

Programming Assignment 1 – MPI Basics
Phys 7411
Spring 2009
Due Date: Feb 19, 2009, 6:00pm (CST)

For this assignment you will write your own version of MPI_Allreduce, called MY_Allreduce, using MPI_Send and MPI_Recv calls. Compare the performance of your implementation with the “real” MPI_Allreduce in the MVAPICH MPI library on Glenn. You may work on this project as an individual or in groups of two (choose your own partner) and can write your code in either C or Fortran.

You may assume:

```
datatype = MPI_INT
operator = MPI_SUM and
comm.= MPI_COMM_WORLD
```

1. Write a program to run MY_Allreduce and MPI_Allreduce to sum vectors of length 512 (integer elements) and 65536 (integer elements). Use MPI_Wtime to measure the execution times.
2. Record execution times for a particular problem size on 1, 2, 4, 8 ... upto 128 processes. Take a few measurements of each size. Choose a problem size that is large enough that there is enough work to spread across 128 processes but is not too large that it requires more than a few minutes to run on 1 or 2 processors.

Suggestions: Write the test program first using MPI_Allreduce, then work on MY_Allreduce. Check the resulting sum from your reduce with the standard one, to make sure your result is correct.

What to submit:

Electronically submit your code, performance results and discussion via email by the date and time listed above. Send to katomko@gmail.com and moreno@phys.lsu.edu with the subject “Phys7411 Assignment 1” in the subject so that we can easily search for your message. Specifically you should include:

1. Source code for your MY_Allreduce routine and your performance measurement program.
2. A text file named README which describes how to compile and run the program.
3. Your code and README files should be bundled up in a .tar archive file for submission.
4. Also submit a writeup as an MS Word or pdf document describing your code which includes the following
 - i. Your name (or names if you worked with a partner)
 - ii. Pseudo code for your MY_Allreduce routine.
 - iii. An analysis of the number of messages exchanged in your MY_Allreduce code as a function of the number of processors
 - iv. A description of your performance tests

- v. A graph or graphs comparing the MY_Allreduce performance to the MVAPICH MPI_Allreduce performance on the Glenn Opteron cluster at OSC.

Late submissions accepted with late penalty which increases by 5% each 24 hour period after the deadline.