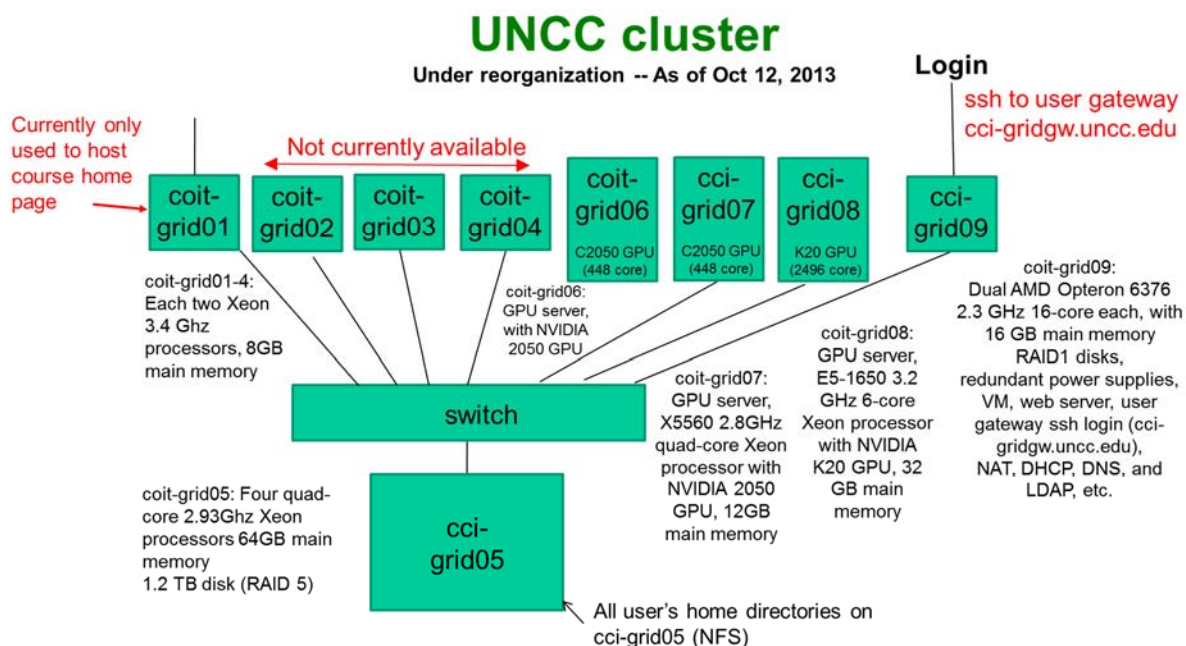


Using UNCC Parallel Programming Cluster

B. Wilkinson: Modification date October 30, 2013

Overview

The current state of the cluster is shown below:



Work in progress: machines renamed to cci-grid0x during upgrade.

Note this cluster does not use a job scheduler. Your programs can be executed directly for the command line and you will have direct interactive access to your programs. However, you will not get control of the command line until the program finishes (or you issue a control-C). If necessary, you can run your jobs in the background with the & option on the command line.

FOR THE SAKE OF OTHERS, please make sure you do not leave any long running processes.

VERY VERY IMPORTANT: Do not ssh *from* internal nodes 05, 07 or 08 to anywhere, only from cci-gridgw (09) as currently ssh *from* internal nodes 05, 07 or 08 causes really significant problems including loosing all your files. **ONLY** run MPI from **cci-gridgw.uncc.edu**. If you need to use only an internal node, specify the node in a machines file.

Backup — There is no automatic file backup on this cluster although a RAID-5 system is in place for home directories. *It is highly recommended that keep a back-up copy of your files on another computer.*

Logging on

Users ssh to **cci-gridgw.uncc.edu** (user gateway on **cci-grid09**). When you log in for the first time, accept all default settings (no key passphrase, password-less ssh between nodes):

```
login as: xxx
xxx@cci-gridgw.uncc.edu's password:
Creating directory '/nfs-home/xxx'.

We need to set up some things so you can SSH between
nodes securely from your account.

Please hit enter a bunch, accepting all defaults!

Generating public/private rsa key pair.
Enter file in which to save the key (/nfs-home/xxx/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /nfs-home/xxx/.ssh/id_rsa.
Your public key has been saved in /nfs-home/xxx/.ssh/id_rsa.pub.
The key fingerprint is: ...

All done!

You should now be able to run the following commands
to connect to the other three nodes:

ssh cci-grid05
ssh cci-grid07
ssh cci-grid08

Enjoy!

[xxx@cci-gridgw ~]$
```

Home directory — The full path is **/nsf-home/<username>/...** .

Executing programs that exist in current directory — As is usual on Linux systems, the current directory is not in the path and it is necessary to provide **./** or the full path otherwise, you will get a "File not found" error.

X11 libraries: Currently installed on **cci-gridgw.uncc.edu** and **cci-grid05**. Compile with **-lX11**. See separate notes on creating graphical output for more details.

MPI

MPICH2 – Compute nodes installed on 05, 07, 08. Run MPI from **cci-gridgw.uncc.edu** only.

Compile **hello.c** with **mpicc**.

```
mpicc -o hello hello.c
```

Execute **hello** with the Hydra process manager:

```
mpiexec.hydra -machinefile <machinesfile> -n <number of processes> ./hello
```

or

```
mpiexec.hydra -f <hostfile> -n <number of processes> ./hello
```

Without a machines file, the program will run just on **cci-gridgw.uncc.edu** (grid09)

OpenMP

You are allowed to ssh to internal nodes to execute OpenMP.

Compile an OpenMP program `omp_hello.c` with the regular gcc compiler (version 4.2 onwards) using the command:

```
cc -fopenmp -o omp_hello omp_hello.c
```

Execute as a regular executable:

```
./omp_hello.c
```

Combined (hybrid) OpenMP/MPI programs

Compile hybrid program `omp-mpi_hello.c` with:

```
mpicc -fopenmp -o omp-mpi_hello omp-mpi_hello.c
```

Note this command invokes the regular cc compiler.

Execute as an MPI program on **cci-gridgw.uncc.edu** using:

```
mpiexec.hydra -machinefile <machinesfile> -n <number of processes> ./omp-mpi_hello
```