MPI Quick Reference in C

```
#include <mpi.h>
```

Environmental Management:

```
int MPI_Init(int *argc, char ***argv)
int MPI_Finalize(void)
int MPI_Initialized(int *flag)
int MPI_Finalized(int *flag)
int MPI_Comm_size(MPI_Comm comm, int *size)
int MPI_Comm_rank(MPI_Comm comm, int *rank)
int MPI_Abort(MPI_Comm comm, int errorcode)
double MPI_Wtime(void)
double MPI_Wtick(void)
```

Blocking Point-to-Point-Communication:

```
int MPI_Send (const void* buf, int count,
    MPI_Datatype datatype, int dest, int tag,
    MPI_Comm comm)
```

Related: `MPI_Bsend, MPI_Ssend, MPI_Rsend`

```
int MPI_Recv (void* buf, int count,
    MPI_Datatype datatype, int source, int
    tag, MPI_Comm comm, MPI_Status *status)
int MPI_Probe (int source, int tag, MPI_Comm
    comm, MPI_Status *status)
int MPI_Get_count (const MPI_Status *status,
    MPI_Datatype datatype, int *count)
```

Related: `MPI_Get_elements`

```
int MPI_Sendrecv (const void *sendbuf, int
    sendcount, MPI_Datatype sendtype, int
    dest, int sendtag, void *recvbuf, int
    recvcount, MPI_Datatype recvtype, int
    source, int recvtag, MPI_Comm comm,
    MPI_Status *status)
int MPI_Sendrecv_replace (void *buf, int
    count, MPI_Datatype datatype, int dest,
    int sendtag, int source, int recvtag,
    MPI_Comm comm, MPI_Status *status)
int MPI_Buffer_attach (void *buffer, int size)
int MPI_Buffer_detach (void *buffer_addr, int
    *size)
```

Non-Blocking Point-to-Point-Communication:

```
int MPI_Isend (const void* buf, int count,
    MPI_Datatype datatype, int dest, int tag,
    MPI_Comm comm, MPI_Request *request)
```

Related: `MPI_Ibsend, MPI_Issend, MPI_Irsend`

```
int MPI_Irecv (void* buf, int count,
    MPI_Datatype datatype, int source, int
    tag, MPI_Comm comm, MPI_Request *request)
int MPI_Iprobe (int source, int tag, MPI_Comm
    comm, int *flag, MPI_Status *status)
int MPI_Wait (MPI_Request *request,
    MPI_Status *status)
int MPI_Test (MPI_Request *request, int
    *flag, MPI_Status *status)
int MPI_Waitall (int count, MPI_Request
    request_array[], MPI_Status
    status_array[])
```

Related: `MPI_Testall`

```
int MPI_Waitany (int count, MPI_Request
    request_array[], int *index, MPI_Status
    *status)
```

Related: `MPI_Testany`

```
int MPI_Waitsome (int incount, MPI_Request
    request_array[], int *outcount, int
    index_array[], MPI_Status status_array[])
```

Related: `MPI_Testsome,`

```
int MPI_Request_free (MPI_Request *request)
```

Related: `MPI_Cancel`

```
int MPI_Test_cancelled (const MPI_Status
    *status, int *flag)
```

Collective Communication:

```
int MPI_Barrier (MPI_Comm comm)
int MPI_Bcast (void *buffer, int count,
    MPI_Datatype datatype, int root, MPI_Comm
    comm)
int MPI_Gather (const void *sendbuf, int
    sendcount, MPI_Datatype sendtype, void
    *recvbuf, int recvcount, MPI_Datatype
    recvtype, int root, MPI_Comm comm)
int MPI_Gatherv (const void *sendbuf, int
    sendcount, MPI_Datatype sendtype, void
    *recvbuf, const int recvcount_array[],
    const int displ_array[], MPI_Datatype
    recvtype, int root, MPI_Comm comm)
int MPI_Scatter (const void *sendbuf, int
    sendcount, MPI_Datatype sendtype, void
    *recvbuf, int recvcount, MPI_Datatype
    recvtype, int root, MPI_Comm comm)
int MPI_Scatterv (const void *sendbuf, const
    int sendcount_array[], const int
    displ_array[], MPI_Datatype sendtype, void
    *recvbuf, int recvcount, MPI_Datatype
    recvtype, int root, MPI_Comm comm)
int MPI_Allgather (const void *sendbuf, int
    sendcount, MPI_Datatype sendtype, void
    *recvbuf, int recvcount, MPI_Datatype
    recvtype, MPI_Comm comm)
```

Related: `MPI_Alltoall`

```
int MPI_Allgatherv (const void *sendbuf, int
    sendcount, MPI_Datatype sendtype, void
    *recvbuf, const int recvcount_array[],
    const int displ_array[], MPI_Datatype
    recvtype, MPI_Comm comm)
```

Related: `MPI_Alltoallv`

```
int MPI_Reduce (const void *sendbuf, void
    *recvbuf, int count, MPI_Datatype datatype,
    MPI_Op op, int root, MPI_Comm comm)
int MPI_Allreduce (const void *sendbuf, void
    *recvbuf, int count, MPI_Datatype
    datatype, MPI_Op op, MPI_Comm comm)
```

Related: `MPI_Scan, MPI_Exscan`

```
int MPI_Reduce_scatter (const void *sendbuf,
    void *recvbuf, const int
    recvcount_array[], MPI_Datatype datatype,
    MPI_Op op, MPI_Comm comm)
int MPI_Op_create (MPI_User_function *func,
    int commute, MPI_Op *op)
int MPI_Op_free (MPI_Op *op)
```

Derived Datatypes:

```
int MPI_Type_commit (MPI_Datatype *datatype)
int MPI_Type_free (MPI_Datatype *datatype)
int MPI_Type_contiguous (int count,
    MPI_Datatype oldtype, MPI_Datatype
    *newtype)
```

int **MPI_Type_vector** (int count, int blocklength, int stride, MPI_Datatype oldtype, MPI_Datatype *newtype)

int **MPI_Type_indexed** (int count, const int blocklength_array[], const int displ_array[], MPI_Datatype oldtype, MPI_Datatype *newtype)

int **MPI_Type_create_struct** (int count, const int blocklength_array[], const MPI_Aint displ_array[], const MPI_Datatype oldtype_array[], MPI_Datatype *newtype)

int **MPI_Type_create_subarray** (int ndims, const int size_array[], const int subsize_array[], const int start_array[], int order, MPI_Datatype oldtype, MPI_Datatype *newtype)

int **MPI_Get_address** (const void *location, MPI_Aint *address)

int **MPI_Type_size** (MPI_Datatype *datatype, int *size)

int **MPI_Type_get_extent** (MPI_Datatype datatype, MPI_Aint *lb, MPI_Aint *extent)

int **MPI_Pack** (const void *inbuf, int incount, MPI_Datatype datatype, void *outbuf, int outcount, int *position, MPI_Comm comm)

int **MPI_Unpack** (const void *inbuf, int insize, int *position, void *outbuf, int outcount, MPI_Datatype datatype, MPI_Comm comm)

int **MPI_Pack_size** (int incount, MPI_Datatype datatype, MPI_Comm comm, int *size)

Related: MPI_Type_create_hvector, MPI_Type_create_hindexed, MPI_Type_create_indexed_block, MPI_Type_create_darray, MPI_Type_create_resized, MPI_Type_get_true_extent, MPI_Type_dup, MPI_Pack_external, MPI_Unpack_external, MPI_Pack_external_size

Groups and Communicators:

int **MPI_Group_size** (MPI_Group group, int *size)

int **MPI_Group_rank** (MPI_Group group, int *rank)

int **MPI_Comm_group** (MPI_Comm comm, MPI_Group *group)

int **MPI_Group_translate_ranks** (MPI_Group group1, int n, const int ranks1[], MPI_Group group2, const int ranks2[])

int **MPI_Group_compare** (MPI_Group group1, MPI_Group group2, int *result)

MPI_IDENT, MPI_COMGRUENT, MPI_SIMILAR, MPI_UNEQUAL

int **MPI_Group_union** (MPI_Group group1, MPI_Group group2, MPI_Group *newgroup)

Related: MPI_Group_intersection, MPI_Group_difference

int **MPI_Group_incl** (MPI_Group group, int n, const int ranks[], MPI_Group *newgroup)

Related: MPI_Group_excl

int **MPI_Comm_create** (MPI_Comm comm, MPI_Group group, MPI_Comm *newcomm)

int **MPI_Comm_compare** (MPI_Comm comm1, MPI_Comm comm2, int *result)

MPI_IDENT, MPI_COMGRUENT, MPI_SIMILAR, MPI_UNEQUAL

int **MPI_Comm_dup** (MPI_Comm comm, MPI_Comm *newcomm)

int **MPI_Comm_split** (MPI_Comm comm, int color, int key, MPI_Comm *newcomm)

int **MPI_Comm_free** (MPI_Comm *comm)

Topologies:

int **MPI_Dims_create** (int nnodes, int ndims, int dims[])

int **MPI_Cart_create** (MPI_Comm comm_old, int ndims, const int dims[], const int periods[], int reorder, MPI_Comm *comm_cart)

int **MPI_Cart_shift** (MPI_Comm comm, int direction, int disp, int *rank_source, int *rank_dest)

int **MPI_Cartdim_get** (MPI_Comm comm, int *ndim)

int **MPI_Cart_get** (MPI_Comm comm, int maxdims, int dims[], int periods[], int coords[])

int **MPI_Cart_rank** (MPI_Comm comm, const int coords[], int *rank)

int **MPI_Cart_coords** (MPI_Comm comm, int rank, int maxdims, int coords[])

int **MPI_Cart_sub** (MPI_Comm comm_old, const int remain_dims[], MPI_Comm *comm_new)

int **MPI_Cart_map** (MPI_Comm comm_old, int ndims, const int dims[], const int periods[], int *new_rank)

int **MPI_Graph_create** (MPI_Comm comm_old, int nnodes, const int index[], const int edges[], int reorder, MPI_Comm *comm_graph)

int **MPI_Graph_neighbors_count** (MPI_Comm comm, int rank, int *nneighbors)

int **MPI_Graph_neighbors** (MPI_Comm comm, int rank, int maxneighbors, int neighbors[])

int **MPI_Graphdims_get** (MPI_Comm comm, int *nnodes, int *nedges)

int **MPI_Graph_get** (MPI_Comm comm, int maxindex, int maxedges, int index[], int edges[])

int **MPI_Graph_map** (MPI_Comm comm_old, int nnodes, const int index[], const int edges[], int *new_rank)

int **MPI_Topo_test** (MPI_Comm comm, int *status)

Wildcards:

MPI_ANY_TAG, MPI_ANY_SOURCE

Basic Datatypes:

MPI_CHAR, MPI_SHORT, MPI_INT, MPI_LONG, MPI_UNSIGNED_CHAR, MPI_UNSIGNED_SHORT, MPI_UNSIGNED, MPI_UNSIGNED_LONG MPI_FLOAT, MPI_DOUBLE, MPI_LONG_DOUBLE, MPI_BYTE, MPI_PACKED

Predefined Groups and Communicators:

MPI_GROUP_EMPTY, MPI_GROUP_NULL, MPI_COMM_WORLD, MPI_COMM_SELF, MPI_COMM_NULL

Reduction Operations:

MPI_MAX, MPI_MIN, MPI_SUM, MPI_PROD, MPI_BAND, MPI_BOR, MPI_BXOR, MPI_LAND, MPI_LOR, MPI_LXOR

Status Object:

status.MPI_SOURCE, status.MPI_TAG, status.MPI_ERROR