**User-defined datatypes** (DataType object):
for non-contiguous memory locations
Typemap = \{(type\_0, displacement\_0), ...\}
specifies message buffer together with base address (passed with send/receive command)

Create types with (and commit with Commit command!)
Contiguous: replication of a datatype
Vector: equally spaced blocks (stride)
Hvector: stride is arbitrary nbr of bytes
Indexed: different #blocks, # displacements
Hindexed: Struct diff datatypes (most general)

**Communicators**
> subdivide processes into groups (type MPI\_GROUP)
process has (different) rank in each group it belongs to
MPI\_Group\_rank: MPI\_UNDEFINED if no member
MPI\_Group\_size
MPI\_Comm\_group: get group of communicator ...

> communicator is associated with one or two groups
communication only happens within a communicator
intracommunicator: within a group
intercommunicator: P2P between 2 disjoint groups
MPI\_Comm\_world = communicator of all processes

**Collective Communications** (Intracomm object)
Barrier: returns when all processes entered the call
Bcast: broadcast (one-message-to-all), root also!
Gather: all-to-one (root included)
Gatherv: with stride
Scatter: diff-messages-to-all (Scatterv)
Allgather: all-to-all (Allgatherv)
Alltoall: personalized messages all-to-all
Alltoallv
Reduce: global reduce operation all-to-one
Operations (Op object): Max, Min, Sum, Prod, ...
Allreduce: result to all
Reduce\_scatter: scatter the result (array)
Scan

**Error handling**
an MPIException is thrown when an error occurs

http://parallel.vub.ac.be