

Using the High Performance Computing Center

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Table Of Contents

Table of Contents

Introduction	3
Acceptable Use Policy	3
Getting Access.....	3
HPCC Hardware.....	4
Programs Needed for Accessing the HPCC	5
Xming X Server	5
PuTTY.....	5
UNIX Terminal	6
Developing on the HPCC	7
Create a QSub Script	9
Submitting a QSUB script File to the Queue	10
Checking the Scheduler.....	10
Deleting a job	10
Checking Status of a Job	10
Works Cited.....	11

Introduction

The High Performance Computing Center (HPCC) is a powerful grid of computers that faculty members and students may use to run computational intense jobs on. A computational intense job is any process that takes many hours to complete. The HPCC has a large cluster of various computers to run these intense jobs on that will outperform any desktop machines that standard users will own.

Acceptable Use Policy

The High Performance Computing Center exists to provide resources for the pursuit of academic research by the MSU community. As such the resources of the facility are to be used by MSU researchers to further their research. HPCC staff has the authority to limit or disable account access at their discretion to ensure fair and equitable access to the center's resources.

Access will not be restricted without the Director's approval unless a situation exists where other users are adversely affected. Users may request a review of the decision by the HPCC Advisory Committee by emailing hpcadvisory@list.msu.edu. (HPCC, Acceptable use Policy, 2009)

Getting Access

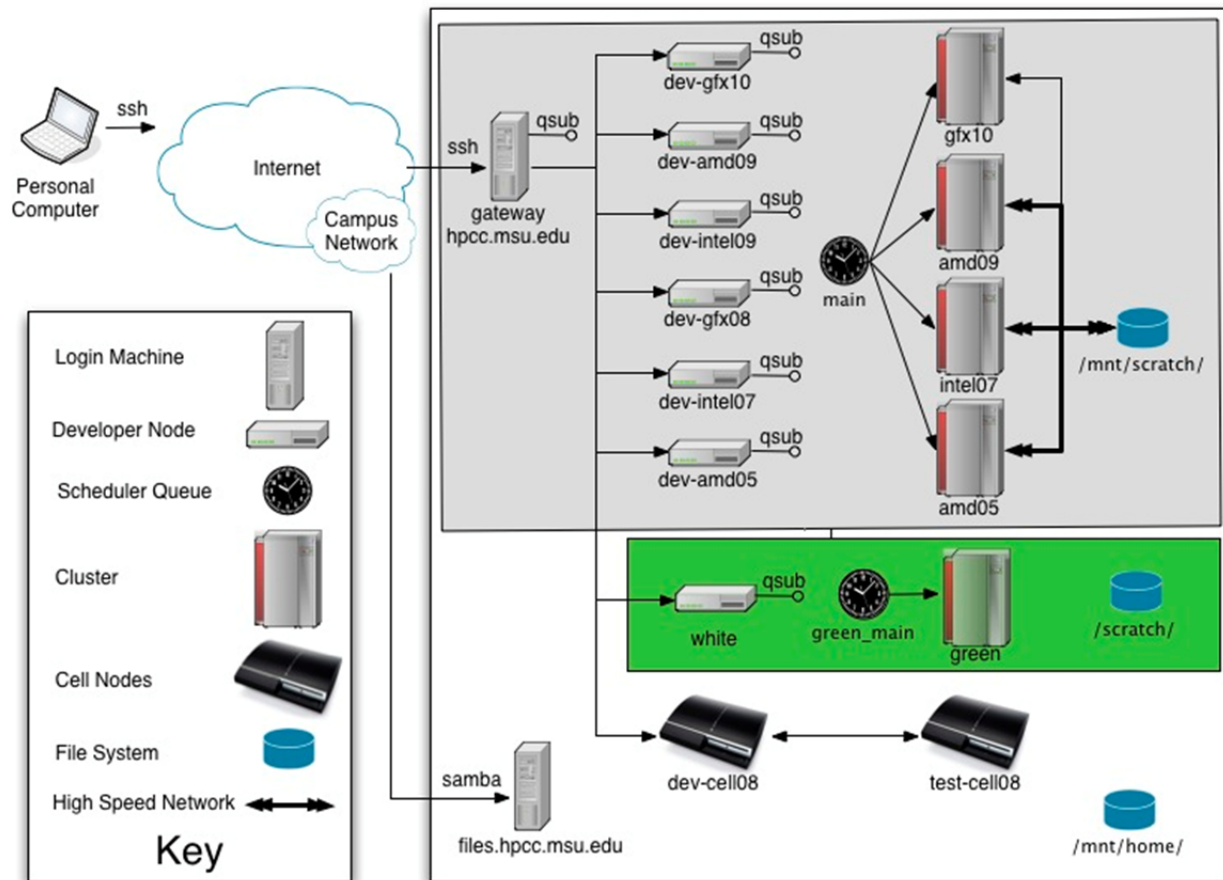
For any Michigan State University student to get access to the HPCC a faculty member must fill out a account request form on behalf of the student. At the following address:

<http://www.hpcc.msu.edu/request> (HPCC, HPCC Account Request Page, 2009)

As long as the reasons for account request are valid access is granted (usually) after a few hours.

HPCC Hardware

Below is the current list description of the hardware layout of the HPCC, it is always subject to change and should be studied before submitting jobs to the HPCC clusters.



(HPCC, 2010)

Programs Needed for Accessing the HPCC

Xming X Server

Xming allows for displaying the X protocol on windows machines. XMING allows for GUI interfaces to be displayed on the client PC over the SSH protocol used to connect to the HPCC. Xming is installed on all DECS windows computers. If you are installing on your own personal computer you may also have to install the xming fonts package as well. Xming can easily be downloaded from sourceforge

<http://sourceforge.net/projects/xming/> (SourceForge, 2011)

To run Xming simply run the Xming program "Xming.exe" and allow the Xserver to run in the widows background.

PuTTY

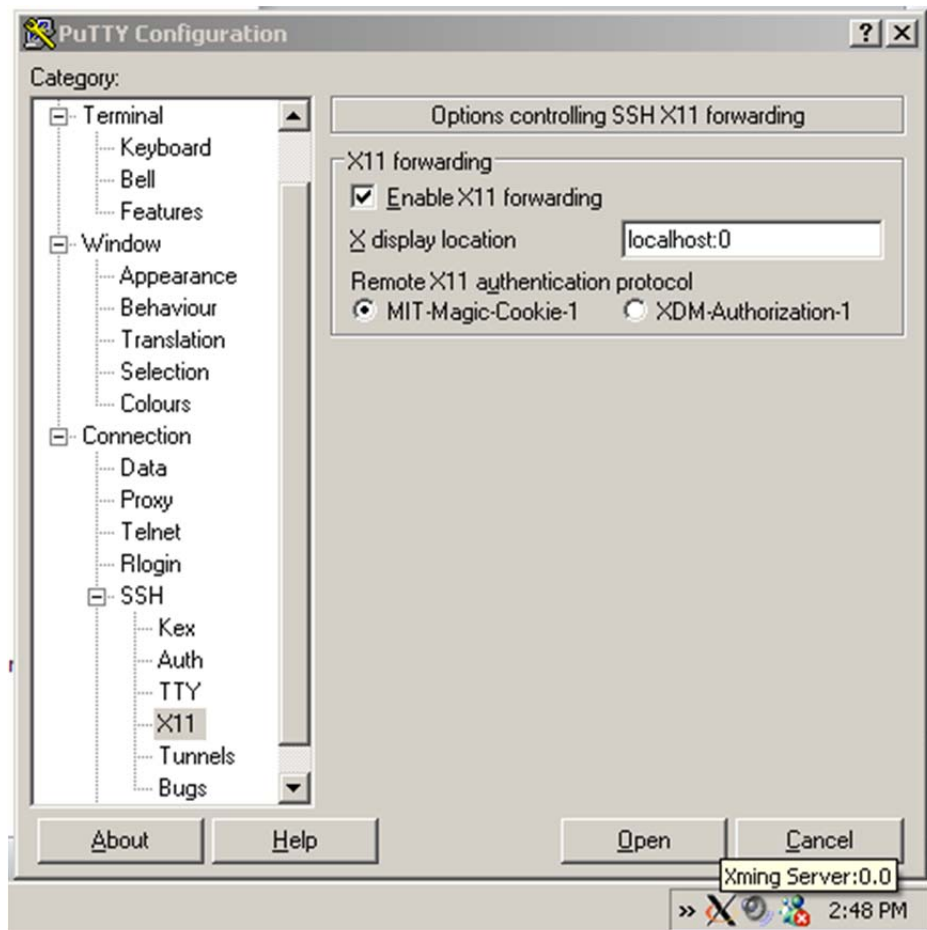
PuTTY is a free Telnet and SSH client for windows. It is the main program used to connect to the hpcc. If using putty with Xming you will have to configure putty to forward the X11 protocol to Xming. This is simply done after starting PuTTY browse to the

Connection->SSH->X11 section

Check the "Enable X11 forwarding" box

Xdisplay location is default to "localhost:0"

You can verify that xming is running at "Xming Server 0.0" simply by mouse over the icon in the windows tray.



To connect to the hpcc simply navigate back to

Session and fill out the hostname: gateway.hpcc.msu.edu port: 22

It would be beneficial to now save the state of putty as “HPCC” so that this does not have to be configured again

UNIX Terminal

Alternatives to using Xming and Putty is to use any unix computer as they come with SSH and X11 rendering by default.

Simply open a unix terminal and type

```
ssh -X username@gateway.hpcc.msu.edu
```

Compression is enabled with -C argument

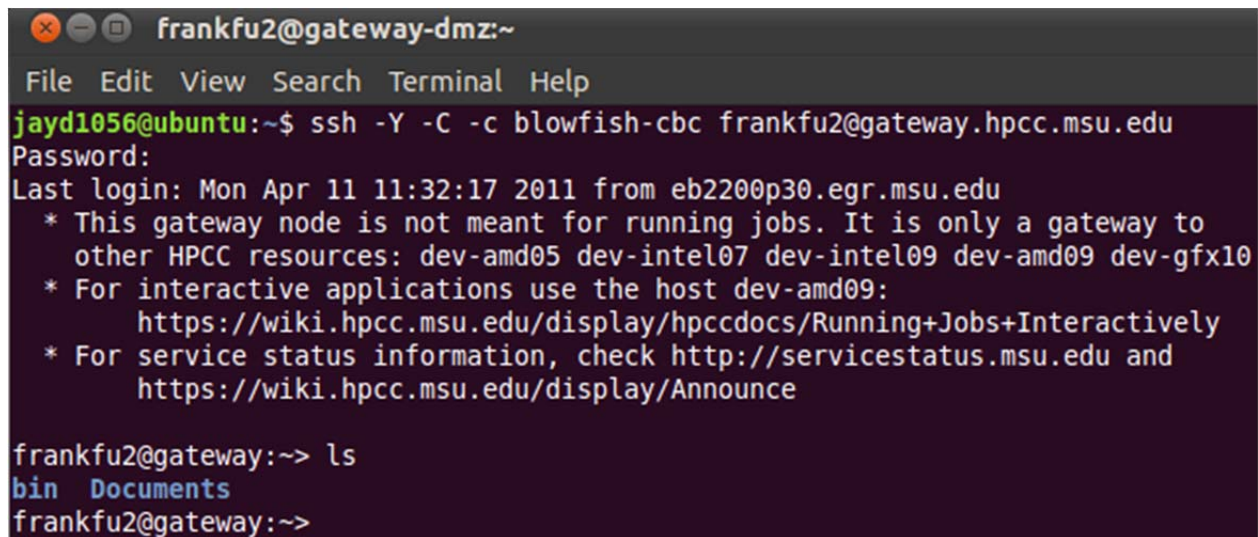
```
ssh -X -C username@gateway.hpcc.msu.edu
```

Different encryption cyphers are enabled with `-c` argument

```
ssh -X -C -c blowfish-cbc username@gateway.hpcc.msu.edu
```

If you have issues with X11 not displaying try “Trusted SSH Connection” `-Y` argument

```
ssh -Y -C -c blowfish-cbc username@gateway.hpcc.msu.edu
```



```
frankfu2@gateway-dmz:~  
File Edit View Search Terminal Help  
jayd1056@ubuntu:~$ ssh -Y -C -c blowfish-cbc frankfu2@gateway.hpcc.msu.edu  
Password:  
Last login: Mon Apr 11 11:32:17 2011 from eb2200p30.egr.msu.edu  
* This gateway node is not meant for running jobs. It is only a gateway to  
  other HPCC resources: dev-amd05 dev-intel07 dev-intel09 dev-amd09 dev-gfx10  
* For interactive applications use the host dev-amd09:  
  https://wiki.hpcc.msu.edu/display/hpccdocs/Running+Jobs+Interactively  
* For service status information, check http://servicestatus.msu.edu and  
  https://wiki.hpcc.msu.edu/display/Announce  
frankfu2@gateway:~> ls  
bin Documents  
frankfu2@gateway:~>
```

NOTE: all arguments in the ssh command are case sensitive

Developing on the HPCC

To use interactive session with a GUI interfaces the user will log into a development node in the hpcc. They can be found on the HPCC hardware diagram, they are all labeled dev-NODE_NAME.

Example dev-amd09

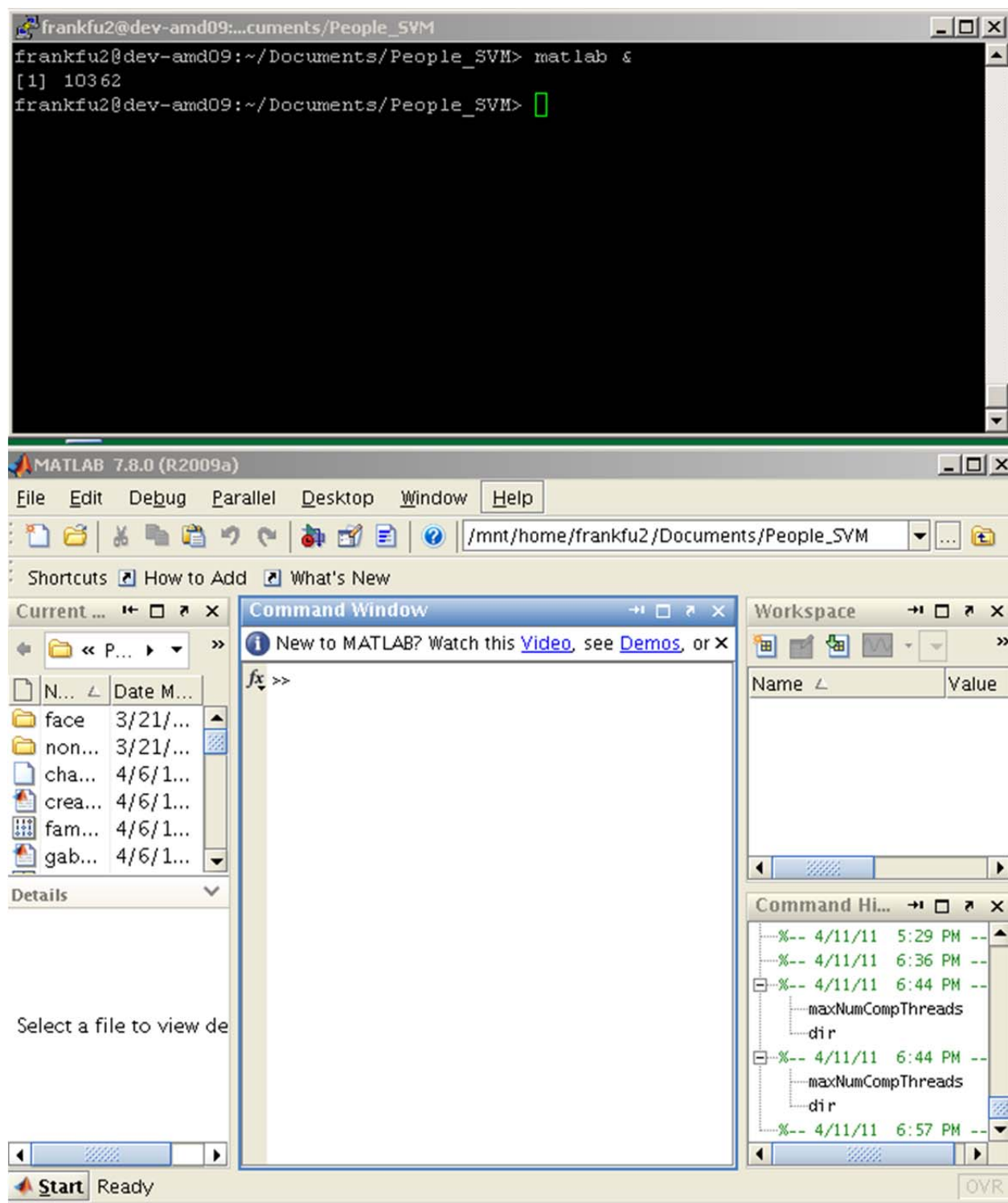
After connecting to the gateway one can ssh into any dev node simply by typing

```
ssh dev-NODE_NAME
```

you do not need to type all the x11 or compression arguments.

Once on the development all programs should be available to the user.

Example: matlab & (run matlab in background)



Create a QSub Script

Use of the development nodes is for testing small batches of jobs, job times are currently limited to 2 hours on a development node. Longer jobs must be submitted to the cluster. Using the command “qsub” it is possible to submit jobs without a script file but having a script file allows easy repetition of jobs.

Example Script:

```
1. #!/bin/sh -login
2. #PBS -N ece480SVMgenPED
3. #PBS -l nodes=1:ppn=1,mem=24gb,walltime=100:00:00
4. #PBS -W x=gres:MATLAB
5. #PBS -M frankfu2@msu.edu
6. #PBS -m abe
7. #PBS -j oe
8. #PBS -o /home/frankfu2/MatlabScriptOutputMT
9. module load matlab/2009a
10. export OMP_NUM_THREADS=1
11. export MKL_NUM_THREADS=1
12. export OPT_NUM_THREADS=1
13. cd $PBS_O_WORKDIR
14. cd /home/frankfu2/
15. rm MatlabScriptOutput
16. cd /home/frankfu2/Documents/People_SVM/
17. /opt/hpc/matlab/2009a/bin/matlab -e
18. matlab -nodisplay -r "script"
```

the above script will

- 1) run the users account login script file
- 2) set the name of the process to ece480SVMgenPED
- 3) ask for 1 node, with at least 1 processor, 24 gb of ram, and 100 hours of run time
- 4) get 1 matlab license
- 5) set the email to the users email account
- 6) set the types of email notifications to be sent to the email address
- 7) tell the cluster to join the standard output and the error output
- 8) and output the completed output to a particular file
- 9) load the matlab module
- 10) manually set environment variable OMP_NUM_THREADS
- 11) manually set environment variable MKL_NUM_THREADS
- 12) manually set environment variable OPT_NUM_THREADS
- 13) change directory to the development node working folder
- 14) change directory to user space
- 15) remove any scripts outputs that are saved
- 16) change directory to the matlab folder containing matlab files you wish to run
- 17) add the currently environment variables to the output file
- 18) run the matlab file script.m

Submitting a QSUB script File to the Queue

If a script is contained in QsubScript.qsub then the command

```
qsub QsubScript.qsub
```

Will send the script to the scheduler.

Checking the Scheduler

The command

```
qstat -u YOURUSERNAME
```

Will list all jobs belonging to you that are in the queue and their PIDs

Deleting a job

```
qdel PID
```

Will delete a running job with id PID

Checking Status of a Job

```
checkjob PID
```

Will list the status of a job

Works Cited

- HPCC. (2010). Retrieved April 11, 2011, from HPCC Description of Processing Hardware:
<https://wiki.hpcc.msu.edu/display/hpccdocs/Description+of+the+Processing+Hardware>
- HPCC. (2009). *Acceptable use Policy*. Retrieved April 11, 2011, from [www.icer.msu.edu](http://www.icer.msu.edu/?q=node/103):
<http://www.icer.msu.edu/?q=node/103>
- HPCC. (2009). *HPCC Account Request Page*. Retrieved April 21, 2011, from www.icer.msu.edu:
<http://www.hpcc.msu.edu/request>
- SourceForge. (2011). *Xming at Sourceforge*. Retrieved April 11, 2011, from Xming at Sourceforge:
<http://sourceforge.net/projects/xming/>