MPI Communicators and Groups

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Communicator & Group Overview

To limit communication to a subset of the processors,
a group are created and are associated with a communicator

A group is an ordered set of processes.
Each process in a group is associated with a unique integer rank. (0 ~ N-1)
The group routines are used to specify processes involved in a communicator

A communicator is for a self-contained communication "universe".
A message sent with a given communicator can only be received by a process specifying the same communicator.

A communicator incorporates an instance of a group, and also includes contexts.

Both groups and communicators are
MPI objects that are accessed by handles (opaque object)

Context

A message sent in one context cannot be received in another context.
Collective operations may be independent of pending p2p operations.

Distinct communicators in the same process have distinct contexts.
A context is essentially a system-managed tag (or tags) to ensure that collective and p2p communication within one communicator do not interfere, and that communications over distinct communicators don't interfere.

A possible implementation:
a supplemental tag attached to messages on send and matched on receive.

Each **intra-communicator** stores the value of its two tags (one for p2p and one for collective communication).

In **inter-communication** (which is strictly p2p communication), two context tags are stored per communicator, one used by group A to send and group B to receive, and a second used by group B to send and for group A to receive.

Since contexts are not explicit objects, other implementations are also possible.

Communicator

Communicators and Groups defines
collection of processes that may communicate with each other.

Need to specify a communicator as an argument.

MPI_COMM_WORLD
predefined communicator that includes all MPI processes.

Rank (Task ID)
within a communicator, every process has its own unique integer identifier
– used to specify the source and destination.
– can be used in conditional statements.

Group

Group: an ordered set of processes
Rank: 0 to N-1

One process can belong to many groups
Opaque group object, and cannot directly transferred to other process
Used within a communicator
    To describe the participants in a communication universe and to rank them
Include the same local process
The source and destination of a message is identified by process rank within that group
Dynamic – can be created and destroyed during execution

Need to specify a communicator as an argument.

Message Aggregation

References

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