

# UPC Collectives Extensions Proposals


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|---|---|
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# MTU extensions

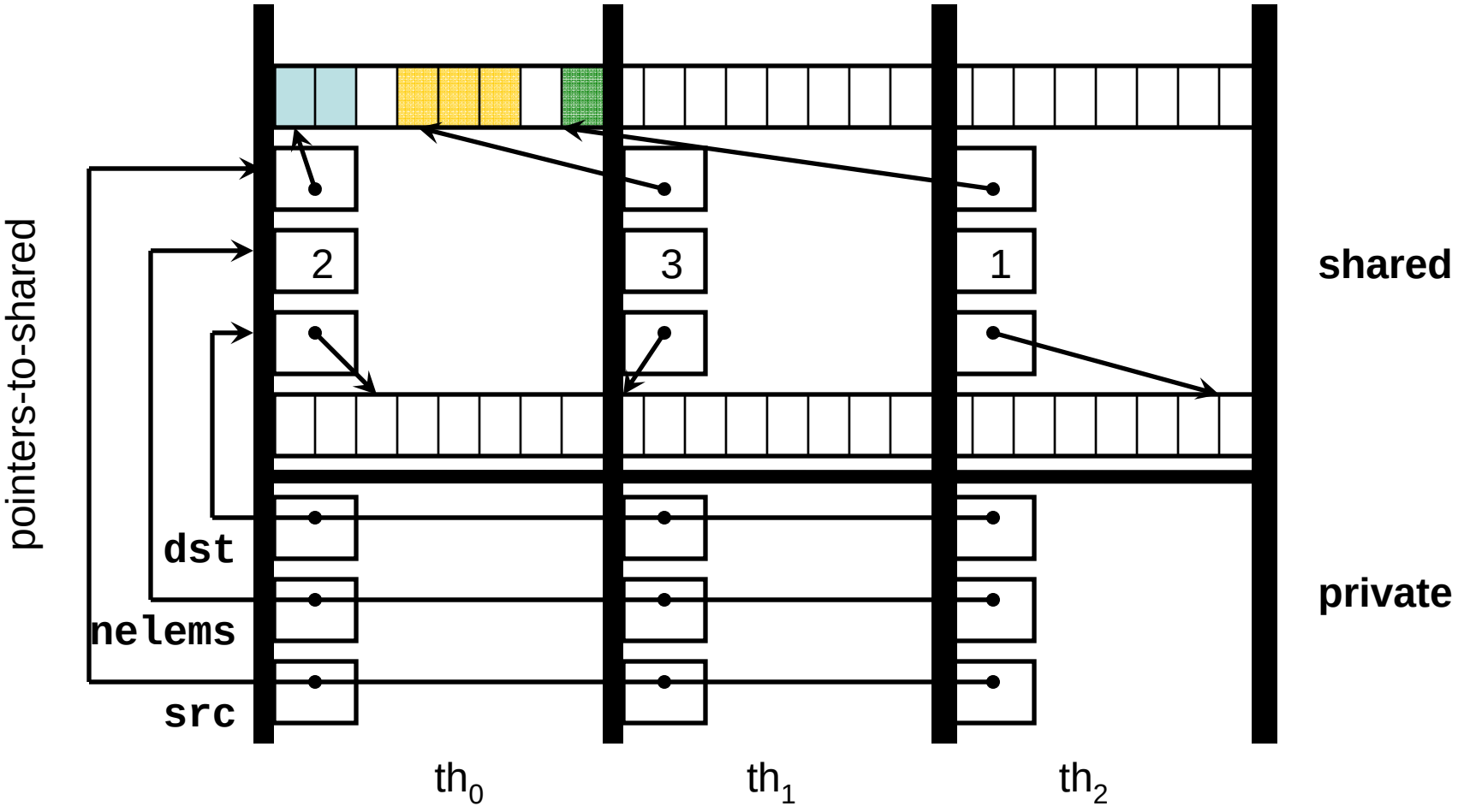
```
upc_all_relocalize_x (
  shared void * shared * restrict dst,
  shared const void * shared * restrict src,
  shared size_t * nbytes, upc_flag_t mode );
```

where ***relocalize*** is

- **broadcast**
- **scatter**
- **gather**
- **gather_all**
- **exchange**

- **(Individual signatures vary)**

# upc_all_scatter_x()



# Asynchronous collectives

- Functions return **`upc_coll_handle_t`**
- Compatible with UPC v1.2 standard
- Specified by **`upc_flag_t UPC_ASYNC`**
- Various completion functions provided
- Out-of-order completion is allowed
- Completion function respects **`…OUTSYNC`** mode
- **`UPC_HANDLE_COMPLETE`** is the “null” handle

# Async Completion Functions

```
upc_coll_handle_t handle;
…
handle = upc_all_broadcast(…);
…
upc_wait(handle);
```

# Async Completion Functions

**`void upc_wait(upc_handle_t h)`**

blocks until complete

**`int upc_test(upc_handle_t h)`**

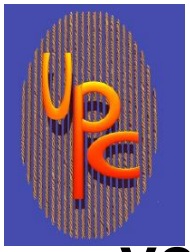
returns 0 immediately if not complete, otherwise completes and returns nonzero

**`int upc_waitany(count, upc_handle_t * H)`**

blocks until any collective is complete, returns index

**`int upc_testany(count, upc_handle_t * H)`**

returns 0 immediately if none complete, otherwise completes one function and returns index



# Async Completion Functions

**`void upc_waitall(count, upc_handle_t * H)`**

waits for all calls with handles in array to complete

**`int upc_testall(count, upc_handle_t * H)`**

returns positive int and completes all handles if all calls are complete; else returns negative int

**`int upc_wait_some(count upc_handle_t * H)`**

completes at least one call, completes all currently complete calls, returns count of completed call(s)

**`int upc_test_some(count upc_handle_t * H)`**

completes all currently complete calls (if there are some) and returns count of completed call(s)

**`int upc_get_status(upc_handle_t handle)`**

returns positive int if call is complete; else returns 0

# Berkeley extensions

- Reduce and prefix reduce
  - support missing C99 types
    - **`signed long long`** **`unsigned long long`**
      **`_Complex float`** **`_Complex double`**
      **`_Complex long double`** **`_Bool`**
      (not **`_Imaginary`**)
  - adds an “exclusive” prefix reduce
  - adds **`upc_all_reduce_all()`**
    as if **`upc_all_reduce`** followed by **`upc_all_broadcast`**

# Berkeley extensions

- Proposes several possible “in-place” extensions for relocalization collectives
- Favored proposal replaces **`src`** argument with **`UPC_IN_PLACE`**:

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| **`upc_all_exchange`** | as if | **`src==dst`** |
| **`upc_all_permute`** | as if | **`src==dst`** |
| **`upc_all_prefix_reduce`** | as if | **`src==dst`** |
| **`upc_all_gather_all`** | as if | **`src==dst`** |

- For **`upc_all_broadcast`** replace **`src`** with **`UPC_IN_PLACE(root)`** as if **`src==&dst[root]`**

# Berkeley extensions

- Non-single-valued arguments, variable **`nbytes`**
  - The MTU proposal addresses this, though the **`upc_all_`*`relocalize`*`_x`** extensions do require **`src`**, **`dst`**, and **`nbytes`** pointers (to arrays) to be single-valued.
- Non-shared (private) arguments
  - A proposal is needed
- Teams
  - *"At this time we ask that you turn off and stow all electronic equipment …"*