

# Chen GU Assignment 2 CPSC 424

## Building and running information

### Development environment

#### Module loaded

```
[cg736@compute-33-1 ~]$ module list
Currently Loaded Modulefiles:
  1) Base/yale_hpc              2) Langs/Intel/15              3) MPI/OpenMPI/1.8.6-intel15
  nMPI/1.8.6-intel15
```

#### env command

```
[cg736@compute-33-1 ~]$ env
MKLR00T=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mkl
MANPATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15/share/man:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/man/en_US:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/intel64/share/man:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/intel64_mic/share/man:/usr/share/man:/opt/moab/share/man:
GDB_HOST=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/intel64_mic/bin/gdb-ia-mic
HOSTNAME=compute-33-1.local
IPPR00T=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/ipp
INTEL_LICENSE_FILE=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/licenses:/opt/intel/licenses:/home/apps/fas/Licenses/intel_site.lic
TERM=xterm-256color
SHELL=/bin/bash
HISTSIZE=1000
GDBSERVER_MIC=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/target/mic/bin/gdbserver
SSH_CLIENT=10.191.63.252 43942 22
LIBRARY_PATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15/lib:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/ipp/./compiler/lib
```

```
/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/ipp/lib/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/compiler/lib/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mkl/lib/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/tbb/lib/intel64/gcc4.4
PERL5LIB=/opt/rocks/lib/perl5
FPATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15/include:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mkl/include
QTDIR=/usr/lib64/qt-3.3
QTINC=/usr/lib64/qt-3.3/include
MIC_LD_LIBRARY_PATH=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mpirt/lib/mic:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/ipp/lib/mic:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/compiler/lib/mic:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mkl/lib/mic:/opt/intel/mic/coi/device-linux-release/lib:/opt/intel/mic/myo/lib:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/tbb/lib/mic
SSH_TTY=/dev/pts/3
ANT_HOME=/opt/rocks
USER=cg736
LD_LIBRARY_PATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15/lib:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mpirt/lib/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/ipp/./compiler/lib/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/ipp/lib/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/ipp/tools/intel64/perfsys:/opt/intel/mic/coi/host-linux-release/lib:/opt/intel/mic/myo/lib:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/compiler/lib/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mkl/lib/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/tbb/lib/intel64/gcc4.4:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/ipt/intel64/lib
MIC_LIBRARY_PATH=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/compiler/lib/mic:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mpirt/lib/mic:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/tbb/lib/mic
ROCKS_ROOT=/opt/rocks
CPATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15/include:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/ipp/include:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mkl/include:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/tbb/include
YHPC_COMPILER=Intel
OMPI_MCA_orte_precondition_transports=f20cd2d28f432704-15e3f8c3bb8e89d6
NLSPATH=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/compiler/lib/intel64/locale/%l_%t/%N:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/ipp/lib/intel64/locale/%l_%t/%N:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mkl/lib/intel64/locale/%l_%t/%N:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/intel64_mic/share/locale/%l_%t/%N:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/intel64/share/locale/%l_%t/%N
```



```
MAIL=/var/spool/mail/cg736
PATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15/bin:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/bin/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mpirt/bin/intel64:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/intel64_mic/bin:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/intel64/bin:/home/apps/fas/Modules:/usr/lib64/qt-3.3/bin:/opt/roab/bin:/usr/local/bin:/bin:/usr/bin:/usr/local/sbin:/usr/sbin:/sbin:/usr/java/latest/bin:/opt/rocks/bin:/opt/rocks/sbin:/home/apps/bin:/home/fas/cpsc424/cg736/bin
YHPC_COMPILER_MINOR=164
TBBROOT=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/tbb
C_INCLUDE_PATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15/include
F90=ifort
PWD=/home/fas/cpsc424/cg736
_LMFILES=/home/apps/fas/Modules/Base/yale_hpc:/home/apps/fas/Modules/Langs/Intel/15:/home/apps/fas/Modules/MPI/OpenMPI/1.8.6-intel15
YHPC_COMPILER_MAJOR=2
JAVA_HOME=/usr/java/latest
GDB_CROSS=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/intel64_mic/bin/gdb-mic
DOMAIN=omega
LANG=en_US.iso885915
MODULEPATH=/home/apps/fas/Modules
MOABHOMEDIR=/opt/roab
YHPC_COMPILER_RELEASE=2015
LOADED_MODULES=Base/yale_hpc:Langs/Intel/15:MPI/OpenMPI/1.8.6-intel15
KDEDIRS=/usr
F77=ifort
MPM_LAUNCHER=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/mpm/bin/start_mpm.sh
CXX=icpc
SSH_ASKPASS=/usr/libexec/openssh/gnome-ssh-askpass
HISTCONTROL=ignoredups
INTEL_PYTHONHOME=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/python/intel64/
SHLVL=1
HOME=/home/fas/cpsc424/cg736
FC=ifort
LOGNAME=cg736
QTLIB=/usr/lib64/qt-3.3/lib
CVS_RSH=ssh
SSH_CONNECTION=10.191.63.252 43942 10.191.12.33 22
MODULESHOME=/usr/share/Modules
LESSOPEN=||/usr/bin/lesspipe.sh %s
arch=intel64
INFOPATH=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/intel64/share/info:/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/intel64_mic/share/info/
```

```
CC=icc
INCLUDE=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/mkl
/include
MPI_PATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15
G_BROKEN_FILENAMES=1
BASH_FUNC_module()=() { eval ` /usr/bin/modulecmd bash $* `
}
_=/bin/env
```

## How to run the code

### Compiling and linking

In the source code directory, you can type

```
make
```

to compile and link.

### Running

After compiling and linking the files, you will get three executables: `task1`, `task2` and `task3`.

### Interactive mode

You can run the program in interactive mode, for example:

```
mpiexec -n 4 task1
```

In the above command, the optional parameter `n` represents number of processes to run this job. Running `task2` and `task3` is the same as above.

### Batch mode

You can also run the program in batch mode. To do so, you can type

```
qsub runtask1.dh
```

to run task1. Similarly, you can type

```
qsub runtask2.sh
```

```
qsub runtask3.sh
```

to run `task2` and `task3` respectively.

## Output

### Output for task1

```
[cg736@compute-33-1 log]$ cat Task1.o5402040
/lustre/home/client/fas/cpsc424/cg736
/lustre/home/client/fas/cpsc424/cg736/as/as2
compute-32-14
compute-32-14
compute-32-13
compute-32-13
Message printed by master: Total elapsed time is 0.000361 seconds.
From process 3: I worked for 4 seconds after receiving the following message:
    Hello, from process 0.
From process 2: I worked for 8 seconds after receiving the following message:
    Hello, from process 0.
From process 1: I worked for 12 seconds after receiving the following message:
    Hello, from process 0.

real    0m14.652s
user    0m2.157s
sys     0m0.238s
Message printed by master: Total elapsed time is 0.000057 seconds.
From process 2: I worked for 4 seconds after receiving the following message:
    Hello, from process 0.
From process 1: I worked for 8 seconds after receiving the following message:
    Hello, from process 0.
From process 3: I worked for 12 seconds after receiving the following message:
```



```

Hello, from process 0.

real    0m13.440s
user    0m2.222s
sys 0m0.217s
Message printed by master: Total elapsed time is 0.000056 seconds.
From process 2: I worked for 4 seconds after receiving the following message:
    Hello, from process 0.
From process 3: I worked for 8 seconds after receiving the following message:
    Hello, from process 0.
From process 1: I worked for 12 seconds after receiving the following message:
    Hello, from process 0.

real    0m13.420s
user    0m2.149s
sys 0m0.199s

```

## Output for task2

```

[cg736@compute-33-1 log]$ cat Task2.o5402054
/lustre/home/client/fas/cpsc424/cg736
/lustre/home/client/fas/cpsc424/cg736/as/as2
compute-32-14
compute-32-14
compute-32-13
compute-32-13
Message from process 1: Hello master, from process 1 after working for 12 seconds.
Message from process 2: Hello master, from process 2 after working for 4 seconds.
Message from process 3: Hello master, from process 3 after working for 8 seconds.
Message printed by master: Total elapsed time is 21.000697 seconds.

real    0m24.069s
user    0m14.127s
sys 0m0.213s
Message from process 1: Hello master, from process 1 after working for 8 seconds.
Message from process 2: Hello master, from process 2 after working for 12 seconds.
Message from process 3: Hello master, from process 3 after working for 4 seconds.

```

Message printed by master: Total elapsed time is 18.000620 seconds.

real 0m19.419s

user 0m11.176s

sys 0m0.161s

Message from process 1: Hello master, from process 1 after working for 4 seconds.

Message from process 2: Hello master, from process 2 after working for 8 seconds.

Message from process 3: Hello master, from process 3 after working for 12 seconds.

Message printed by master: Total elapsed time is 15.000283 seconds.

real 0m16.415s

user 0m8.123s

sys 0m0.212s

## Output for task3

```
[cg736@compute-33-1 log]$ cat Task3
```

```
cat: Task3: No such file or directory
```

```
[cg736@compute-33-1 log]$ cat Task3.o5402069
```

```
/lustre/home/client/fas/cpsc424/cg736
```

```
/lustre/home/client/fas/cpsc424/cg736/as/as2
```

```
compute-32-14
```

```
compute-32-14
```

```
compute-32-13
```

```
compute-32-13
```

Message from process 1: Hello master, from process 1 after working for 8 seconds.

Message from process 2: Hello master, from process 2 after working for 4 seconds.

Message from process 3: Hello master, from process 3 after working for 12 seconds.

Message printed by master: Total elapsed time is 15.000835 seconds.

real 0m16.743s

user 0m8.116s

sys 0m0.209s

Message from process 1: Hello master, from process 1 after working for 12 seconds.

Message from process 2: Hello master, from process 2 after working for 8 seconds.

Message from process 3: Hello master, from process 3 after working for 4 seconds.

Message printed by master: Total elapsed time is 15.000308 seconds.

real 0m16.422s

user 0m8.079s

sys 0m0.176s

Message from process 1: Hello master, from process 1 after working for 4 seconds.

Message from process 2: Hello master, from process 2 after working for 12 seconds.

Message from process 3: Hello master, from process 3 after working for 8 seconds.

Message printed by master: Total elapsed time is 15.000318 seconds.

real 0m16.433s

user 0m8.134s

sys 0m0.211s



