at line 2212 of file dl_malloc.c.

7.17.1.116 MMAP_CLEARS

```
#define MMAP_CLEARS 1
```

Definition at line 646 of file dl_malloc.c.

7.17.1.117 MMAP_DEFAULT

```
#define MMAP_DEFAULT(
              s )
```

Value:

```
((dev_zero_fd < 0) ? \
          (dev_zero_fd = open("/dev/zero", O_RDWR), \
           mmap(0, (s), MMAP_PROT, MMAP_FLAGS, dev_zero_fd, 0)) : \
           mmap(0, (s), MMAP_PROT, MMAP_FLAGS, dev_zero_fd, 0))
```

Definition at line 1659 of file dl_malloc.c.

7.17.1.118 MMAP_FLAGS

```
#define MMAP_FLAGS (MAP_PRIVATE)
```

Definition at line 1657 of file dl_malloc.c.

7.17.1.119 MMAP_FOOT_PAD

```
#define MMAP_FOOT_PAD (FOUR_SIZE_T_SIZES)
```

Definition at line 2214 of file dl_malloc.c.

7.17.1.120 MMAP_PROT

```
#define MMAP_PROT (PROT_READ|PROT_WRITE)
```

Definition at line 1645 of file dl_malloc.c.

7.17.1.121 MORECORE_CONTIGUOUS

```
#define MORECORE_CONTIGUOUS 0
```

Definition at line 669 of file dl_malloc.c.

7.17.1.122 MSPACES

```
#define MSPACES 1
```

Definition at line 615 of file dl_malloc.c.

7.17.1.123 MUNMAP_DEFAULT

```
#define MUNMAP_DEFAULT(
              a,
              s ) munmap((a), (s))
```

Definition at line 1644 of file dl_malloc.c.

7.17.1.124 next_chunk

```
#define next_chunk(
              p ) ((mchunkptr)( ((char*)(p)) + ((p)->head & ~FLAG_BITS)))
```

Definition at line 2276 of file dl_malloc.c.

7.17.1.125 next_pinuse

```
#define next_pinuse(
              p ) ((next_chunk(p)->head) & PINUSE_BIT)
```

Definition at line 2280 of file dl_malloc.c.

7.17.1.126 NO_MALLINFO

```
#define NO_MALLINFO 0
```

Definition at line 711 of file dl_malloc.c.

7.17.1.127 NO_MALLOC_STATS

```
#define NO_MALLOC_STATS 0
```

Definition at line 717 of file dl_malloc.c.

7.17.1.128 NO_SEGMENT_TRAVERSAL

```
#define NO_SEGMENT_TRAVERSAL 0
```

Definition at line 720 of file dl_malloc.c.

7.17.1.129 NOINLINE

```
#define NOINLINE
```

Definition at line 802 of file dl_malloc.c.

7.17.1.130 NSMALLBINS

```
#define NSMALLBINS (32U)
```

Definition at line 2573 of file dl_malloc.c.

7.17.1.131 NTREEBINS

```
#define NTREEBINS (32U)
```

Definition at line 2574 of file dl_malloc.c.

7.17.1.132 ok_address

```
#define ok_address(
              M,
              a ) ((char*)(a) >= (M)->least_addr)
```

Definition at line 3014 of file dl_malloc.c.

7.17.1.133 ok_inuse

```
#define ok_inuse(
              p ) is_inuse(p)
```

Definition at line 3018 of file dl_malloc.c.

7.17.1.134 ok_magic

```
#define ok_magic(
              M ) (1)
```

Definition at line 3033 of file dl_malloc.c.

7.17.1.135 ok_next

```
#define ok_next(
              p,
              n ) ((char*)(p) < (char*)(n))
```

Definition at line 3016 of file dl_malloc.c.

7.17.1.136 ok_pinuse

```
#define ok_pinuse(
              p ) pinuse(p)
```

Definition at line 3020 of file dl_malloc.c.

7.17.1.137 ONLY_MSPACES

```
#define ONLY_MSPACES 1
```

Definition at line 2 of file dl_malloc.c.

7.17.1.138 overhead_for

```
#define overhead_for(
              p ) (is_mmapped(p)?  MMAP_CHUNK_OVERHEAD : CHUNK_OVERHEAD)
```

Definition at line 2295 of file dl_malloc.c.

7.17.1.139 pad_request

```
#define pad_request(
              req ) (((req) + CHUNK_OVERHEAD + CHUNK_ALIGN_MASK) & ~CHUNK_ALIGN_MASK)
```

Definition at line 2231 of file dl_malloc.c.

7.17.1.140 page_align

```
#define page_align(
              S ) (((S) + (mparams.page_size - SIZE_T_ONE)) & ~(mparams.page_size - SIZE_T_O↩
NE))
```

Definition at line 2672 of file dl_malloc.c.

7.17.1.141 pinuse

```
#define pinuse(
              p ) ((p)->head & PINUSE_BIT)
```

Definition at line 2260 of file dl_malloc.c.

7.17.1.142 PINUSE_BIT

```
#define PINUSE_BIT (SIZE_T_ONE)
```

Definition at line 2249 of file dl_malloc.c.

7.17.1.143 POSTACTION

```
#define POSTACTION(
              M ) { if (use_lock(M)) RELEASE_LOCK(&(M)->mutex); }
```

Definition at line 2749 of file dl_malloc.c.

7.17.1.144 PREACTION

```
#define PREACTION(
              M ) ((use_lock(M))? ACQUIRE_LOCK(&(M)->mutex) :  0)
```

Definition at line 2748 of file dl_malloc.c.

7.17.1.145 prev_chunk

```
#define prev_chunk(
              p ) ((mchunkptr)( ((char*)(p)) - ((p)->prev_foot) ))
```

Definition at line 2277 of file dl_malloc.c.

7.17.1.146 PROCEED_ON_ERROR

```
#define PROCEED_ON_ERROR 0
```

Definition at line 633 of file dl_malloc.c.

7.17.1.147 RELEASE_LOCK

```
#define RELEASE_LOCK(
              lk ) pthread_mutex_unlock(lk)
```

Definition at line 2008 of file dl_malloc.c.

7.17.1.148 RELEASE_MALLOC_GLOBAL_LOCK

```
#define RELEASE_MALLOC_GLOBAL_LOCK( ) RELEASE_LOCK(&malloc_global_mutex);
```

Definition at line 2045 of file dl_malloc.c.

7.17.1.149 replace_dv

```
#define replace_dv(
              M,
              P,
              S )
```

Value:

```
{\
  size_t DVS = M->dvsize;\
  assert(is_small(DVS));\
  if (DVS != 0) {\
    mchunkptr DV = M->dv;\
    insert_small_chunk(M, DV, DVS);\
  }\
  M->dvsize = S;\
  M->dv = P;\
}
```

Definition at line 3636 of file dl_malloc.c.

7.17.1.150 request2size

```
#define request2size(
              req ) (((req) < MIN_REQUEST)? MIN_CHUNK_SIZE : pad_request(req))
```

Definition at line 2235 of file dl_malloc.c.

7.17.1.151 RTCHECK

```
#define RTCHECK(
              e ) (e)
```

Definition at line 3041 of file dl_malloc.c.

7.17.1.152 same_or_left_bits

```
#define same_or_left_bits(
              x ) ((x) | -(x))
```

Definition at line 2938 of file dl_malloc.c.

7.17.1.153 segment_holds

```
#define segment_holds(
              S,
              A ) ((char*)(A) >= S->base && (char*)(A) < S->base + S->size)
```

Definition at line 2697 of file dl_malloc.c.

7.17.1.154 set_flag4

```
#define set_flag4(
              p ) ((p)->head |= FLAG4_BIT)
```

Definition at line 2268 of file dl_malloc.c.

7.17.1.155 set_foot

```
#define set_foot(
              p,
              s ) (((mchunkptr)((char*)(p) + (s)))->prev_foot = (s))
```

Definition at line 2284 of file dl_malloc.c.

7.17.1.156 set_free_with_pinuse

```
#define set_free_with_pinuse(
              p,
              s,
              n ) (clear_pinuse(n), set_size_and_pinuse_of_free_chunk(p, s))
```

Definition at line 2291 of file dl_malloc.c.

7.17.1.157 set_inuse

```
#define set_inuse(
              M,
              p,
              s )
```

Value:

```
((p)->head = (((p)->head & PINUSE_BIT)|s|CINUSE_BIT),\
  ((mchunkptr)(((char*)(p)) + (s)))->head |= PINUSE_BIT)
```

Definition at line 3056 of file dl_malloc.c.

7.17.1.158 set_inuse_and_pinuse

```
#define set_inuse_and_pinuse(
              M,
              p,
              s )
```

Value:

```
((p)->head = (s|PINUSE_BIT|CINUSE_BIT),\
  ((mchunkptr)(((char*)(p)) + (s)))->head |= PINUSE_BIT)
```

Definition at line 3061 of file dl_malloc.c.

7.17.1.159 set_lock

```
#define set_lock(
              M,
              L )
```

Value:

```
((M)->mflags = (L)?\
  ((M)->mflags | USE_LOCK_BIT) :\
  ((M)->mflags & ~USE_LOCK_BIT))
```

Definition at line 2666 of file dl_malloc.c.

7.17.1.160 set_size_and_pinuse_of_free_chunk

```
#define set_size_and_pinuse_of_free_chunk(
              p,
              s ) ((p)->head = (s|PINUSE_BIT), set_foot(p, s))
```

Definition at line 2287 of file dl_malloc.c.

7.17.1.161 set_size_and_pinuse_of_inuse_chunk

```
#define set_size_and_pinuse_of_inuse_chunk(
              M,
              p,
              s ) ((p)->head = (s|PINUSE_BIT|CINUSE_BIT))
```

Definition at line 3066 of file dl_malloc.c.

7.17.1.162 should_trim

```
#define should_trim(
              M,
              s ) ((s) > (M)->trim_check)
```

Definition at line 2725 of file dl_malloc.c.

7.17.1.163 SIX_SIZE_T_SIZES

```
#define SIX_SIZE_T_SIZES (FOUR_SIZE_T_SIZES+TWO_SIZE_T_SIZES)
```

Definition at line 1614 of file dl_malloc.c.

7.17.1.164 SIZE_T_BITSIZE

```
#define SIZE_T_BITSIZE (sizeof(size_t) << 3)
```

Definition at line 1604 of file dl_malloc.c.

7.17.1.165 SIZE_T_FOUR

```
#define SIZE_T_FOUR ((size_t)4)
```

Definition at line 1611 of file dl_malloc.c.

7.17.1.166 SIZE_T_ONE

```
#define SIZE_T_ONE ((size_t)1)
```

Definition at line 1609 of file dl_malloc.c.

7.17.1.167 SIZE_T_SIZE

```
#define SIZE_T_SIZE (sizeof(size_t))
```

Definition at line 1603 of file dl_malloc.c.

7.17.1.168 SIZE_T_TWO

```
#define SIZE_T_TWO ((size_t)2)
```

Definition at line 1610 of file dl_malloc.c.

7.17.1.169 SIZE_T_ZERO

```
#define SIZE_T_ZERO ((size_t)0)
```

Definition at line 1608 of file dl_malloc.c.

7.17.1.170 small_index

```
#define small_index(
              s ) (bindex_t)((s) >> SMALLBIN_SHIFT)
```

Definition at line 2830 of file dl_malloc.c.

7.17.1.171 small_index2size

```
#define small_index2size(
              i ) ((i) << SMALLBIN_SHIFT)
```

Definition at line 2831 of file dl_malloc.c.

7.17.1.172 smallbin_at

```
#define smallbin_at(
              M,
              i ) ((sbinptr)((char*)&((M)->smallbins[(i)<<1])))
```

Definition at line 2835 of file dl_malloc.c.

7.17.1.173 SMALLBIN_SHIFT

```
#define SMALLBIN_SHIFT (3U)
```

Definition at line 2575 of file dl_malloc.c.

7.17.1.174 SMALLBIN_WIDTH

```
#define SMALLBIN_WIDTH (SIZE_T_ONE << SMALLBIN_SHIFT)
```

Definition at line 2576 of file dl_malloc.c.

7.17.1.175 smallmap_is_marked

```
#define smallmap_is_marked(
              M,
              i ) ((M)->smallmap & idx2bit(i))
```

Definition at line 2925 of file dl_malloc.c.

7.17.1.176 STRUCT_MALLINFO_DECLARED

```
#define STRUCT_MALLINFO_DECLARED 1
```

Definition at line 767 of file dl_malloc.c.

7.17.1.177 SYS_ALLOC_PADDING

```
#define SYS_ALLOC_PADDING (TOP_FOOT_SIZE + MALLOC_ALIGNMENT)
```

Definition at line 2689 of file dl_malloc.c.

7.17.1.178 TOP_FOOT_SIZE

```
#define TOP_FOOT_SIZE (align_offset(chunk2mem(0))+pad_request(sizeof(struct malloc_segment))+M↩
IN_CHUNK_SIZE)
```

Definition at line 2735 of file dl_malloc.c.

7.17.1.179 treebin_at

```
#define treebin_at(
              M,
              i ) (&((M)->treebins[i]))
```

Definition at line 2836 of file dl_malloc.c.

7.17.1.180 TREEBIN_SHIFT

```
#define TREEBIN_SHIFT (8U)
```

Definition at line 2577 of file dl_malloc.c.

7.17.1.181 treemap_is_marked

```
#define treemap_is_marked(
              M,
              i ) ((M)->treemap & idx2bit(i))
```

Definition at line 2929 of file dl_malloc.c.

7.17.1.182 TRY_LOCK

```
#define TRY_LOCK(
              lk ) (!pthread_mutex_trylock(lk))
```

Definition at line 2009 of file dl_malloc.c.

7.17.1.183 TWO_SIZE_T_SIZES

```
#define TWO_SIZE_T_SIZES (SIZE_T_SIZE<<1)
```

Definition at line 1612 of file dl_malloc.c.

7.17.1.184 unlink_chunk

```
#define unlink_chunk(
              M,
              P,
              S )
```

Value:

```
if (is_small(S)) unlink_small_chunk(M, P, S)\
  else { tchunkptr TP = (tchunkptr)(P); unlink_large_chunk(M, TP); }
```

Definition at line 3795 of file dl_malloc.c.

7.17.1.185 unlink_first_small_chunk

```
#define unlink_first_small_chunk(
                M,
                B,
                P,
                I )
```

Value:

```
{\
  mchunkptr F = P->fd;\
  assert(P != B);\
  assert(P != F);\
  assert(chunksize(P) == small_index2size(I));\
  if (B == F) {\
    clear_smallmap(M, I);\
  }\
  else if (RTCHECK(ok_address(M, F) && F->bk == P)) {\
    F->bk = B;\
    B->fd = F;\
  }\
  else {\
    CORRUPTION_ERROR_ACTION(M);\
  }\
}
```

Definition at line 3617 of file dl_malloc.c.

7.17.1.186 unlink_large_chunk

```
#define unlink_large_chunk(
                M,
                X )
```

Definition at line 3718 of file dl_malloc.c.

7.17.1.187 unlink_small_chunk

```
#define unlink_small_chunk(
                M,
                P,
                S )
```

Value:

```
{\
  mchunkptr F = P->fd;\
  mchunkptr B = P->bk;\
  bindex_t I = small_index(S);\
  assert(P != B);\
  assert(P != F);\
  assert(chunksize(P) == small_index2size(I));\
  if (RTCHECK(F == smallbin_at(M,I) || (ok_address(M, F) && F->bk == P))) { \
    if (B == F) {\
      clear_smallmap(M, I);\
    }\
    else if (RTCHECK(B == smallbin_at(M,I) ||\
```

```
                    (ok_address(M, B) && B->fd == P))) {\
      F->bk = B;\
      B->fd = F;\
    }\
    else {\
      CORRUPTION_ERROR_ACTION(M);\
    }\
  }\
  else {\
    CORRUPTION_ERROR_ACTION(M);\
  }\
}
```

Definition at line 3591 of file dl_malloc.c.

7.17.1.188 USAGE_ERROR_ACTION

```
#define USAGE_ERROR_ACTION(
              m,
              p ) ABORT
```

Definition at line 2788 of file dl_malloc.c.

7.17.1.189 USE_BUILTIN_FFS

```
#define USE_BUILTIN_FFS 0
```

Definition at line 705 of file dl_malloc.c.

7.17.1.190 USE_DEV_RANDOM

```
#define USE_DEV_RANDOM 0
```

Definition at line 708 of file dl_malloc.c.

7.17.1.191 use_lock

```
#define use_lock(
              M ) ((M)->mflags & USE_LOCK_BIT)
```

Definition at line 2647 of file dl_malloc.c.

7.17.1.192 USE_LOCK_BIT

```
#define USE_LOCK_BIT (2U)
```

Definition at line 2038 of file dl_malloc.c.

7.17.1.193 USE_LOCKS

```
#define USE_LOCKS
```

Value:

```
((defined(USE_SPIN_LOCKS) && USE_SPIN_LOCKS != 0) || \
                   (defined(USE_RECURSIVE_LOCKS) && USE_RECURSIVE_LOCKS != 0))
```

Definition at line 591 of file dl_malloc.c.

7.17.1.194 use_mmap

```
#define use_mmap(
              M ) ((M)->mflags & USE_MMAP_BIT)
```

Definition at line 2655 of file dl_malloc.c.

7.17.1.195 USE_MMAP_BIT

```
#define USE_MMAP_BIT (SIZE_T_ONE)
```

Define CALL_MMAP/CALL_MUNMAP/CALL_DIRECT_MMAP

Definition at line 1729 of file dl_malloc.c.

7.17.1.196 use_noncontiguous

```
#define use_noncontiguous(
              M ) ((M)->mflags & USE_NONCONTIGUOUS_BIT)
```

Definition at line 2663 of file dl_malloc.c.

7.17.1.197 USE_NONCONTIGUOUS_BIT

```
#define USE_NONCONTIGUOUS_BIT (4U)
```

Definition at line 1771 of file dl_malloc.c.

7.17.1.198 USE_SPIN_LOCKS

```
#define USE_SPIN_LOCKS 0
```

Definition at line 607 of file dl_malloc.c.

7.17.2 Typedef Documentation

7.17.2.1 bindex_t

```
typedef unsigned int bindex_t
```

Definition at line 2197 of file dl_malloc.c.

7.17.2.2 binmap_t

```
typedef unsigned int binmap_t
```

Definition at line 2198 of file dl_malloc.c.

7.17.2.3 flag_t

```
typedef unsigned int flag_t
```

Definition at line 2199 of file dl_malloc.c.

7.17.2.4 mchunk

```
typedef struct malloc_chunk mchunk
```

Definition at line 2194 of file dl_malloc.c.

7.17.2.5 mchunkptr

```
typedef struct malloc_chunk* mchunkptr
```

Definition at line 2195 of file dl_malloc.c.

7.17.2.6 msegment

```
typedef struct malloc_segment msegment
```

Definition at line 2482 of file dl_malloc.c.

7.17.2.7 msegmentptr

```
typedef struct malloc_segment* msegmentptr
```

Definition at line 2483 of file dl_malloc.c.

7.17.2.8 mspace

```
typedef void* mspace
```

Definition at line 1275 of file dl_malloc.c.

7.17.2.9 mstate

```
typedef struct malloc_state* mstate
```

Definition at line 2607 of file dl_malloc.c.

7.17.2.10 sbinptr

```
typedef struct malloc_chunk* sbinptr
```

Definition at line 2196 of file dl_malloc.c.

7.17.2.11 tbinptr

```
typedef struct malloc_tree_chunk* tbinptr
```

Definition at line 2410 of file dl_malloc.c.

7.17.2.12 tchunk

```
typedef struct malloc_tree_chunk tchunk
```

Definition at line 2408 of file dl_malloc.c.

7.17.2.13 tchunkptr

```
typedef struct malloc_tree_chunk* tchunkptr
```

Definition at line 2409 of file dl_malloc.c.

7.17.3 Function Documentation

7.17.3.1 create_mspace()

```
mspace create_mspace (
            size_t capacity,
            int locked )
```

Definition at line 5424 of file dl_malloc.c.

7.17.3.2 create_mspace_with_base()

```
mspace create_mspace_with_base (
            void * base,
            size_t capacity,
            int locked )
```

Definition at line 5443 of file dl_malloc.c.

7.17.3.3 destroy_mspace()

```
size_t destroy_mspace (
            mspace msp )
```

Definition at line 5474 of file dl_malloc.c.

7.17.3.4 mspace_bulk_free()

```
size_t mspace_bulk_free (
            mspace msp,
            void * array[],
            size_t nelem )
```

Definition at line 5846 of file dl_malloc.c.

7.17.3.5 mspace_calloc()

```
void * mspace_calloc (
            mspace msp,
            size_t n_elements,
            size_t elem_size )
```

Definition at line 5717 of file dl_malloc.c.

7.17.3.6 mspace_footprint()

```
size_t mspace_footprint (
            mspace msp )
```

Definition at line 5897 of file dl_malloc.c.

7.17.3.7 mspace_footprint_limit()

```
size_t mspace_footprint_limit (
            mspace msp )
```

Definition at line 5921 of file dl_malloc.c.

7.17.3.8 mspace_free()

```
void mspace_free (
            mspace msp,
            void * mem )
```

Definition at line 5616 of file dl_malloc.c.

7.17.3.9 mspace_independent_calloc()

```
void ** mspace_independent_calloc (
            mspace msp,
            size_t n_elements,
            size_t elem_size,
            void * chunks[] )
```

Definition at line 5825 of file dl_malloc.c.

7.17.3.10 mspace_independent_comalloc()

```
void ** mspace_independent_comalloc (
            mspace msp,
            size_t n_elements,
            size_t sizes[],
            void * chunks[] )
```

Definition at line 5836 of file dl_malloc.c.

7.17.3.11 mspace_mallinfo()

```
struct mallinfo mspace_mallinfo (
            mspace msp )
```

Definition at line 5953 of file dl_malloc.c.

7.17.3.12 mspace_malloc()

```
void * mspace_malloc (
            mspace msp,
            size_t bytes )
```

Definition at line 5502 of file dl_malloc.c.

7.17.3.13 mspace_malloc_stats()

```
void mspace_malloc_stats (
             mspace msp )
```

Definition at line 5886 of file dl_malloc.c.

7.17.3.14 mspace_mallopt()

```
int mspace_mallopt (
             int param_number,
             int value )
```

Definition at line 5971 of file dl_malloc.c.

7.17.3.15 mspace_max_footprint()

```
size_t mspace_max_footprint (
             mspace msp )
```

Definition at line 5909 of file dl_malloc.c.

7.17.3.16 mspace_memalign()

```
void * mspace_memalign (
             mspace msp,
             size_t alignment,
             size_t bytes )
```

Definition at line 5814 of file dl_malloc.c.

7.17.3.17 mspace_realloc()

```
void * mspace_realloc (
             mspace msp,
             void * mem,
             size_t newsize )
```

Definition at line 5737 of file dl_malloc.c.

7.17.3.18 mspace_realloc_in_place()

```
void* mspace_realloc_in_place (
             mspace msp,
             void * oldmem,
             size_t bytes )
```

Definition at line 5782 of file dl_malloc.c.

7.17.3.19 mspace_set_footprint_limit()

```
size_t mspace_set_footprint_limit (
             mspace msp,
             size_t bytes )
```

Definition at line 5934 of file dl_malloc.c.

7.17.3.20 mspace_track_large_chunks()

```
int mspace_track_large_chunks (
             mspace msp,
             int enable )
```

Definition at line 5457 of file dl_malloc.c.

7.17.3.21 mspace_trim()

```
int mspace_trim (
             mspace msp,
             size_t pad )
```

Definition at line 5870 of file dl_malloc.c.

7.17.3.22 mspace_usable_size()

```
size_t mspace_usable_size (
             const void * mem )
```

Definition at line 5962 of file dl_malloc.c.

7.18 dl_malloc.h File Reference

```
#include <stddef.h>
```

Classes

- struct mallinfo

Macros

- #define ONLY_MSPACES 1
- #define ONLY_MSPACES 1
- #define NO_MALLINFO 0
- #define MSPACES 1
- #define MALLINFO_FIELD_TYPE size_t
- #define STRUCT_MALLINFO_DECLARED 1

Typedefs

- typedef void * mspace

Functions

- size_t dlmalloc_usable_size (const void *)
- mspace create_mspace (size_t capacity, int locked)
- size_t destroy_mspace (mspace msp)
- mspace create_mspace_with_base (void *base, size_t capacity, int locked)
- int mspace_track_large_chunks (mspace msp, int enable)
- struct mallinfo mspace_mallinfo (mspace msp)
- int mspace_mallopt (int, int)
- void * mspace_malloc (mspace msp, size_t bytes)
- void mspace_free (mspace msp, void *mem)
- void * mspace_calloc (mspace msp, size_t n_elements, size_t elem_size)
- void * mspace_realloc (mspace msp, void *mem, size_t newsize)
- void * mspace_realloc_in_place (mspace msp, void *mem, size_t newsize)
- void * mspace_memalign (mspace msp, size_t alignment, size_t bytes)
- void ** mspace_independent_calloc (mspace msp, size_t n_elements, size_t elem_size, void *chunks[])
- void ** mspace_independent_comalloc (mspace msp, size_t n_elements, size_t sizes[], void *chunks[])
- size_t mspace_bulk_free (mspace msp, void **, size_t n_elements)
- size_t mspace_usable_size (const void *mem)
- void mspace_malloc_stats (mspace msp)
- int mspace_trim (mspace msp, size_t pad)
- size_t mspace_footprint (mspace msp)
- size_t mspace_max_footprint (mspace msp)
- size_t mspace_footprint_limit (mspace msp)
- size_t mspace_set_footprint_limit (mspace msp, size_t bytes)
- void mspace_inspect_all (mspace msp, void(*handler)(void *, void *, size_t, void *), void *arg)

7.18.1 Macro Definition Documentation

7.18.1.1 MALLINFO_FIELD_TYPE

```
#define MALLINFO_FIELD_TYPE size_t
```

Definition at line 57 of file dl_malloc.h.

7.18.1.2 MSPACES

```
#define MSPACES 1
```

Definition at line 46 of file dl_malloc.h.

7.18.1.3 NO_MALLINFO

```
#define NO_MALLINFO 0
```

Definition at line 41 of file dl_malloc.h.

7.18.1.4 ONLY_MSPACES [1/2]

```
#define ONLY_MSPACES 1
```

Definition at line 38 of file dl_malloc.h.

7.18.1.5 ONLY_MSPACES [2/2]

```
#define ONLY_MSPACES 1
```

Definition at line 38 of file dl_malloc.h.

7.18.1.6 STRUCT_MALLINFO_DECLARED

```
#define STRUCT_MALLINFO_DECLARED 1
```

Definition at line 60 of file dl_malloc.h.

7.18.2 Typedef Documentation

7.18.2.1 mspace

```
typedef void* mspace
```

Definition at line 533 of file dl_malloc.h.

7.18.3 Function Documentation

7.18.3.1 create_mspace()

```
mspace create_mspace (
            size_t capacity,
            int locked )
```

Definition at line 5424 of file dl_malloc.c.

7.18.3.2 create_mspace_with_base()

```
mspace create_mspace_with_base (
            void * base,
            size_t capacity,
            int locked )
```

Definition at line 5443 of file dl_malloc.c.

7.18.3.3 destroy_mspace()

```
size_t destroy_mspace (
            mspace msp )
```

Definition at line 5474 of file dl_malloc.c.

7.18.3.4 dlmalloc_usable_size()

```
size_t dlmalloc_usable_size (
            const void *  )
```

7.18.3.5 mspace_bulk_free()

```
size_t mspace_bulk_free (
            mspace msp,
            void ** ,
            size_t n_elements )
```

7.18.3.6 mspace_calloc()

```
void* mspace_calloc (
            mspace msp,
            size_t n_elements,
            size_t elem_size )
```

Definition at line 5717 of file dl_malloc.c.

7.18.3.7 mspace_footprint()

```
size_t mspace_footprint (
            mspace msp )
```

Definition at line 5897 of file dl_malloc.c.

7.18.3.8 mspace_footprint_limit()

```
size_t mspace_footprint_limit (
            mspace msp )
```

Definition at line 5921 of file dl_malloc.c.

7.18.3.9 mspace_free()

```
void mspace_free (
             mspace msp,
             void * mem )
```

Definition at line 5616 of file dl_malloc.c.

7.18.3.10 mspace_independent_calloc()

```
void** mspace_independent_calloc (
             mspace msp,
             size_t n_elements,
             size_t elem_size,
             void * chunks[] )
```

Definition at line 5825 of file dl_malloc.c.

7.18.3.11 mspace_independent_comalloc()

```
void** mspace_independent_comalloc (
             mspace msp,
             size_t n_elements,
             size_t sizes[],
             void * chunks[] )
```

Definition at line 5836 of file dl_malloc.c.

7.18.3.12 mspace_inspect_all()

```
void mspace_inspect_all (
             mspace msp,
             void(*)(void *, void *, size_t, void *) handler,
             void * arg )
```

7.18.3.13 mspace_mallinfo()

```
struct mallinfo mspace_mallinfo (
             mspace msp )
```

Definition at line 5953 of file dl_malloc.c.

7.18.3.14 mspace_malloc()

```
void* mspace_malloc (
             mspace msp,
             size_t bytes )
```

Definition at line 5502 of file dl_malloc.c.

7.18.3.15 mspace_malloc_stats()

```
void mspace_malloc_stats (
             mspace msp )
```

Definition at line 5886 of file dl_malloc.c.

7.18.3.16 mspace_mallopt()

```
int mspace_mallopt (
             int ,
             int  )
```

Definition at line 5971 of file dl_malloc.c.

7.18.3.17 mspace_max_footprint()

```
size_t mspace_max_footprint (
             mspace msp )
```

Definition at line 5909 of file dl_malloc.c.

7.18.3.18 mspace_memalign()

```
void* mspace_memalign (
             mspace msp,
             size_t alignment,
             size_t bytes )
```

Definition at line 5814 of file dl_malloc.c.

7.18.3.19 mspace_realloc()

```
void* mspace_realloc (
             mspace msp,
             void * mem,
             size_t newsize )
```

Definition at line 5737 of file dl_malloc.c.

7.18.3.20 mspace_realloc_in_place()

```
void* mspace_realloc_in_place (
             mspace msp,
             void * mem,
             size_t newsize )
```

Definition at line 5782 of file dl_malloc.c.

7.18.3.21 mspace_set_footprint_limit()

```
size_t mspace_set_footprint_limit (
             mspace msp,
             size_t bytes )
```

Definition at line 5934 of file dl_malloc.c.

7.18.3.22 mspace_track_large_chunks()

```
int mspace_track_large_chunks (
             mspace msp,
             int enable )
```

Definition at line 5457 of file dl_malloc.c.

7.18.3.23 mspace_trim()

```
int mspace_trim (
             mspace msp,
             size_t pad )
```

Definition at line 5870 of file dl_malloc.c.

7.18.3.24 mspace_usable_size()

```
size_t mspace_usable_size (
            const void * mem )
```

Definition at line 5962 of file dl_malloc.c.

7.19 future.hpp File Reference

```
#include <upcxx/future/core.hpp>
#include <upcxx/future/future1.hpp>
#include <upcxx/future/apply.hpp>
#include <upcxx/future/make_future.hpp>
#include <upcxx/future/promise.hpp>
#include <upcxx/future/then.hpp>
#include <upcxx/future/when_all.hpp>
```

7.20 future/apply.hpp File Reference

```
#include <upcxx/future/core.hpp>
#include <upcxx/future/make_future.hpp>
```

Classes

- struct upcxx::detail::apply_tupled_as_future_impl< Return >
- struct upcxx::detail::apply_tupled_as_future_impl< void >
- struct upcxx::detail::apply_tupled_as_future_impl< Return >
- struct upcxx::detail::apply_tupled_as_future_impl< future1< Kind, T... > >
- struct upcxx::detail::apply_tupled_as_future_help< Fn, ArgTup, ArgTupDecayed >
- struct upcxx::detail::apply_tupled_as_future_help< Fn, ArgTup, std::tuple< T... > >
- struct upcxx::detail::apply_tupled_as_future< Fn, ArgTup >
- struct upcxx::detail::apply_futured_as_future< Fn(future1< Kind, T... >)>

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename Fn , typename ArgTup >
  auto upcxx::apply_tupled_as_future (Fn &&fn, ArgTup &&argtup) -> decltype(detail::apply_tupled_as_↩ future< Fn, ArgTup >()(std::forward< Fn >(fn), std::forward< ArgTup >(argtup)))

7.21 future/body_pure.hpp File Reference

```
#include <upcxx/future/core.hpp>
```

Classes

- struct upcxx::detail::future_body_pure< future1< Kind, T... > >

Namespaces

- upcxx
- upcxx::detail

7.22 future/core.cpp File Reference

```
#include <upcxx/future/core.hpp>
```

Typedefs

- template<typename ... T>
  using future_header_result = upcxx::detail::future_header_result< T... >

7.22.1 Typedef Documentation

7.22.1.1 future_header_result

```
template<typename ...  T>
using future_header_result = upcxx::detail::future_header_result<T...>
```

Definition at line 11 of file core.cpp.

7.23 future/core.hpp File Reference

```
#include <upcxx/diagnostic.hpp>
#include <upcxx/utility.hpp>
```

Classes

- struct upcxx::detail::future_header_result< T >
- struct upcxx::detail::future_dependency< FuArg >
- struct upcxx::detail::future_body_proxy< T >
- struct upcxx::detail::future_body_pure< FuArg >
- struct upcxx::detail::future_body_then< FuArg, Fn >
- struct upcxx::detail::future_impl_shref< HeaderOps, T >
- struct upcxx::detail::future_impl_result< T >
- struct upcxx::detail::future_impl_when_all< ArgTuple, T >
- struct upcxx::detail::future_impl_mapped< FuArg, Fn, T >
- struct upcxx::detail::future_kind_shref< HeaderOps >
- struct upcxx::detail::future_kind_result
- struct upcxx::detail::future_kind_when_all< FuArg >
- struct upcxx::detail::future_kind_mapped< FuArg, Fn >
- struct upcxx::future1< Kind, T >
- struct upcxx::future_is_trivially_ready< FutureOrKind >
- struct upcxx::detail::future_from_tuple< Kind, Tup >
- struct upcxx::detail::future_from_tuple< Kind, std::tuple< T... > >
- struct upcxx::detail::future_then< Arg, Fn, FnRet, arg_trivial >
- struct upcxx::detail::future_then_pure< Arg, Fn, FnRet, arg_trivial, fnret_trivial >
- struct upcxx::detail::future_header
- struct upcxx::detail::future_header::dependency_link
- struct upcxx::detail::future_header_dependent
- struct upcxx::detail::future_header_ops_general
- struct upcxx::detail::future_header_ops_result
- struct upcxx::detail::future_header_ops_result_ready
- struct upcxx::detail::future_body
- struct upcxx::detail::future_body_proxy_
- struct upcxx::detail::future_body_proxy< T >
- struct upcxx::detail::future_header_result< T >
- struct upcxx::detail::future_header_result<>

Namespaces

- upcxx
- upcxx::detail

Typedefs

- template<typename ... T>
  using upcxx::future = future1< detail::future_kind_shref< detail::future_header_ops_general >, T... >
- template<typename App >
  using upcxx::detail::apply_futured_as_future_return_t = typename apply_futured_as_future< App >::return_type
- template<typename Kind , typename Tup >
  using upcxx::detail::future_from_tuple_t = typename future_from_tuple< Kind, Tup >::type

7.24 future/future1.hpp File Reference

```
#include <upcxx/future/core.hpp>
```

Classes

- struct upcxx::future1< Kind, T >

Namespaces

- upcxx

7.25 future/impl_mapped.hpp File Reference

```
#include <upcxx/future/core.hpp>
#include <upcxx/future/apply.hpp>
#include <upcxx/future/body_pure.hpp>
```

Classes

- struct upcxx::future_is_trivially_ready< future1< detail::future_kind_mapped< Arg, Fn >, T... > >
- struct upcxx::detail::future_impl_mapped< FuArg, Fn, T >
- struct upcxx::detail::future_impl_mapped< FuArg, Fn, T >::result_lrefs_function
- struct upcxx::detail::future_dependency< future1< future_kind_mapped< FuArg, Fn >, T... > >

Namespaces

- upcxx
- upcxx::detail

7.26 future/impl_result.hpp File Reference

```
#include <upcxx/future/core.hpp>
```

Classes

- struct upcxx::future_is_trivially_ready< future1< detail::future_kind_result, T... > >
- struct upcxx::detail::future_impl_result< T >
- struct upcxx::detail::future_impl_result<>
- struct upcxx::detail::future_dependency< future1< future_kind_result, T... > >
- struct upcxx::detail::future_dependency< future1< future_kind_result > >

Namespaces

- upcxx
- upcxx::detail

7.27 future/impl_shref.hpp File Reference

```
#include <upcxx/future/core.hpp>
```

Classes

- struct upcxx::future_is_trivially_ready< future1< detail::future_kind_shref< HeaderOps >, T... > >
- struct upcxx::detail::future_impl_shref< HeaderOps, T >
- struct upcxx::detail::future_dependency_shref_base< is_trivially_ready_result >
- struct upcxx::detail::future_dependency_shref_base< false >
- struct upcxx::detail::future_dependency_shref_base< true >
- struct upcxx::detail::future_dependency< future1< future_kind_shref< HeaderOps >, T... > >

Namespaces

- upcxx
- upcxx::detail

7.28 future/impl_when_all.hpp File Reference

```
#include <upcxx/future/core.hpp>
#include <upcxx/future/body_pure.hpp>
```

Classes

- struct upcxx::future_is_trivially_ready< future1< detail::future_kind_when_all< Arg... >, T... > >
- struct upcxx::detail::future_impl_when_all< ArgTuple, T >
- struct upcxx::detail::future_impl_when_all< std::tuple< FuArg... >, T... >
- struct upcxx::detail::future_dependency_when_all_arg< i, Arg >
- struct upcxx::detail::future_dependency_when_all_base< AllArg, IxSeq >
- struct upcxx::detail::future_dependency_when_all_base< future1< future_kind_when_all< Arg... >, T... >, upcxx::index_sequence< i... > >
- struct upcxx::detail::future_dependency< future1< future_kind_when_all< Arg... >, T... > >

Namespaces

- upcxx
- upcxx::detail

7.29 future/make_future.hpp File Reference

```
#include <upcxx/future/impl_result.hpp>
#include <upcxx/future/impl_shref.hpp>
```

Classes

- struct upcxx::detail::make_future_< trivial, T >
- struct upcxx::detail::make_future_< true, T... >
- struct upcxx::detail::make_future_< false, T... >
- struct upcxx::detail::make_future< T >

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename ... T>
  auto upcxx::make_future (T ...values) -> decltype(detail::make_future< T... >()(std::declval< T >()...))
- template<typename T >
  auto upcxx::to_future (T x) -> decltype(make_future(std::forward< T >(x)))
- template<typename Kind , typename ... T>
  future1< Kind, T... > upcxx::to_future (future1< Kind, T... > x)

7.30 future/promise.hpp File Reference

```
#include <upcxx/future/core.hpp>
#include <upcxx/future/impl_shref.hpp>
#include <cstdint>
```

Classes

- class upcxx::promise< T >
- struct upcxx::detail::promise_like< Fu >
- struct upcxx::detail::promise_like< future1< Kind, T... > >
- class upcxx::promise< T >

Namespaces

- upcxx
- upcxx::detail

Typedefs

- template<typename Fu >
  using upcxx::detail::promise_like_t = typename promise_like< Fu >::type

7.31 future/then.hpp File Reference

```
#include <upcxx/future/core.hpp>
#include <upcxx/future/apply.hpp>
#include <upcxx/future/impl_mapped.hpp>
```

Classes

- struct upcxx::detail::future_body_then_base
- struct upcxx::detail::future_body_then< FuArg, Fn >
- struct upcxx::detail::future_body_then_pure< FuArg, Fn >
- struct upcxx::detail::future_then< Arg, Fn, future1< FnRetKind, FnRetT... >, false >
- struct upcxx::detail::future_then< Arg, Fn, future1< FnRetKind, FnRetT... >, true >
- struct upcxx::detail::future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, false, false >
- struct upcxx::detail::future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, true, fnret_trivial >
- struct upcxx::detail::future_then_pure< Arg, Fn, future1< FnRetKind, FnRetT... >, false, true >

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename ArgKind , typename Fn1 , typename ... ArgT>
  auto upcxx::operator>> (future1< ArgKind, ArgT... > arg, Fn1 &&fn) -> decltype(detail::future_then< future1< ArgKind, ArgT... >, typename std::decay< Fn1 >::type >()(std::move(arg), std::forward< Fn1 >(fn)))
- template<typename Fn1 , typename ... ArgT>
  future< ArgT... > & upcxx::operator>>= (future< ArgT... > &arg, Fn1 &&fn)

7.32 future/when_all.hpp File Reference

```
#include <upcxx/future/core.hpp>
#include <upcxx/future/impl_when_all.hpp>
```

Namespaces

- upcxx
- upcxx::detail

Typedefs

- template<typename ... Arg>
  using upcxx::detail::when_all_return_t = future_from_tuple_t< future_kind_when_all< Arg... >, decltype(std::tuple_cat(std::declval< typename Arg::results_type >()...)) >

Functions

- template<typename ... Arg>
  detail::when_all_return_t< Arg... > upcxx::when_all (Arg ...args)

7.33 global_ptr.hpp File Reference

```
#include <upcxx/backend.hpp>
#include <upcxx/diagnostic.hpp>
#include <cassert>
#include <cstddef>
#include <cstdint>
#include <iostream>
#include <type_traits>
```

Classes

- struct upcxx::detail::global_ptr_ctor_internal
- class upcxx::global_ptr< T >
- struct std::less< upcxx::global_ptr< T > >
- struct std::less_equal< upcxx::global_ptr< T > >
- struct std::greater< upcxx::global_ptr< T > >
- struct std::greater_equal< upcxx::global_ptr< T > >
- struct std::hash< upcxx::global_ptr< T > >

Namespaces

- upcxx
- upcxx::detail
- std

Functions

- bool upcxx::is_memory_shared_with (intrank_t r)
- void * upcxx::pshm_remote_addr2local (intrank_t r, void *addr)
- void * upcxx::pshm_local_addr2remote (void *addr, intrank_t &rank_out)
- template<typename T >
  global_ptr< T > upcxx::operator+ (std::ptrdiff_t diff, global_ptr< T > ptr)
- template<typename T , typename U >
  global_ptr< T > upcxx::reinterpret_pointer_cast (global_ptr< U > ptr)
- template<typename T >
  std::ostream & upcxx::operator<< (std::ostream &os, global_ptr< T > ptr)

7.34 nobsrule.py File Reference

Namespaces

- nobsrule

Functions

- def nobsrule.requires_upcxx_backend (cxt, src)

7.35 os_env.hpp File Reference

```
#include <upcxx/diagnostic.hpp>
#include <cstdlib>
#include <iostream>
#include <sstream>
#include <string>
```

Classes

- struct upcxx::detail::os_env_parse< T >
- struct upcxx::detail::os_env_parse< std::string >
- struct upcxx::detail::os_env_parse< T >

Namespaces

- upcxx
- upcxx::detail

Functions

- template<class T >
  T upcxx::os_env (const std::string &name)
- template<class T >
  T upcxx::os_env (const std::string &name, const T &otherwise)

7.36 packing.cpp File Reference

```
#include <upcxx/packing.hpp>
```

7.37 packing.hpp File Reference

```
#include <upcxx/diagnostic.hpp>
#include <upcxx/reflection.hpp>
#include <upcxx/utility.hpp>
#include <array>
#include <cstddef>
#include <cstdint>
#include <cstring>
#include <string>
#include <tuple>
#include <type_traits>
#include <unordered_map>
#include <unordered_set>
#include <utility>
#include <vector>
```

Classes

- class upcxx::parcel_layout
- struct upcxx::parcel_writer
- class upcxx::parcel_reader
- struct upcxx::packing_not_supported< T >
- struct upcxx::packing_is_trivial< T, false_ >
- struct upcxx::packing_is_trivial< T, std::integral_constant< bool, false &packing< T >::is_trivial > >
- struct upcxx::packing_empty< T, is_default_constructible >
- struct upcxx::packing_empty< T, true >
- struct upcxx::packing_empty< T, false >
- struct upcxx::packing_trivial< T >
- struct upcxx::packing_opaque< T, is_empty, is_trivially_copyable >
- struct upcxx::packing_opaque< T, true, is_trivially_copyable >
- struct upcxx::packing_opaque< T, false, true >
- struct upcxx::packing_opaque< T, false, false >
- struct upcxx::packing_ubound_reflector
- struct upcxx::packing_pack_reflector
- struct upcxx::packing_unpack_reflector< member_assignment_not_construction >
- struct upcxx::packing_unpack_reflector< true >
- struct upcxx::packing_unpack_reflector< false >
- struct upcxx::packing_reflected< T, is_default_constructible >
- struct upcxx::packing_reflected< T, true >
- struct upcxx::packing_reflected< T, false >
- struct upcxx::packing_function_pointer< T >
- struct upcxx::packing_specializer< T, is_empty, is_funptr, is_scalar >
- struct upcxx::packing_specializer< T, true, is_funptr, is_scalar >
- struct upcxx::packing_specializer< T, false, true, is_scalar >
- struct upcxx::packing_specializer< T, false, false, true >
- struct upcxx::packing_specializer< T, false, false, false >
- struct upcxx::packing< T >
- struct upcxx::packing< T const >
- struct upcxx::packing< T volatile >
- struct upcxx::packing< T & >
- struct upcxx::packing< T && >
- struct upcxx::detail::packing_tuple_each< n, i, T >
- struct upcxx::detail::packing_tuple_each< n, n, T... >
- struct upcxx::packing< std::tuple< T... > >
- struct upcxx::packing< std::pair< A, B > >
- struct upcxx::packing< std::array< T, n > >
- struct upcxx::packing< std::string >
- struct upcxx::packing< std::vector< T > >
- struct upcxx::packing< std::unordered_set< T > >
- struct upcxx::packing< std::unordered_map< K, V > >

Namespaces

- upcxx
- upcxx::detail

Functions

- void upcxx::detail::packing_funptr_basis ()

7.38 reflection.hpp File Reference

```
#include <array>
#include <cstdint>
#include <utility>
#include <iostream>
#include <tuple>
#include <type_traits>
```

Classes

- struct upcxx::reflection< Subject >
- struct upcxx::fast_hasher
- struct upcxx::hasher_reflector< Hasher >
- struct upcxx::fast_hashing< T >
- struct upcxx::integer_golden_ratio_bits< bit_n >
- struct upcxx::integer_golden_ratio_bits< 32 >
- struct upcxx::integer_golden_ratio_bits< 64 >
- struct upcxx::integer_golden_ratio< T >
- struct upcxx::mod2n_hashing< T >
- struct upcxx::reflection_tuple< Tup, i, n >
- struct upcxx::reflection_tuple< Tup, n, n >
- struct upcxx::reflection< std::tuple< Ts... > >
- struct upcxx::reflection< std::pair< A, B > >
- struct upcxx::reflection< std::array< T, n > >
- struct upcxx::print_reflector
- struct upcxx::print_proxy< T >

Namespaces

- upcxx

Functions

- template<typename Reflector , typename Subject >
  void reflect (Reflector &re, Subject &&x)
- template<typename Reflector , typename Subject >
  void upcxx::reflect_upon (Reflector &re, Subject &&subj)
- template<typename T >
  std::size_t upcxx::fast_hash (const T &x, std::size_t salt=0)
- template<typename T >
  std::size_t upcxx::mod2n_hash (const T &x, int bits)
- template<typename T >
  print_proxy< T > upcxx::print (T const &subject)

7.38.1 Function Documentation

7.38.1.1 reflect()

```
template<typename Reflector , typename Subject >
void reflect (
             Reflector & re,
             Subject && x )  [inline]
```

Definition at line 33 of file reflection.hpp.

7.39 rget.hpp File Reference

```
#include <upcxx/backend.hpp>
#include <upcxx/completion.hpp>
#include <upcxx/global_ptr.hpp>
```

Classes

- struct upcxx::detail::rget_byval< T >
- struct upcxx::detail::rget_state_operxn< Mode, Cx >
- struct upcxx::detail::rget_state_remote< Cx >
- struct upcxx::detail::rget_state_operxn< rget_byref, nil_cx >
- struct upcxx::detail::rget_state_operxn< rget_byval< T >, nil_cx >
- struct upcxx::detail::rget_state_operxn< rget_byref, future_cx< ordinal > >
- struct upcxx::detail::rget_state_operxn< rget_byval< T >, future_cx< ordinal > >
- struct upcxx::detail::rget_state_operxn< rget_byref, promise_cx<> >
- struct upcxx::detail::rget_state_operxn< rget_byval< T >, promise_cx< T > >
- struct upcxx::detail::rget_state_remote< nil_cx >
- struct upcxx::detail::rget_state_remote< rpc_cx< Fn > >
- struct upcxx::detail::rget_states< Mode, R, O >
- struct upcxx::detail::rget_futures_of< Mode, R, O >
- struct upcxx::detail::rget_futures_of< rget_byref, R, future_cx< 0 > >
- struct upcxx::detail::rget_futures_of< rget_byval< T >, R, future_cx< 0 > >

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename T , typename R = nil_cx, typename O = future_cx<0>>
  detail::rget_futures_of< detail::rget_byval< T >, R, O >::return_type upcxx::rget (global_ptr< T > gp_s, completions< nil_cx, R, O > cxs=completions< nil_cx, R, O >{})
- template<typename T , typename R = nil_cx, typename O = future_cx<0>>
  detail::rget_futures_of< detail::rget_byref, R, O >::return_type upcxx::rget (global_ptr< T > gp_s, T *buf_d, std::size_t n, completions< nil_cx, R, O > cxs=completions< nil_cx, R, O >{})

7.40 rpc.hpp File Reference

```
#include <upcxx/backend.hpp>
#include <upcxx/bind.hpp>
#include <upcxx/future.hpp>
```

Classes

- struct upcxx::detail::rpc_recipient_after< Pro >
- struct upcxx::detail::rpc_return< ValidType, Fn, Args >

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename Fn , typename ... Args>
  void upcxx::rpc_ff (intrank_t recipient, Fn &&fn, Args &&...args)
- template<typename Fn , typename ... Args>
  auto upcxx::rpc (intrank_t recipient, Fn &&fn, Args &&...args) -> typename detail::rpc_return< decltype(fn(args...)), Fn, Args... >::type
- template<typename Fn , typename ... T, typename ... Args>
  void upcxx::rpc (intrank_t recipient, promise< T... > &prom, Fn &&fn, Args &&...args)

7.41 rput.hpp File Reference

```
#include <upcxx/backend.hpp>
#include <upcxx/completion.hpp>
#include <upcxx/global_ptr.hpp>
```

Classes

- struct upcxx::detail::rput_byval< T >
- struct upcxx::detail::rput_state_here< Cx >
- struct upcxx::detail::rput_state_remote< Cx >
- struct upcxx::detail::rput_state_here< nil_cx >
- struct upcxx::detail::rput_state_here< future_cx< ordinal > >
- struct upcxx::detail::rput_state_here< promise_cx<> >
- struct upcxx::detail::rput_state_remote< nil_cx >
- struct upcxx::detail::rput_state_remote< rpc_cx< Fn > >
- struct upcxx::detail::rput_states< Mode, S, R, O >
- struct upcxx::detail::rput_states< rput_byref, S, R, O >
- struct upcxx::detail::rput_states< rput_byval< T >, S, R, O >
- struct upcxx::detail::rput_futures_of< S, R, O >
- struct upcxx::detail::rput_futures_of< future_cx< S_ord >, R, O >
- struct upcxx::detail::rput_futures_of< S, R, future_cx< O_ord > >
- struct upcxx::detail::rput_futures_of< future_cx< S_ord >, R, future_cx< O_ord > >

Namespaces

- upcxx
- upcxx::detail

Functions

- template<typename T , typename S = nil_cx, typename R = nil_cx, typename O = future_cx<0>>
  detail::rput_futures_of< S, R, O >::return_type upcxx::rput (T value_s, global_ptr< T > gp_d, completions< S, R, O > cxs=completions< S, R, O >{})
- template<typename T , typename S = nil_cx, typename R = nil_cx, typename O = future_cx<0>>
  detail::rput_futures_of< S, R, O >::return_type upcxx::rput (T const *buf_s, std::size_t n, global_ptr< T > gp_d, completions< S, R, O > cxs=completions< S, R, O >{})

7.42 upcxx.cpp File Reference

```
#include <upcxx/upcxx.hpp>
```

7.43 upcxx.hpp File Reference

```
#include <upcxx/allocate.hpp>
#include <upcxx/backend.hpp>
#include <upcxx/dist_object.hpp>
#include <upcxx/future.hpp>
#include <upcxx/global_ptr.hpp>
#include <upcxx/rget.hpp>
#include <upcxx/rput.hpp>
#include <upcxx/wait.hpp>
#include <upcxx/atomic.hpp>
#include <upcxx/broadcast.hpp>
#include <upcxx/allreduce.hpp>
```

7.44 utility.hpp File Reference

```
#include <upcxx/diagnostic.hpp>
#include <array>
#include <cstdint>
#include <functional>
#include <iostream>
#include <sstream>
#include <tuple>
#include <utility>
```

Classes

- struct upcxx::nop_function< Sig >
- struct upcxx::nop_function< Ret(Arg...)>
- struct upcxx::nop_function< void(Arg...)>
- struct upcxx::constant_function< T >
- class upcxx::function_ref< Sig >
- class upcxx::function_ref< Ret(Arg...)>
- struct upcxx::trait_forall< Test, T >
- struct upcxx::trait_forall< Test >
- struct upcxx::trait_forall< Test, T, Ts... >
- struct upcxx::trait_forall_tupled< Test, Tuple >
- struct upcxx::trait_forall_tupled< Test, std::tuple< T... > >
- struct upcxx::trait_any< Tr >
- struct upcxx::trait_any<>
- struct upcxx::trait_any< Tr0, Trs... >
- struct upcxx::trait_any< Tr0, Trs... >::type< T >
- struct upcxx::trait_all< Tr >
- struct upcxx::trait_all<>
- struct upcxx::trait_all< Tr0, Trs... >
- struct upcxx::trait_all< Tr0, Trs... >::type< T >
- struct upcxx::tuple_types_into< Tuple, Into >
- struct upcxx::tuple_types_into< std::tuple< T... >, Into >
- struct upcxx::index_sequence<... >
- struct upcxx::detail::make_index_sequence< n, s >
- struct upcxx::detail::make_index_sequence< 0, s... >
- struct upcxx::add_lref_if_nonref< T >
- struct upcxx::add_lref_if_nonref< T & >
- struct upcxx::add_lref_if_nonref< T && >
- struct upcxx::decay_tupled< Tup >
- struct upcxx::decay_tupled< std::tuple< T... > >
- struct upcxx::detail::tuple_get_or_void< i, TupRef, in_range >
- struct upcxx::detail::tuple_get_or_void< i, TupRef, false >
- struct upcxx::detail::tuple_rvals_get< i, Tup >
- struct upcxx::detail::tuple_rvals_get< Tup &, i, Ti & >
- struct upcxx::detail::tuple_rvals_get< Tup &, i, Ti && >
- struct upcxx::detail::tuple_rvals_get< Tup &, i, Ti >
- struct upcxx::detail::tuple_rvals_get< Tup const &, i, Ti & >
- struct upcxx::detail::tuple_rvals_get< Tup const &, i, Ti && >
- struct upcxx::detail::tuple_rvals_get< Tup const &, i, Ti >
- struct upcxx::detail::tuple_rvals_get< Tup &&, i, Ti & >
- struct upcxx::detail::tuple_rvals_get< Tup &&, i, Ti && >
- struct upcxx::detail::tuple_rvals_get< Tup &&, i, Ti >

Namespaces

- upcxx
- upcxx::detail

Typedefs

- template<typename Tuple , template< typename... > class Into>
  using upcxx::tuple_types_into_t = typename tuple_types_into< Tuple, Into >::type
- template<int n>
  using upcxx::make_index_sequence = typename detail::make_index_sequence< n >::type

Functions

- template<typename Sig >
  nop_function< Sig > upcxx::nop ()
- template<typename T >
  constant_function< T > upcxx::constant (T value)
- template<int i, typename Tup >
  auto upcxx::get_or_void (Tup &&tup) -> decltype(detail::tuple_get_or_void< i, Tup >()(std::forward< Tup >(tup)))
- template<typename Tup , int ... i>
  auto upcxx::detail::tuple_rvals (Tup &&tup, index_sequence< i... >) -> std::tuple< decltype(tuple_rvals_↩get< Tup &&, i >()(tup))... >
- template<typename Tup >
  auto upcxx::tuple_rvals (Tup &&tup) -> decltype(detail::tuple_rvals(std::forward< Tup >(tup), make_index↩_sequence< std::tuple_size< typename std::decay< Tup >::type >::value >()))
- template<typename Fn , typename Tup , int ... i>
  auto upcxx::detail::apply_tupled (Fn &&fn, Tup &&args, index_sequence< i... >) -> decltype(fn(std::get< i >(args)...))
- template<typename Fn , typename Tup >
  auto upcxx::apply_tupled (Fn &&fn, Tup &&args) -> decltype(detail::apply_tupled(std::forward< Fn >(fn), std::forward< Tup >(args), make_index_sequence< std::tuple_size< Tup >::value >()))

7.45 wait.hpp File Reference

```
#include <upcxx/backend.hpp>
#include <upcxx/future.hpp>
```

Namespaces

- upcxx

Functions

- template<typename Kind , typename ... T>
  auto upcxx::wait (future1< Kind, T... > const &f) -> decltype(f.result())

Index