

MPI Tutorial

July 15, 2013

Shao-Ching Huang, Ph.D.
Institute for Digital Research and Education, UCLA

Email: schuang@idre.ucla.edu

Class Material

Slides: <http://hpc.ucla.edu/sch/files/vcla-2013-mpi.pdf>
Sample code: <https://bitbucket.org/schuang/vcla-2013/src>

To download sample code, issue the commands (assuming vcla-2013 directory does not exist):

```
$ git clone https://bitbucket.org/schuang/vcla-2013.git vcla-2013
$ cd vcla-2013
```

This command should work on Hoffman2 cluster. If you do this on your computer, make sure that it has “git” (version control software) installed. If you have run the “git clone” command previously and just want to get new updates, enter the vcla-2013 directory and run:

```
$ git pull
```

Note that this command may overwrite any changes you made in the directory.

Exercises

1. (Optional) Install a MPI library on your desktop or laptop computer. Describe the difficulties you encounter and how to solve them.
2. Compile and run all sample codes. Make sure you understand them. You are encouraged to re-write them following your own programming style – did you produce identical results?
3. In the vector inner product example, we assume the global vector size N is a multiple of the number of processors np (e.g. $N = 20$ and $np = 4$). Consider the more general case when N is not a multiple of np (e.g. $N = 20$ and $np = 3$). Modify the sample code (`vecvec_mpi.cpp`), or write your own code, to handle this situation. Show that your result is correct.
4. In the matrix-vector product example, the global size of matrix A being M -by- N , consider the more general situation where both M and N are not multiple of number of processors, np . Modify the sample code (`matvec_mpi.cpp`), or write your own code, to handle this situation. Show that your result is correct.