

# Assignment 2

CPSC424

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## 1 Software and Development Environment

All the programming for this assignment was done in vim. This document was made using Emacs and L<sup>A</sup>T<sub>E</sub>X. The only modules used in this assignment were Langs/Intel/15 and MPI/OpenMPI/1.8.6-intel15.

### 1.1 How to run the code

To compile the code and load the appropriate modules do the following:

```
cd jnb37_ps2_cpsc424
sh setup.sh
```

In order to run code associated with a task, do the following:

```
qsub runtask<n>.sh
```

where  $\langle n \rangle$  is the number of the task (1-3).

### 1.2 Task 1 Output

Message printed by master: Total elapsed time is 0.000061 seconds.

From process 1: 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 2: I worked for 12 seconds after receiving the following message:

Hello, from process 0.

```
real    0m16.175s
```

```

user    0m2.250s
sys     0m0.222s
Message printed by master: Total elapsed time is 0.000057 seconds.
From process 1: 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 2: I worked for 12 seconds after receiving the following message:
    Hello, from process 0.

real    0m14.424s
user    0m2.249s
sys     0m0.206s
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 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    0m14.426s
user    0m2.213s
sys     0m0.184s

```

### 1.3 Task 2 Output

```

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

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

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

Message printed by master: Total elapsed time is 18.001153 seconds.

real    0m20.439s
user    0m12.131s
sys     0m0.252s
Message from process 1: Hello master, from processes 1 after working 4 seconds

```

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

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

Message printed by master: Total elapsed time is 18.001788 seconds.

real 0m20.422s

user 0m12.165s

sys 0m0.210s

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

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

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

Message printed by master: Total elapsed time is 17.001335 seconds.

real 0m19.462s

user 0m11.106s

sys 0m0.228s

## 1.4 Task 3 Output

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

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

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

Message printed by master: Total elapsed time is 15.000776 seconds.

real 0m17.421s user 0m9.139s sys 0m0.213s Message from process 1: Hello master, from processes 1 after working 12 seconds

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

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

Message printed by master: Total elapsed time is 15.000397 seconds.

real 0m17.428s user 0m9.096s sys 0m0.185s Message from process 1: Hello master, from processes 1 after working 8 seconds

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

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

Message printed by master: Total elapsed time is 15.000903 seconds.  
real 0m16.438s user 0m8.113s sys 0m0.185s

## 2 Questions

For task 2, the time reported by the master is much more indicative of the actual total time the program ran as compared to task 1. This is because, in task 1, the worker processes are doing their own printing, so all that we are actually timing is how long it takes for the master to send its initial message. Obviously this operation is only a fraction of the total runtime. Conversely, in task 2, the master collates all the messages from the workers so, in effect, we time how long it takes all the workers to complete their work.

## 3 env

```
MKLROOT=/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/share/man
GDB_HOST=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdb/insight
HOSTNAME=compute-33-1.local
IPPROOT=/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/intel
TERM=xterm
SHELL=/bin/bash
HISTSIZE=1000
GDBSERVER_MIC=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/debugger/gdbserver
SSH_CLIENT=10.191.63.252 34879 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/lib
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/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/mic-ld-library-path
SSH_TTY=/dev/pts/5
ANT_HOME=/opt/rocks
USER=jnb37
```

```

LD_LIBRARY_PATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15/lib:/home/apps/fas/Lan
MIC_LIBRARY_PATH=/home/apps/fas/Langs/Intel/2015_update2/composer_xe_2015.2.164/compil
ROCKS_ROOT=/opt/rocks
CPATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15/include:/home/apps/fas/Langs/Int
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/int
MAIL=/var/spool/mail/jnb37
PATH=/usr/local/cluster/hpc/MPI/OpenMPI/1.8.6-intel15/bin:/home/apps/fas/Langs/Intel/20
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/jnb37
_LMFILES=/home/apps/fas/Modules/Base/yale_hpc:/home/apps/fas/Modules/Langs/Intel/15:/
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/
DOMAIN=omega
LANG=en_US.iso885915
MODULEPATH=/home/apps/fas/Modules
MOABHOMEDIR=/opt/moab
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/mp
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/debugg
SHLVL=1
HOME=/home/fas/cpsc424/jnb37
FC=ifort
LOGNAME=jnb37
QTLIB=/usr/lib64/qt-3.3/lib
CVS_RSH=ssh
SSH_CONNECTION=10.191.63.252 34879 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/in
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

wm
```