

Parallel and Distributed Computing

BGU PDC2014B

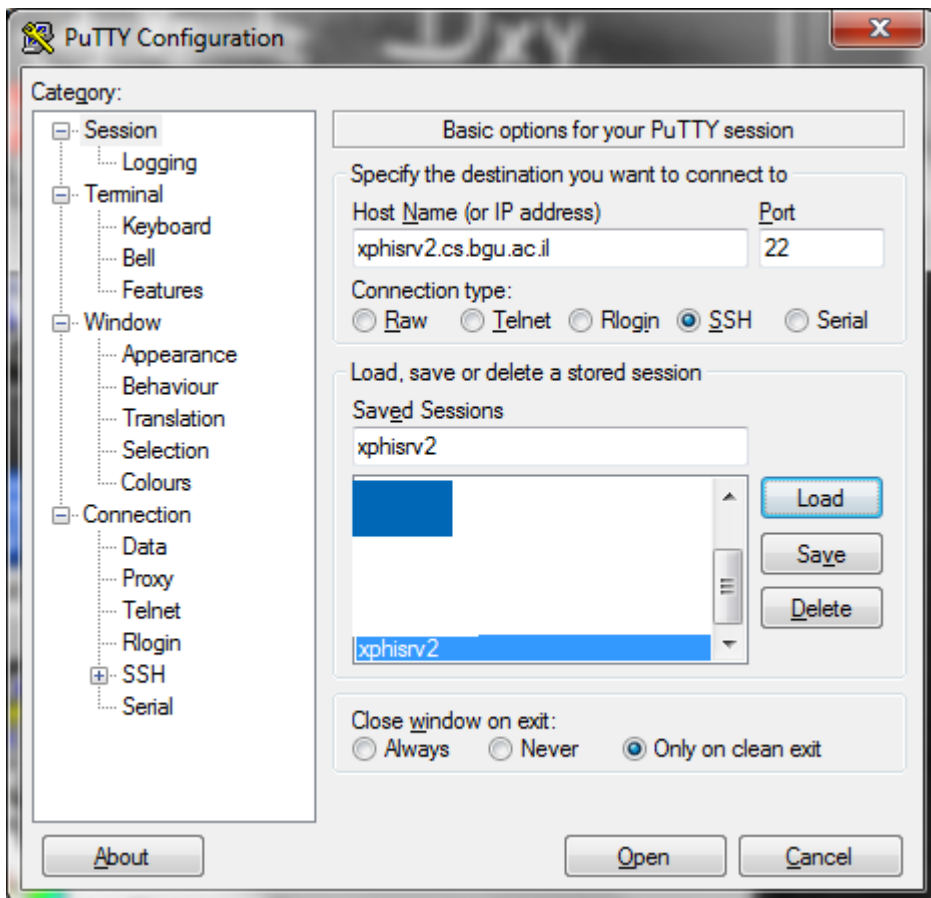
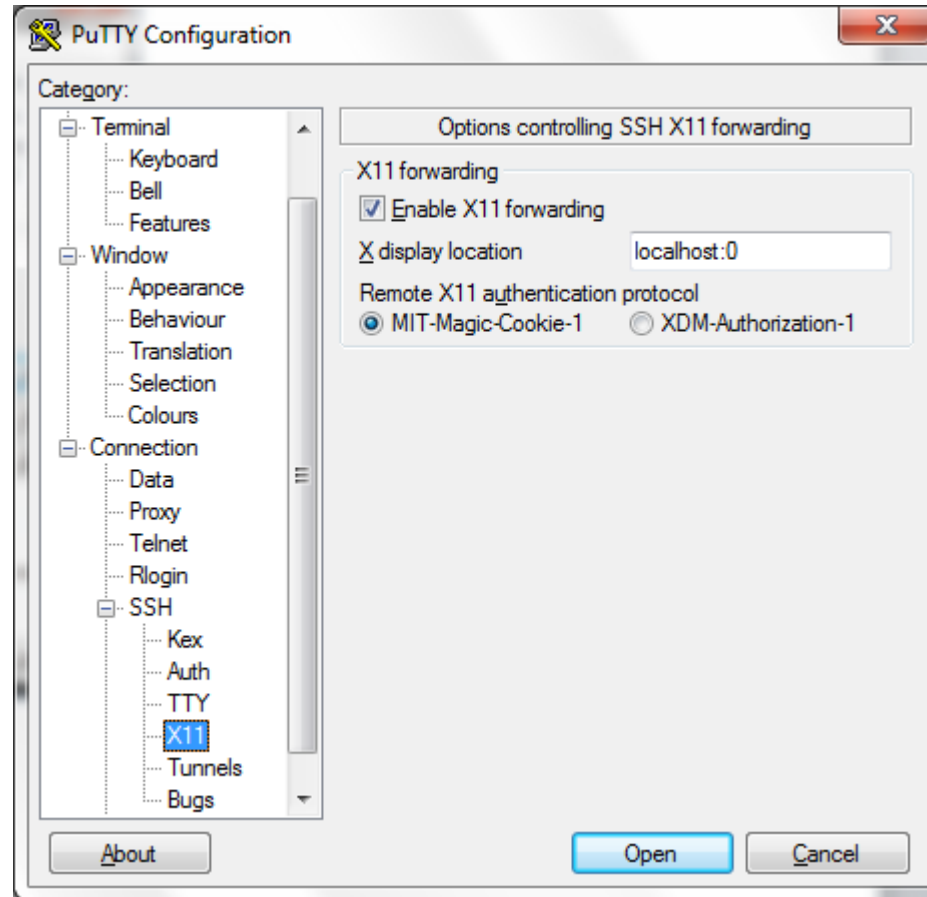
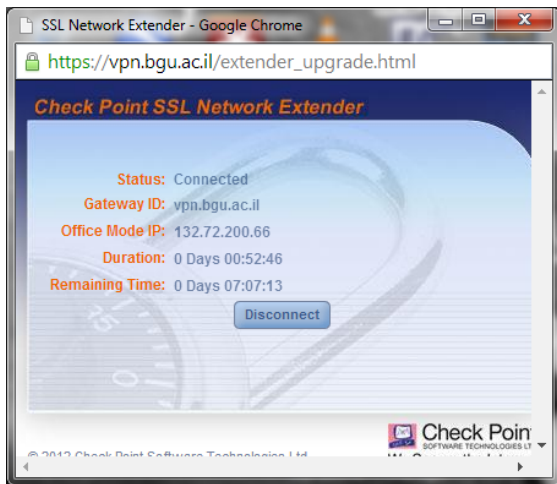
home assignment #1 - solution

**MPI Programming on the
Xeon Phi**

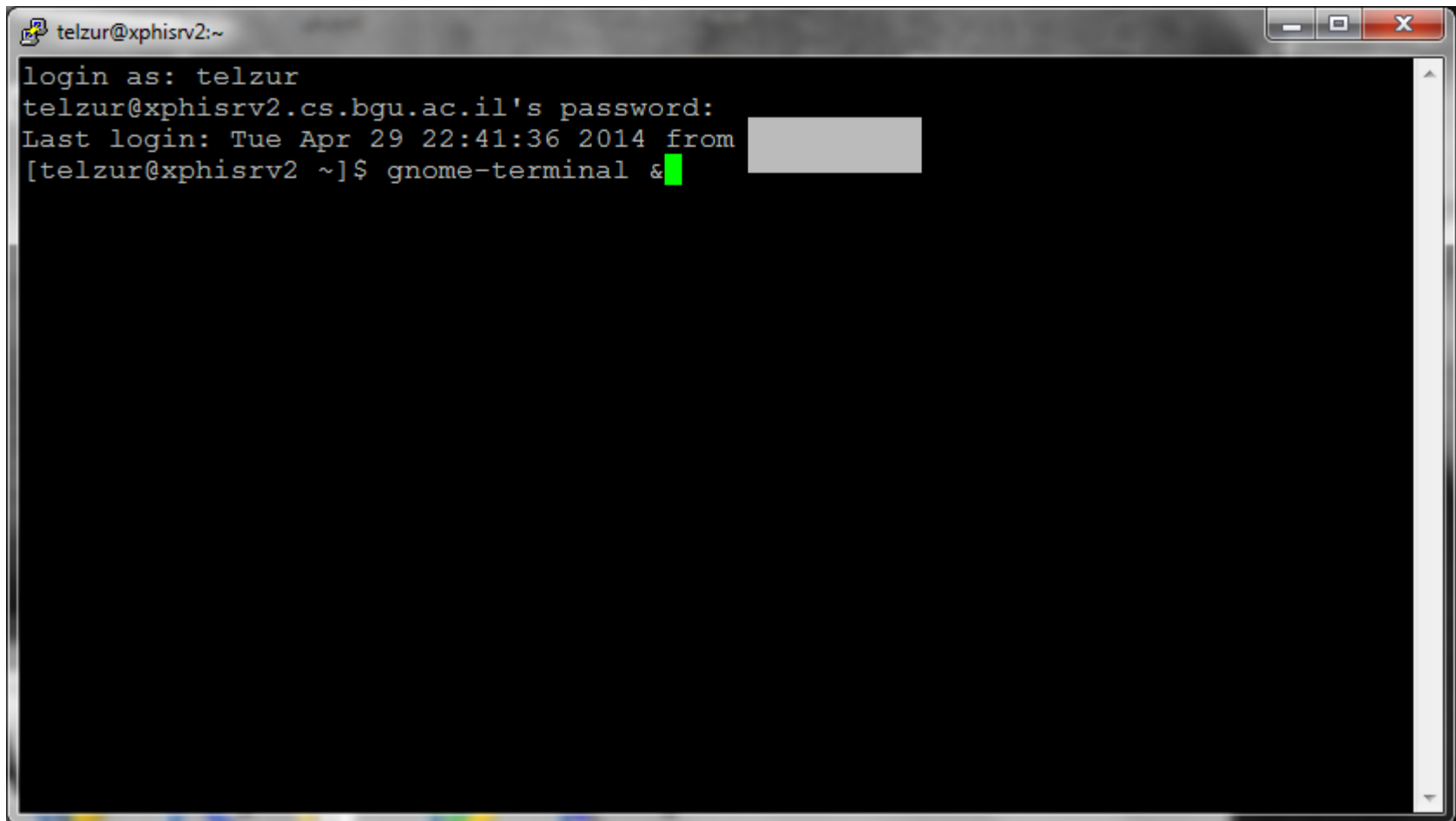
Guy Tel-Zur

Reference

[https://
software.intel.com/en-us/articles/using
-the-intel-mpi-library-on-intel-xeon-ph
i-coprocessor-systems](https://software.intel.com/en-us/articles/using-the-intel-mpi-library-on-intel-xeon-phi-coprocessor-systems)



Remote connection to the xphi server

A terminal window titled 'telzur@xphisrv2:~' with standard window controls. The terminal output shows a successful login for user 'telzur' on 'telzur@xphisrv2.cs.bgu.ac.il'. The last login was on Tue Apr 29 22:41:36 2014 from a redacted IP address. The user has executed the command 'gnome-terminal &' and a green cursor is visible at the end of the command line.

```
telzur@xphisrv2:~  
login as: telzur  
telzur@xphisrv2.cs.bgu.ac.il's password:  
Last login: Tue Apr 29 22:41:36 2014 from [REDACTED]  
[telzur@xphisrv2 ~]$ gnome-terminal & █
```

MPI execution on the main processors CPUs only

```
mpicc -o montecarlo_mpicc.host ./montecarlo.c
```

```
time mpirun -np 24 ./montecarlo_mpicc.host
```

```
Out of 4294967295 points, there are 2248825300 points inside the sphere => pi=  
3.141572713852n
```

```
real    0m22.401s
```

```
user    8m55.266s
```

```
sys     0m1.228s
```

```
mpiicc -o montecarlo_mpiicc.host ./montecarlo.c
```

```
time mpirun -np 24 ./montecarlo_mpiicc.host
```

```
Out of 4294967295 points, there are 2248819907 points inside the sphere => pi=  
3.141565322876n
```

```
real    0m14.492s
```

```
user    5m44.746s
```

```
sys     0m1.941s
```

telzur@xphisrv2:~/tests

```
[telzur@xphisrv2 tests]$ time mpirun -np 24 ./montecarlo_mpiicc
Hello world: rank 0 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 1 of 24 running on xphisrv2.cs.bgu.
ac.ilnHello world: rank 2 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 3 of 24 running on xphisrv2.c
s.bgu.ac.ilnHello world: rank 4 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 5 of 24 running on xphi
srv2.cs.bgu.ac.ilnHello world: rank 6 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 7 of 24 running o
n xphisrv2.cs.bgu.ac.ilnHello world: rank 8 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 9 of 24 run
ning on xphisrv2.cs.bgu.ac.ilnHello world: rank 10 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 11 o
f 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 12 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: r
ank 13 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 14 of 24 running on xphisrv2.cs.bgu.ac.ilnHello
world: rank 15 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 16 of 24 running on xphisrv2.cs.bgu.ac.i
lnHello world: rank 17 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 18 of 24 running on xphisrv2.cs.
bgu.ac.ilnHello world: rank 19 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 20 of 24 running on xphi
srv2.cs.bgu.ac.ilnHello world: rank 21 of 24 running on xphisrv2.cs.bgu.ac.ilnHello world: rank 22 of 24 running
 on xphisrv2.cs.bgu.ac.ilnHello world: rank 23 of 24 running on xphisrv2.cs.bgu.ac.ilnElapsed time from rank 0:
    12.87 (sec) nElapsed time from rank 1:    12.94 (sec) nElapsed time from rank 2:    12.88 (sec) nElapse
d time from rank 3:    12.93 (sec) nElapsed time from rank 4:    13.07 (sec) nElapsed time from rank 5:
    13.06 (sec) nElapsed time from rank 6:    13.12 (sec) nElapsed time from rank 7:    13.20 (sec) nElapsed ti
me from rank 8:    13.28 (sec) nElapsed time from rank 9:    13.39 (sec) nElapsed time from rank 10:    13
.97 (sec) nElapsed time from rank 11:    13.68 (sec) nElapsed time from rank 12:    13.80 (sec) nElapsed tim
e from rank 13:    13.89 (sec) nElapsed time from rank 14:    13.90 (sec) nElapsed time from rank 15:    1
3.90 (sec) nElapsed time from rank 16:    13.66 (sec) nElapsed time from rank 17:    13.56 (sec) nElapsed ti
me from rank 18:    13.23 (sec) nElapsed time from rank 19:    13.06 (sec) nElapsed time from rank 20:
    12.78 (sec) nElapsed time from rank 21:    12.58 (sec) nElapsed time from rank 22:    12.31 (sec) nElapsed t
ime from rank 23:    12.09 (sec) nOut of 4294967295 points, there are 2248836853 points inside the sphere => p
i= 3.141588687897n
real    0m14.035s
user    5m34.359s
sys     0m1.330s
[telzur@xphisrv2 tests]$
```

Parallel execution on the co-Processors mic only

I had to fight many miss configurations...

See next slides

Compiling for the mic

```
telzur@xphisrv2:~/tests
[telzur@xphisrv2 tests]$ source /opt/intel/composer_xe_2013_sp1
composer_xe_2013_sp1/      composer_xe_2013_sp1.0.080/
[telzur@xphisrv2 tests]$ source /opt/intel/composer_xe_2013_sp1.0.080/bin/compilervars.
compilervars.csh  compilervars.sh
[telzur@xphisrv2 tests]$ source /opt/intel/composer_xe_2013_sp1.0.080/bin/compilervars.
compilervars.csh  compilervars.sh
[telzur@xphisrv2 tests]$ source /opt/intel/composer_xe_2013_sp1.0.080/bin/compilervars.sh intel64
[telzur@xphisrv2 tests]$ source /opt/intel/im
imb/ impi/
[telzur@xphisrv2 tests]$ source /opt/intel/impi/4.1.1.036/bin64/mp
mpd                mpdcleanup.py    mpdlistjobs      mpdsigjob         mpiexec.py        mpirun
mpdallexit         mpdexit          mpdlistjobs.py   mpdsigjob.py     mpif77            mpitune
mpdallexit.py     mpdexit.py       mpdman.py        mpdtrace          mpif90            mpivars.csh
mpdboot           mpdgdbdrv.py    mpd.py           mpdtrace.py      mpifc             mpivars.sh
mpdboot.py        mpdhelp          mpdringtest      mpicc             mpigcc
mpdcheck          mpdhelp.py      mpdringtest.py   mpicleanup        mpigxx
mpdcheck.py       mpdkilljob       mpdroot          mpicxx            mpiicc
mpdchkpyver.py    mpdkilljob.py   mpdrun           mpiexec           mpiicpc
mpdcleanup        mpdlib.py        mpdrun.py        mpiexec.hydra     mpiifort
[telzur@xphisrv2 tests]$ source /opt/intel/impi/4.1.1.036/bin64/mpivars.sh
[telzur@xphisrv2 tests]$
```


Prepare 2 versions for the cpu and for the mic

```
telzur@xphisrv2:~/tests
[telzur@xphisrv2 tests]$ mpiicc -mmic -o montecarlo_mpiicc.mic ./montecarlo.c
[telzur@xphisrv2 tests]$ mpiicc -o montecarlo_mpiicc.host ./montecarlo.c
[telzur@xphisrv2 tests]$ █
```

mic0 was down, I had to do:

```
[root@xphisrv2 tests]# /etc/init.d/mpss restart
```

copy the executable to mic0

```
telzur@xphisrv2:~/tests  
[telzur@xphisrv2 tests]$ ls -lt montecarlo_mpiicc*  
-rwxrwxr-x. 1 telzur telzur 25163 May  6 15:35 montecarlo_mpiicc.host  
-rwxrwxr-x. 1 telzur telzur 15839 May  6 15:35 montecarlo_mpiicc.mic  
-rwxrwxr-x. 1 telzur telzur 25163 May  6 15:24 montecarlo_mpiicc  
[telzur@xphisrv2 tests]$ scp ./montecarlo_mpiicc.mic mic0:/home/telzur/.  
montecarlo_mpiicc.mic          100%  15KB  15.5KB/s   00:00  
[telzur@xphisrv2 tests]$ █
```

telzur@xphisrv2:~/tests

```
[telzur@xphisrv2 tests]$ ls -lt montecarlo_mpiicc*  
-rwxrwxr-x. 1 telzur telzur 25163 May  6 15:35 montecarlo_mpiicc.host  
-rwxrwxr-x. 1 telzur telzur 15839 May  6 15:35 montecarlo_mpiicc.mic  
-rwxrwxr-x. 1 telzur telzur 25163 May  6 15:24 montecarlo_mpiicc  
[telzur@xphisrv2 tests]$ scp ./montecarlo_mpiicc.mic mic0:/home/telzur/.  
montecarlo_mpiicc.mic          100%  15KB  15.5KB/s   00:00  
[telzur@xphisrv2 tests]$ export I_MPI_MIC=enable  
[telzur@xphisrv2 tests]$ mpirun -n 24 -host mic0 montecarlo_mpiicc.mic
```

pmi_proxy not found

```
telzur@xphisrv2:~/tests
[telzur@xphisrv2 tests]$ ls -lt montecarlo_mpiicc*
-rwxrwxr-x. 1 telzur telzur 25163 May  6 15:35 montecarlo_mpiicc.host
-rwxrwxr-x. 1 telzur telzur 15839 May  6 15:35 montecarlo_mpiicc.mic
-rwxrwxr-x. 1 telzur telzur 25163 May  6 15:24 montecarlo_mpiicc
[telzur@xphisrv2 tests]$ scp ./montecarlo_mpiicc.mic mic0:/home/telzur/.
montecarlo_mpiicc.mic                               100%  15KB  15.5KB/s   00:00
[telzur@xphisrv2 tests]$ export I_MPI_MIC=enable
[telzur@xphisrv2 tests]$ mpirun -n 24 -host mic0 montecarlo_mpiicc.mic
pmi_proxy: line 0: exec: pmi_proxy: not found
```

Update to
your
installed
version

Update to
your
installed
version

```
telzur@xphisrv2:/home/telzur/tests
#!/bin/sh
export COPROCESSORS="mic0 mic1"
export BINDIR="/opt/intel/impi/4.1.1.036/mic/bin"
export LIBDIR="/opt/intel/impi/4.1.1.036/mic/lib"
export COMPILERLIB="/opt/intel/composer_xe_2013_sp1.0.080/compiler/lib/mic"

for coprocessor in `echo $COPROCESSORS`
do
  for prog in mpiexec mpiexec.hydra pmi_proxy mpirun
  do
    sudo scp $BINDIR/$prog $coprocessor:/bin/$prog
  done

  for lib in libmpi.so.4.1 libmpigf.so.4.1 libmpigc4.so.4.1
  do
    sudo scp $LIBDIR/$lib $coprocessor:/lib64/$lib
  done

  for lib in libimf.so libsvml.so libintlc.so.5
  do
    sudo scp $COMPILERLIB/$lib $coprocessor:/lib64/$lib
  done
--More-- (99%)
```

Edit the script from the reference to your version of Intel's cluster studio

```
telzur@xphisrv2:/home/telzur/tests
[root@xphisrv2 tests]# ./prepare.sh
mpiexec                100% 1118KB    1.1MB/s    00:00
mpiexec.hydra          100% 1118KB    1.1MB/s    00:00
pmi_proxy              100%  926KB   926.3KB/s  00:00
mpirun                 100%   32KB    31.9KB/s   00:00
libmpi.so.4.1          100% 4678KB    4.6MB/s    00:01
libmpigf.so.4.1        100%  321KB   320.6KB/s  00:00
libmpigc4.so.4.1       100%  175KB   175.1KB/s  00:00
libimf.so              100% 2573KB    2.5MB/s    00:00
libsvml.so             100% 6089KB    6.0MB/s    00:01
libintlc.so.5          100%  156KB   155.6KB/s  00:00
mpiexec                100% 1118KB    1.1MB/s    00:00
mpiexec.hydra          100% 1118KB    1.1MB/s    00:00
pmi_proxy              100%  926KB   926.3KB/s  00:00
mpirun                 100%   32KB    31.9KB/s   00:00
libmpi.so.4.1          100% 4678KB    4.6MB/s    00:01
libmpigf.so.4.1        100%  321KB   320.6KB/s  00:00
libmpigc4.so.4.1       100%  175KB   175.1KB/s  00:00
libimf.so              100% 2573KB    2.5MB/s    00:01
libsvml.so             100% 6089KB    6.0MB/s    00:01
libintlc.so.5          100%  156KB   155.6KB/s  00:00
[root@xphisrv2 tests]#
```

If you get errors like: HYDU_sock_connect or unable to connect ... you need to stop the firewall

```
telzur@xphisrv2:/home/telzur/tests
5 ACCEPT all -- 0.0.0.0/0 0.0.0.0/0 state RELATED,ESTABLISHED
6 ACCEPT icmp -- 0.0.0.0/0 0.0.0.0/0
7 ACCEPT all -- 0.0.0.0/0 0.0.0.0/0
8 ACCEPT tcp -- 0.0.0.0/0 0.0.0.0/0 state NEW tcp dpt:22
9 REJECT all -- 0.0.0.0/0 0.0.0.0/0 reject-with icmp-host-prohi
bited

Chain FORWARD (policy ACCEPT)
num target prot opt source destination
1 ACCEPT all -- 0.0.0.0/0 192.168.122.0/24 state RELATED,ESTABLISHED
2 ACCEPT all -- 192.168.122.0/24 0.0.0.0/0
3 ACCEPT all -- 0.0.0.0/0 0.0.0.0/0
4 REJECT all -- 0.0.0.0/0 0.0.0.0/0 reject-with icmp-port-unrea
chable
5 REJECT all -- 0.0.0.0/0 0.0.0.0/0 reject-with icmp-port-unrea
chable
6 REJECT all -- 0.0.0.0/0 0.0.0.0/0 reject-with icmp-host-prohi
bited

Chain OUTPUT (policy ACCEPT)
num target prot opt source destination

[root@xphisrv2 tests]# /etc/init.d/iptables stop
iptables: Setting chains to policy ACCEPT: nat mangle filte[ OK ]
iptables: Flushing firewall rules: [ OK ]
iptables: Unloading modules: [ OK ]
[root@xphisrv2 tests]#
```

Wrong shared libraries configuration

An ad hoc solution:

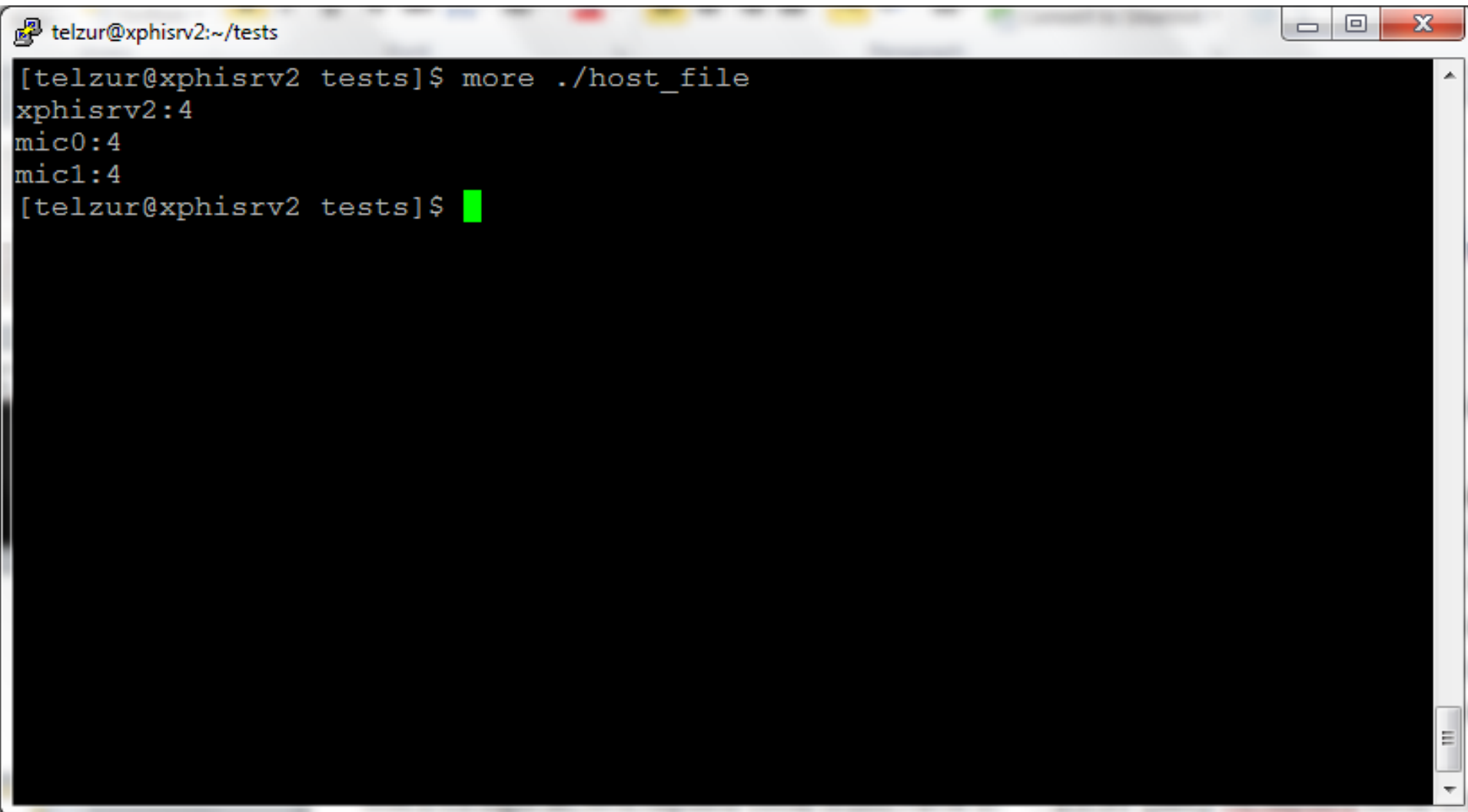
```
[root@xphisrv2-mic0 usr]# cd /lib64
[root@xphisrv2-mic0 lib64]# cp libmpigf.so.4.1
libmpigf.so.4
[root@xphisrv2-mic0 lib64]# cp libmpi.so.4.1 libmpi.so.4
```

Do the same also at the other mic


```
[telzur@xphisrv2 tests]$ mpirun -n 24 -host mic0 /home/telzur/tests/montecarlo_mpiicc.mic
Hello world: rank 0 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 1 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 2 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 3 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 4 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 5 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 6 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 7 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 8 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 9 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 10 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 11 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 12 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 13 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 14 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 15 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 16 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 17 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 18 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 19 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 20 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 21 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 22 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 23 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnElapsed time from rank 0: 94.64 (sec) nElapsed time from rank 1: 94.94 (sec) nElapsed time from rank 2: 95.30 (sec) nElapsed time from rank 3: 94.79 (sec) nElapsed time from rank 4: 94.50 (sec) nElapsed time from rank 5: 95.67 (sec) nElapsed time from rank 6: 95.60 (sec) nElapsed time from rank 7: 95.06 (sec) nElapsed time from rank 8: 95.65 (sec) nElapsed time from rank 9: 95.96 (sec) nElapsed time from rank 10: 96.25 (sec) nElapsed time from rank 11: 95.92 (sec) nElapsed time from rank 12: 95.13 (sec) nElapsed time from rank 13: 95.61 (sec) nElapsed time from rank 14: 96.05 (sec) nElapsed time from rank 15: 95.61 (sec) nElapsed time from rank 16: 96.60 (sec) nElapsed time from rank 17: 96.53 (sec) nElapsed time from rank 18: 96.56 (sec) nElapsed time from rank 19: 95.95 (sec) nElapsed time from rank 20: 101.20 (sec) nElapsed time from rank 21: 136.25 (sec) nElapsed time from rank 22: 95.49 (sec) nElapsed time from rank 23: 94.51 (sec) nOut of 4294967295 points, there are 2248845005 points inside the sphere => pi= 3.141600131989n[telzur@xphisrv2 tests]$ clear
```

```
[telzur@xphisrv2 tests]$ time mpirun -n 24 -host mic0 /home/telzur/tests/montecarlo_mpiicc.mic
Hello world: rank 0 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 1 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 2 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 3 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 4 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 5 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 6 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 7 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 8 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 9 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 10 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 11 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 12 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 13 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 14 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 15 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 16 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 17 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 18 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 19 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 20 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 21 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 22 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnHello world: rank 23 of 24 running on xphisrv2-mic0.cs.bgu.ac.ilnElapsed time from rank 0: 94.77 (sec) nElapsed time from rank 1: 94.61 (sec) nElapsed time from rank 2: 94.54 (sec) nElapsed time from rank 3: 94.66 (sec) nElapsed time from rank 4: 94.52 (sec) nElapsed time from rank 5: 94.57 (sec) nElapsed time from rank 6: 95.08 (sec) nElapsed time from rank 7: 95.09 (sec) nElapsed time from rank 8: 94.98 (sec) nElapsed time from rank 9: 95.03 (sec) nElapsed time from rank 10: 94.99 (sec) nElapsed time from rank 11: 94.72 (sec) nElapsed time from rank 12: 94.61 (sec) nElapsed time from rank 13: 95.29 (sec) nElapsed time from rank 14: 94.79 (sec) nElapsed time from rank 15: 94.58 (sec) nElapsed time from rank 16: 94.51 (sec) nElapsed time from rank 17: 94.57 (sec) nElapsed time from rank 18: 95.96 (sec) nElapsed time from rank 19: 94.51 (sec) nElapsed time from rank 20: 94.51 (sec) nElapsed time from rank 21: 94.51 (sec) nElapsed time from rank 22: 94.51 (sec) nElapsed time from rank 23: 94.51 (sec) nOut of 4294967295 points, there are 2248845005 points inside the sphere => pi= 3.141600131989n[telzur@xphisrv2 tests]$ clear
```

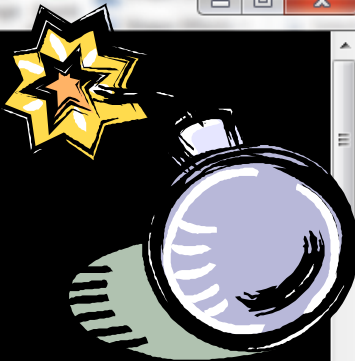
Symmetric mode



```
telzur@xphisrv2:~/tests
[telzur@xphisrv2 tests]$ more ./host_file
xphisrv2:4
mic0:4
mic1:4
[telzur@xphisrv2 tests]$ █
```

More problems: errors when trying to execute with more than one device!

```
telzur@xphisrv2:~/tests
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
CMA: unable to get RDMA device list
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
CMA: unable to get RDMA device list
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
CMA: unable to get RDMA device list
CMA: unable to get RDMA device list
CMA: unable to get RDMA device list
CMA: unable to get RDMA device list
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
CMA: unable to get RDMA device list
CMA: unable to get RDMA device list
CMA: unable to get RDMA device list
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
CMA: unable to get RDMA device list
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
CMA: unable to get RDMA device list
librdmacm: couldn't read ABI version.
librdmacm: assuming: 4
CMA: unable to get RDMA device list
```



Symmetric mode - cont'
ignoring the errors from previous slide!

```
mpirun -machinefile ./host_file
/home/telzur/tests/montecarlo_mpiicc
```

```
Hello world: rank 0 of 12 running on xphisrv2.cs.bgu.ac.ilHello
world: rank 1 of 12 running on xphisrv2.cs.bgu.ac.ilHello world: rank 2
of 12 running on xphisrv2.cs.bgu.ac.ilHello world: rank 3 of 12 running
on xphisrv2.cs.bgu.ac.ilHello world: rank 4 of 12 running on
xphisrv2-mic0.cs.bgu.ac.ilHello world: rank 5 of 12 running on
xphisrv2-mic0.cs.bgu.ac.ilHello world: rank 6 of 12 running on
xphisrv2-mic0.cs.bgu.ac.ilHello world: rank 7 of 12 running on
xphisrv2-mic0.cs.bgu.ac.ilHello world: rank 8 of 12 running on
xphisrv2-mic1.cs.bgu.ac.ilHello world: rank 9 of 12 running on
xphisrv2-mic1.cs.bgu.ac.ilHello world: rank 10 of 12 running on
xphisrv2-mic1.cs.bgu.ac.ilHello world: rank 11 of 12 running on
xphisrv2-mic1.cs.bgu.ac.ilElapsed time from rank 0:    25.97 (sec)
nElapsed time from rank 1:    25.99 (sec) nElapsed time from rank 2:
  25.72 (sec) nElapsed time from rank 3:    25.73 (sec) nElapsed time
from rank 4:    189.20 (sec) nElapsed time from rank 5:    198.36 (sec)
nElapsed time from rank 6:    189.01 (sec) nElapsed time from rank 7:
  190.37 (sec) nElapsed time from rank 8:    190.26 (sec) nElapsed
time from rank 9:    188.23 (sec) nElapsed time from rank 10:
  189.21 (sec) nElapsed time from rank 11:    190.46 (sec) nOut of
```

That's It!