

## **Using MPI in tembusu for CS3211 Parallel and Concurrent Programming**

You need to login to [tembusu.comp.nus.edu.sg](https://tembusu.comp.nus.edu.sg) If you have difficulty, go to <https://mysoc.nus.edu.sg/~myacct/> click on Services, and enable tembusu access.

More details about tembusu access appear in <https://docs.comp.nus.edu.sg/node/1254>

The following instructions contain many ways of working with MPI, and you clearly do not need all of them.

---

### **To compile MPI program**

cpi.c is an example program provided by the MPICH distribution. It and other examples can be found in /opt/mpich/examples. Myrinet examples are from tembusu1 which has a 64-node Myrinet network. In the following sample instruction, the same program is used to illustrate both MPICH and LAM-MPI. First, copy the program into your home directory. Then, follow the steps below.

1. MPI program running over Ethernet (MPICH)  
[user@access0]\$ /opt/mpich/bin/mpicc -c cpi.c  
[user@access0]\$ /opt/mpich/bin/mpicc -o cpi cpi.o]
2. MPI program running over Ethernet (LAM-MPI)  
[user@access0]\$ /opt/lam-mpi/bin/mpicc -g -c cpi.c  
[user@access0]\$ /opt/lam-mpi/bin/mpicc -g cpi.o -o cpi]
3. MPI program running over Myrinet (applicable to Myrinet nodes ONLY)  
[user@compute-0-36]\$ /opt/mpich/myrinet/gcc/bin/mpicc -c cpi.c  
[user@compute-0-36]\$ /opt/mpich/myrinet/gcc/bin/mpicc -o cpi-gm cpi.o]

### **Prerequisite: Creating the machine file**

1. For MPICH, create a machine file that looks like this:

```
# cat mynodes
access0
access1
access2
access3
access4
access5
access6
access7
access8
access9
```

2. The machine file for LAM-MPI should look something like this:

```
# cat machinefile
access0.cl.comp.nus.edu.sg cpu=2
access1.cl.comp.nus.edu.sg cpu=2
access2.cl.comp.nus.edu.sg cpu=2
access3.cl.comp.nus.edu.sg cpu=2
access4.cl.comp.nus.edu.sg cpu=2
access5.cl.comp.nus.edu.sg cpu=2
access6.cl.comp.nus.edu.sg cpu=2
access7.cl.comp.nus.edu.sg cpu=2
access8.cl.comp.nus.edu.sg cpu=2
access9.cl.comp.nus.edu.sg cpu=2
```

Run lamboot to launch the LAM runtime environment.

```
[user@access0]$ lamboot -v -ssi boot rsh machinefile
```

lamboot will invoke the LAM-MPI requisite programs via SSH on all compute nodes listed in the machine file.

### To run MPI program over Ethernet

1. Run binary MPI program (MPICH)  

```
[user@access0]$ /opt/mpich/bin/mpirun -machinefile mynodes -np 8 /home/user/cpi
```
2. Run binary MPI program (LAM-MPI)  

```
[user@access0]$ /opt/lam-mpi/bin/mpirun C /home/user/cpi
```

### More information on MPI

More documentation on the MPICH distribution can be found on its website (also see [www.mpich.org](http://www.mpich.org))

LAM MPI documentation can be found [here](#).

LAM MPI tutorials are found [here](#).

### Using MPI with SGE

SGE is tightly coupled with MPICH and allows you to submit MPICH jobs. To do so, you are going to need a script file that calls mpirun.

The script file should look like:

```
#
# My MPICH SGE Submission script
#
# SGE gives me 2 parameters
# $NSLOTS = the number of slots
# $TMPDIR/machines = the machine file
#
# I start the job with:
#
/opt/mpich/bin/mpirun -np $NSLOTS -machinefile $TMPDIR/machines /path/to/my/job
#
# Note that tembusu houses several different architecture so you
# need to use the mpirun from the correct directory:
```

```
# /opt/mpich - 32bit mpich (x86 Linux)
# /opt/mpich-64 - 64bit mpich (AMD64 Linux)
# /opt/mpich2-64 - 64bit mpich (AMD64 Linux) but MPICH2
```

You can start the job with

```
$ qsub -pe mpich <#slots> /path/to/my/script
```

**Notes:**

- If you use your own machine file, your job will start but will be killed by a cleanup process after a short while. This is described in Usage Policy for Compute Nodes.
- If your job does not start, take a look at the error file for a hint of what happened.