<u>Cluster Development for Fall Semester 2007</u> <u>Patrick Ford</u>

This report will outline the results of my work developing the cluster over the Fall Semester 2007. The majority of my time was spent determining the best method of restoring our frontend to full functionality for any reason. This information was gathered by reinstalling our malfunctioning frontend, which is now fully operational as the cluster central manager.

Instead of outlining incorrect techniques that were tried and discarded over the course of the semester, this report will be a detailed guide of the correct and systematic method to reinstalling the FLTECH cluster.

We begin with a completely formatted machine, assuming that you have configuration files backed up from a previous frontend. If not, the Rocks and Condor websites contain information for modifying configuration files to your needs.

Important Restore Files

If you want to reinstall a frontend from another functioning system, you will need to back up the following files and directories:

Run Command: # tar cvzfp <folder>.tar.gz

- /state/partition1/home // Specific user files
- /etc/ files: profile, group, passwd, shadow, sudoers, auto.*, hosts // System
- /usr/local/ // Important user binaries and libraries
- /var/www/ // The cluster website
- /opt/condor/condor_config.local // Use these files as a reference
- /opt/condor/etc/condor_config
- /opt/condor/log // If condor fails to create them (verify permissions)

If the tarball creation fails, it is likely because the process failed to back up file permissions. If this happens, you can run # tar cvzf <folder>.tar.gz But you will need to ensure that, when you untar the files again, they have the correct permissions.

Installing Rocks

Rocks is the operating system running on all cluster server hardware. We use Rocks 4.2.1 (Cydonia) with the following Roll CDs:

- Area 51
- Base
- Ganglia
- HPC
- Java
- Kernel
- OS 1-4
- Service Pack
- Web Server

The installation is very straightforward, make sure the machine has an Internet connection (and two network cards) and use the following Cluster info when prompted: Host name: uscms1.fltech-grid3.fit.edu **Cluster: FLTECH** Cert Org: FLTECH Melbourne FL. US www.fit.edu/hep Location: N28.10 W80.63 Time: time.nist.gov Eth0 IP - 10.1.1.1 Subnet - 255.0.0.0 IP – 163.118.206.157 Eth1 Subnet - 255.255.255.0 Gateway - 163.118.205.254

DNS - 163.118.5.4

Select Auto-partitioning and insert the CDs when prompted.

Restoring Files

Once Rocks is installed, you will need to restore some files and make sure they interface correctly. Note: To change permissions, use # chown <owner>:<owner> <file/dir>

- All the /etc/ files should be restored now **Make sure their owner is root**. Now add the following lines to /etc/fstab **Be careful with this file**
 - o nas-0-1.local:/nas1 /mnt/nas1 nfs defaults 00
 - o nas-0-2.local:/nas2 /mnt/nas2 nfs defaults 00
- Restore /usr/local Check that the /usr/local/lib folder has the following links in it, if it doesn't make them with # ln –s <link name> <file to be linked to>
 - o libCLHEP.a -> libCLHEP-2.0.3.1.a
 - libCLHEP.so -> libCLHEP-2.0.3.1.so
 - o libDtPrint.so -> libDtPrint.so.1.0.0
 - o libDtPrint.so.1 -> libDtPrint.so.1.0.0
 - libexpat.so -> libexpat.so.1.5.0
 - libexpat.so.1 -> libexpat.so.1.5.0
 - o libMrm.so -> libMrm.so.2.0.1
 - libMrm.so.2 -> libMrm.so.2.0.1
 - o libUil.so -> libUil.so.2.0.1
 - o libUil.so.2 -> libUil.so.2.0.1
 - libXm.so -> libXm.so.2.0.1
 - libXm.so.1 -> libXm.so.2.0.1
 - libXm.so.2 -> libXm.so.2.0.1
 - libXm.so.3 -> libXm.so.2.0.1
- Restore /var/www and edit /etc/sysconfig/iptables uncomment the line that enables web access to the cluster.

• Restore the /state/partition1/home directory and ensure that all owners are correct (use \$ ls -la), run # chmod -R o+rwx ./*

Now reboot and cross your fingers. Everyone's home directories in /state/partition1/home should now be automounted to /home on the frontend.

Installing Condor

There is an existing guide to condor installation that provides packages and XML files for our cluster: http://research.fit.edu/hep/rocks/condorconfig.html

You should download the RPM packages condor and condor-profiles from online or the cluster web-server, but this guide only covers version 6.6.11. In order to install them, you will also need the libstdc++ RPM package – I don't believe that version matters. Install the libstdc++ RPM, and then condor and condor-profiles. Create a symbolic link in /opt from condor to condor-<version>. If you have the files backed up, restore /opt/condor/etc/condor_config and /opt/condor/condor_config.local. Otherwise, configure the existing ones.

At this point, condor should be installed. If you restored /usr/local from a previous frontend, all the XML and RPM files should be in the correct places. Verify this using the guide specified earlier. Now cd to /home/install and run # rocks-dist dist. Check the kickstart graph via the cluster website under the misc admin tab. It should contain a condor-compute bubble with a link to the compute appliance.

Once you reboot, condor should start automatically. Verify that all daemons are running with: \$ ps ax --forest | grep condor

You should see something like the following:

- 3199 ? Ss 4:38 /opt/condor/sbin/condor_master
- 3206 ? Ss 1:50 $\$ condor_collector -f
- 3209 ? Ss $0:40 \ condor_negotiator f$
- 3210 ? Ss 7:36 $\$ condor_startd -f
- 3216 ? Ss $0:16 \ condor_schedd f$

If any are not running, check that daemons are running by running

/opt/condor/sbin/condor_master for example. If there is an error starting daemons, it is very likely a permission problem. Check that the ./log directory and files are owned by condor. Also check that spool is owned by condor, ./local.uscms1 is owned by daemon:root, and ./execute is owned by condor. Everything else should be root.

You should now be able to run /opt/condor/bin/condor_status and see the frontend's CPUs available.

Installing Nodes

In order to install nodes as condor-compute you have to add a new appliance. All the XML files should at this point be in their proper places (this you verified with the kickstart graph).

Run in /opt/rocks:

add-new-appliance --appliance-name "condor-compute" --xml-config-file-name condor-compute

Now you can run # insert-ethers and install nodes with the kernel roll CD. They should eventually show up in the ganglia monitoring toolkit on the cluster website.

If you want to restore your existing NAS, you must manually enter it into the rocks database with their correct MAC addresses and static IP addresses. You can do this through the cluster website under misc admin -> Database administration. The root-password should allow you access to this database. Note: You must add all cluster machines (nodes, NAS, switches) to both "nodes" and "networks" for them to function correctly. In order for the network to recognize the NAS, you need to add it to /etc/hosts For example:

10.255.255.247 nas-0-1.local nas-0-1 10.255.255.248 nas-0-2.local nas-0-2

Ping the NAS hostname (e.g. nas-0-1) to verify that it exists on the network.

Nodes with active CPUs should now show up in condor_status and ganglia when they have completed installation. Also, you should be able to log into the NAS and be automatically sent to your home directory (if not, check /etc/passwd and /etc/auto.home)

Congratulations, you should have a functioning cluster. If there were any mysterious errors, double-check file permissions.