MPI Collective Communications

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MPI_Alltoall

MPI_Alltoall - Sends data from all to all processes

```
int MPI_Alltoall( void *sendbuf, int sendcount, MPI_Datatype sendtype,
                  void *recvbuf, int recvcnt, MPI_Datatype recvtype, MPI_Comm comm )
```

INPUT PARAMETERS

- **sendbuf** - starting address of send buffer (choice)
- **sendcounts** - integer array equal to the group size specifying the number of elements to send to each processor
- **sendtype** - data type of send buffer elements (handle)
- **recvcounts** - integer array equal to the group size specifying the maximum number of elements that can be received from each processor
- **recvtype** - data type of receive buffer elements (handle)
- **comm** - communicator (handle)

OUTPUT PARAMETERS

- **recvbuf** - address of receive buffer (choice)

MPI_Alltoallv

MPI_Alltoallv - Sends data from all to all processes, with a displacement

int MPI_Alltoallv (void *sendbuf, int *sendcnts, int *sdispls, MPI_Datatype sendtype,
void *recvbuf, int *recvcnts, int *rdispls, MPI_Datatype recvtype, MPI_Comm comm)

INPUT PARAMETERS

sendbuf - starting address of send buffer (choice)

sendcounts - integer array equal to the group size specifying the number of elements to send to each processor

sdispls - integer array (of length group size). Entry j specifies the displacement (relative to sendbuf from which to take the outgoing data destined for process j

sendtype - data type of send buffer elements (handle)

recvcounts - integer array equal to the group size specifying the maximum number of elements that can be received from each processor

rdispls - integer array (of length group size). Entry i specifies the displacement (relative to recvbuf at which to place the incoming data from process

recvtype - data type of receive buffer elements (handle)

comm - communicator (handle)

OUTPUT PARAMETERS

recvbuf - address of receive buffer (choice)

MPI_Alltoallv

Alltoallv
flexibility in that the location of send data is specified by sdispls
and the location of the placement of receive data is specified by rdispls.

The **jth block** sent from **process i** is received
by **process j** and is placed in the **ith block**.

Need not be all the same size block

sendcount[j], sendtype at **process i**
recvcount[i], recvtype at **process j**.

The amount of data sent must be equal to the amount of data received,
pairwise between every pair of processes.

Distinct type maps between sender and receiver are still allowed.

MPI_Alltoallw

ALLTOALLW in MPI-2.

Can specify separately count, displacement, and datatype.

The displacement of blocks is specified in bytes.

Can be seen as a generalization several MPI functions
depending on the input arguments.

Message Aggregation

References

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[5] Hager & Wellein, Introduction to High Performance Computing for Scientists and Engineers
[6] http://www.mpi-forum.org/docs/mpi-11-html