

Second HomeWork

MPI Application across multiple systems using different methods to inter-operate, as well as different programming models

- MPI-2 (or IMPI) vs MPI_Connect/PVMPI
- Single MPI_COMM_WORLD vs multiple MPI_COMM_WORLDs

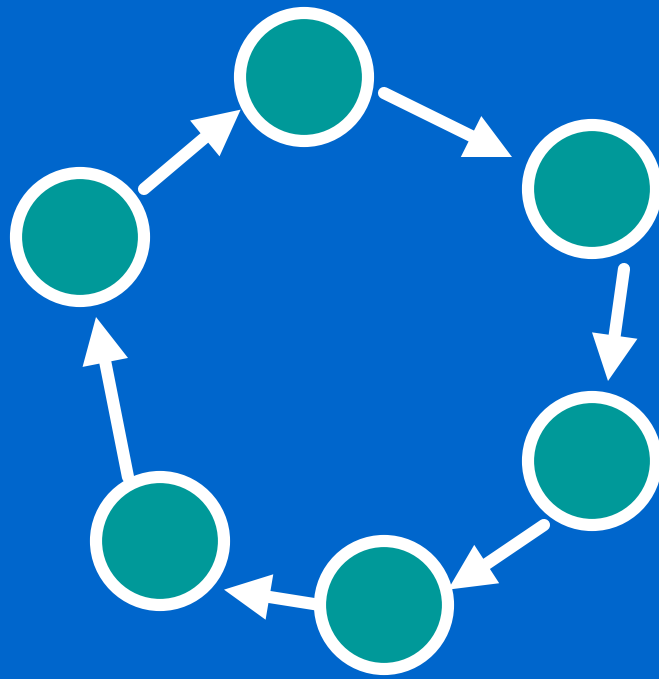
The Application

MPI application(s) that has the communication topology of a ring.

The application is from a single piece of code that is structured to allow for two separate MPI executables or a single executable.

The ring calculates the value p using the integral method.

The application



Part 1

Write the application so that it uses MPI-2 (MPICH / LAM) or IMPI and that half the MPI tasks run on the Cetus machines and the other half run on the Hydra machines.

The executable should output results of where each node ran, which part of the interval they calculated, their result and running total.

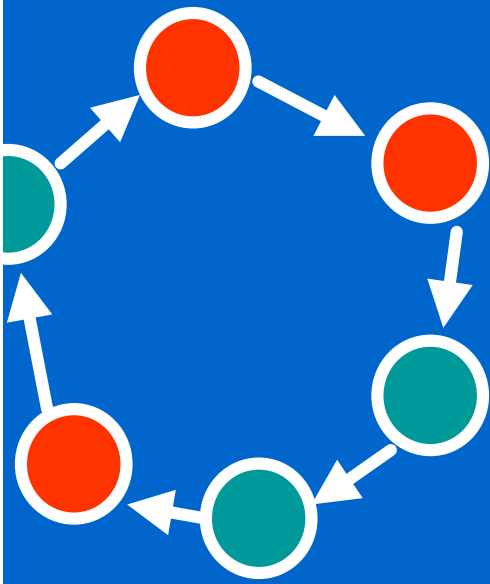
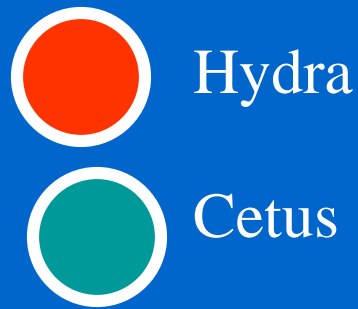
Part 1

Inter-operating two halves

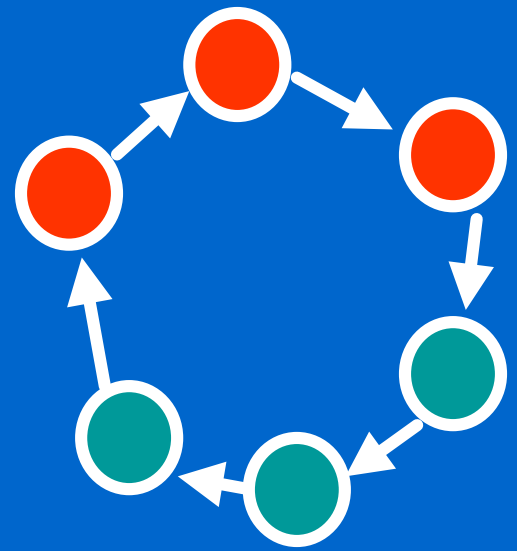
Two runs of all this version are required:

- (1) that uses the nodes as they are allocated.
- (2) a version that divides up the nodes so that the first part of the ring is on the cetus machine and the second part of ring is on the hydra machines.
 - This involves making a mapping from the given topology to a new one with the nodes in the right order.

Part 1 example



the original allocation order



Remap the ordering so that messages pass around one machines and then the other

Part 2

Inter-operating two halves

Using the same source code which is controlled at compile time by precompiler directives (`#ifdef`) alter the application to run as two separate MPI applications that interact to form a single ring and still calculate the same result.

Part 2

Inter-operating two halves

Two versions are required:

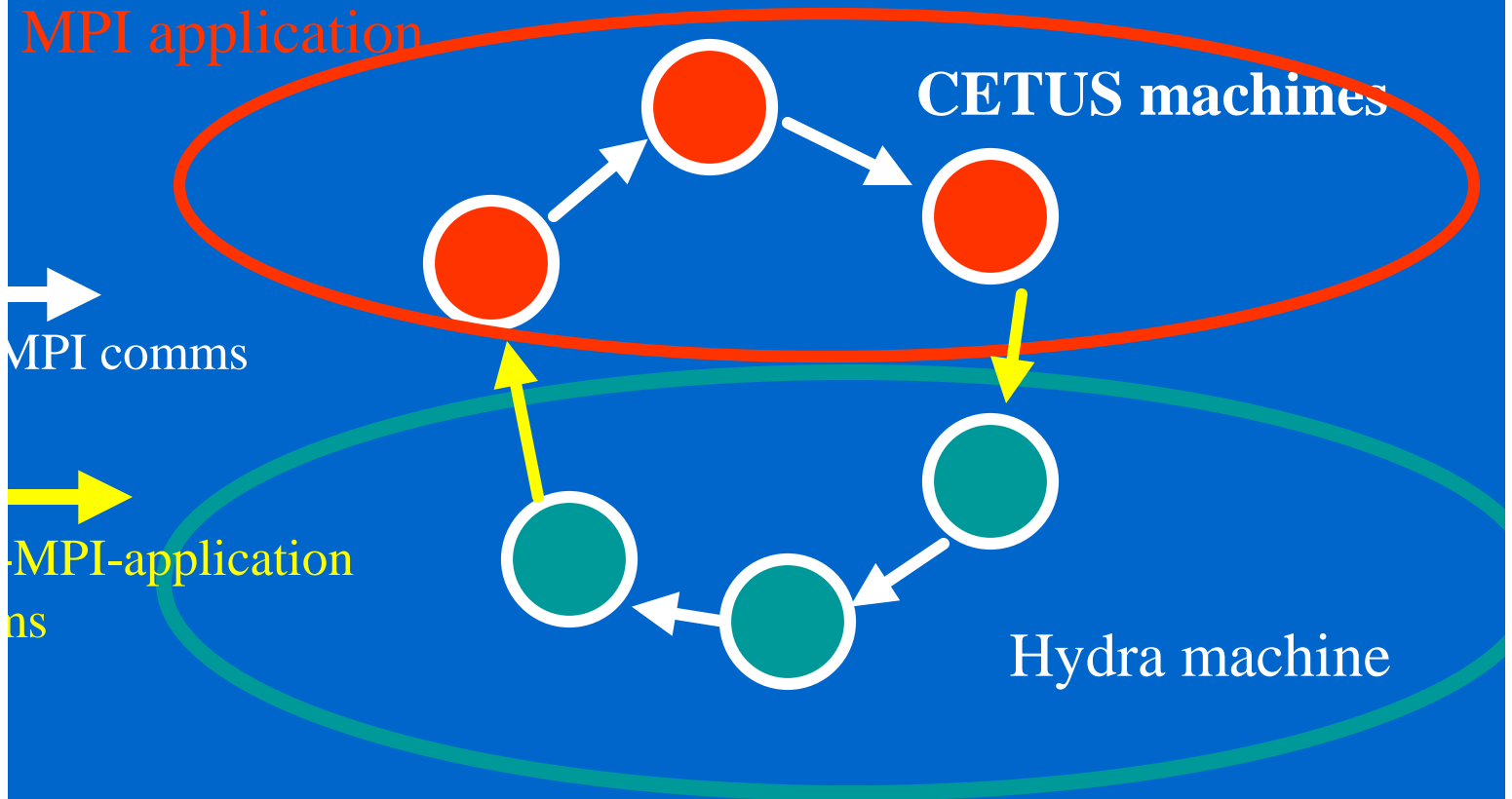
(1) using PVMPI/MPI_Connect as an interconnection system.

(2) a version using either native PVM, SNIPE_Lite, or your own socket library!

– Dr Plank also has a library available on the web. Although knowing how to write TCP or UDP code is good for you!

Application Examples

MPI application



MPI comms

MPI-application

CETUS machines

Hydra machine

Another MPI application

Bonus points

Bonus points:

- how can you check for homogeneous systems and thus reduce any data conversion overheads
- Code it if you can
 - do you need to do it for all the communication or just parts? Explain...

Write up

Write two sides on the following:

Explain which provided the better interface for inter-operation?

Which was more flexible?

Which could be made fault tolerant?

If it was not a ring, but a more complex graph, how would you optimise the job placement? Or would you just change the communication ordering...

Marking

Tar up your Makefile, write up and source code into a single file.

Then calculate its message digest using md5 I.e.

- `/usr/local/bin/md5 myfile.tar`
- `MD5 (myfile.tar) = 89e54c5e2d1b67153fd780e3fb1b19eb`

Mail me the md5 result. I will compare it when you demo your code to me.

- I.e. your Makefile should have a 'clean' and 'makedist' option.
- I will need to see you make the executables from a clean directory!

(fagg@cs.utk.edu) by the 25th April 2000.

- And demo'd to me by the end of THAT WEEK.

What if...

If you can't find the software you need on the system?

– **INSTALL IT IN YOUR HOME AREA**

- Share the installed software with your class mates
 - I.e. learn how to correctly use file/directory permissions.
- Knowing how to do this is essential for when you leave UTK and YOU become the system admin!
- Know HOW to find documents on the web about different APIs and learn to look for example code.