Exchange

The upc_all_exchange function copies the *i*th block of memory from a shared memory area that has affinity to thread *j* to the *j*th block of a shared memory area that has affinity to thread *i*.

Permute

The upc_all_permute function copies a block of memory from a shared memory area that has affinity to the *i*th thread to a block of a shared memory that has affinity to thread perm[*i*].

Computational Operations

The upc_op_t argument indicates which operation is going to take in the collective function. This type can have value as: UPC_ADD, UPC_MULT, UPC_AND, UPC_OR, UPC_XOR, UPC_LOGAND, UPC_LOGOR, UPC_MIN, UPC_MAX, UPC_FUN, UPC_NONCOMM_FUNC.

Reduce

```
void upc_all_reduceT(shared void * restrict dst,
        shared const void * restrict src,
        Upc_op_t op, size t nelems, size t blk size,
        TYPE(*func)(TYPE, TYPE), upc flag t flags);
```

The reduce family has different variants, which are differentiated by **T** and **TYPE:**

T	TYPE	T	TYPE
C	signed char	L	signed long
UC	unsigned char	UL	unsigned long
S	signed short	F	float
US	unsigned short	D	double
I	signed int	LD	long double
UI	unsigned int		

On completion of the upc_all_reduce variants, the value of the TYPE shared object referenced by dst is "src[0] ⊕ src[1] ⊕ · · ·⊕ src[nelems-1]".

Prefix_reduce

Prefix_reduce function has the same argument list as prefix. On completion of the upc all prefix reduce variants, the value of the TYPE shared object referenced by dst[i] is src[0] ⊕ src [1] ⊕· · ·⊕ src[i] for $0 \le i \le$ nelems-1 and where "⊕" is the operator specified by the variable op.

High Performance Computing Lab

Dept of Electrical and Computer Engineering
The George Washington University
801 22nd street NW, Washington DC 20052

For additional information, send email to
gwu-upc@hermes.gwu.edu

UPC-Collective QUICK REFERENCE

General Information

If some thread calls a collective function during a synchronization phase, all other threads must also call that function and they must provide identical arguments. All threads must call the same sequence of collective functions. Collective calls may not be made between upc_notify and upc_wait. The following header file must be included:

```
#include <upc_collective.h>
```

Synchronization Modes

The upc_flag_t argument includes synchronization requirements on entry to the collective call and on exit. This argument has the general form:

(**UPC_IN_XSYNC** | **UPC_OUT_YSYNC**)

where X and Y may be

NO - no synchronization will be done
MY - sync with respect to data with affinity to this thread
ALL - sync with respect to all data on all threads

Basic Collective functions

Broadcast

```
void upc_all_broadcast(
                shared void * restrict dst,
                shared const void * restrict src,
                size_t nbytes,
                upc_flag_t flags);
```

The upc_all_broadcast function copies a block of memory with affinity to a single thread to a block of shared memory on each thread.

The following collective functions have the same arguments as upc_all_broadcast.

Scatter

The upc_all_scatter function copies the *i*th block of an area of shared memory with affinity to a single thread to a block of shared memory with affinity to the *i*th thread.

Gather

The upc_all_gather function copies a block of shared memory that has affinity to the *i*th thread to the *i*th block of a shared memory area that has affinity to a single thread.

Gather_all

The upc_all gather_all function copies a block of memory from one shared memory area with affinity to the *i*th thread to the *i*th block of a shared memory area on each thread.