CPSC 3620 Group #7
Project #2 Documentation
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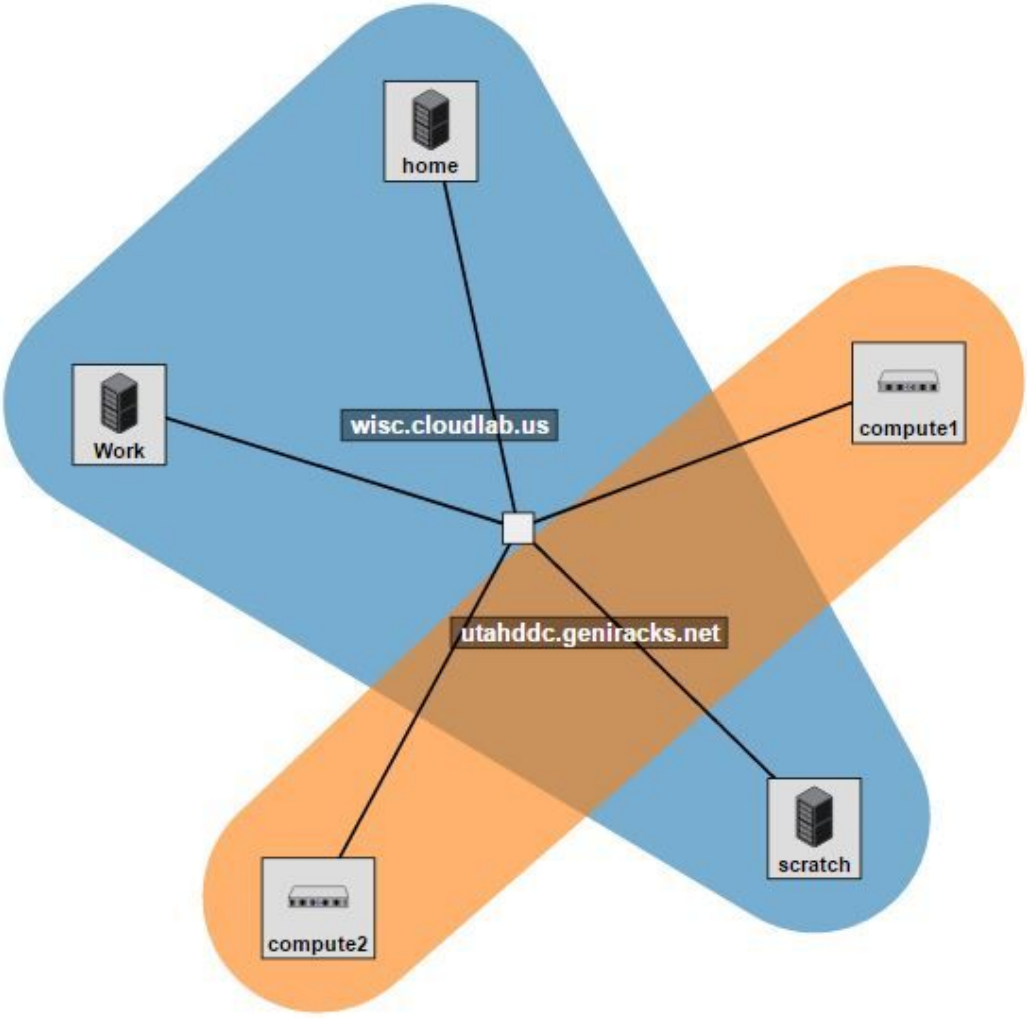

Our Diagram above is the basic setup of the cloudlab nodes for our project. There are two distinct node types in our version of the distribution. These nodes are storage nodes designated by HOME,WORK,and SCRATCH and compute nodes designated by COMPUTE_1 and COMPUTE_2. The Compute nodes are of hardware type dl360 which can be seen in figure 2. The storage nodes implement 1 Lustre File systems. The hardware for the storage nodes

c220g1 are shown in Figure 3. We planned to designate HOME and SCRATCH as the servers for the file system while WORK was to be the client. This is shown in figure 7.
Home would have been the MDS/MGS server while SCRATCH would have been the OSS server .

dl360	33 nodes (Sandy Bridge, 16 cores)
CPU	2x Xeon E5-2450 processors (8 cores each, 2.1Ghz)
RAM	48GB Memory (6 x 8GB RDIMMs, 1.6Ghz)
Disk	1 x 1TB 7.2K SATA Drive
NIC	1GbE 4-port embedded NIC

Figure 2.

c220g1	90 nodes (Haswell, 16 core, 3 disks)
CPU	Two Intel E5-2630 v3 8-core CPUs at 2.40 GHz (Haswell w/ EM64T)
RAM	128GB ECC Memory (8x 16 GB DDR4 1866 MHz dual rank RDIMMs)
Disk	Two 1.2 TB 10K RPM 6G SAS SFF HDDs
Disk	One Intel DC S3500 480 GB 6G SATA SSDs
NIC	Dual-port Intel X520-DA2 10Gb NIC (PCIe v3.0, 8 lanes)
NIC	Onboard Intel i350 1Gb

Figure 3.

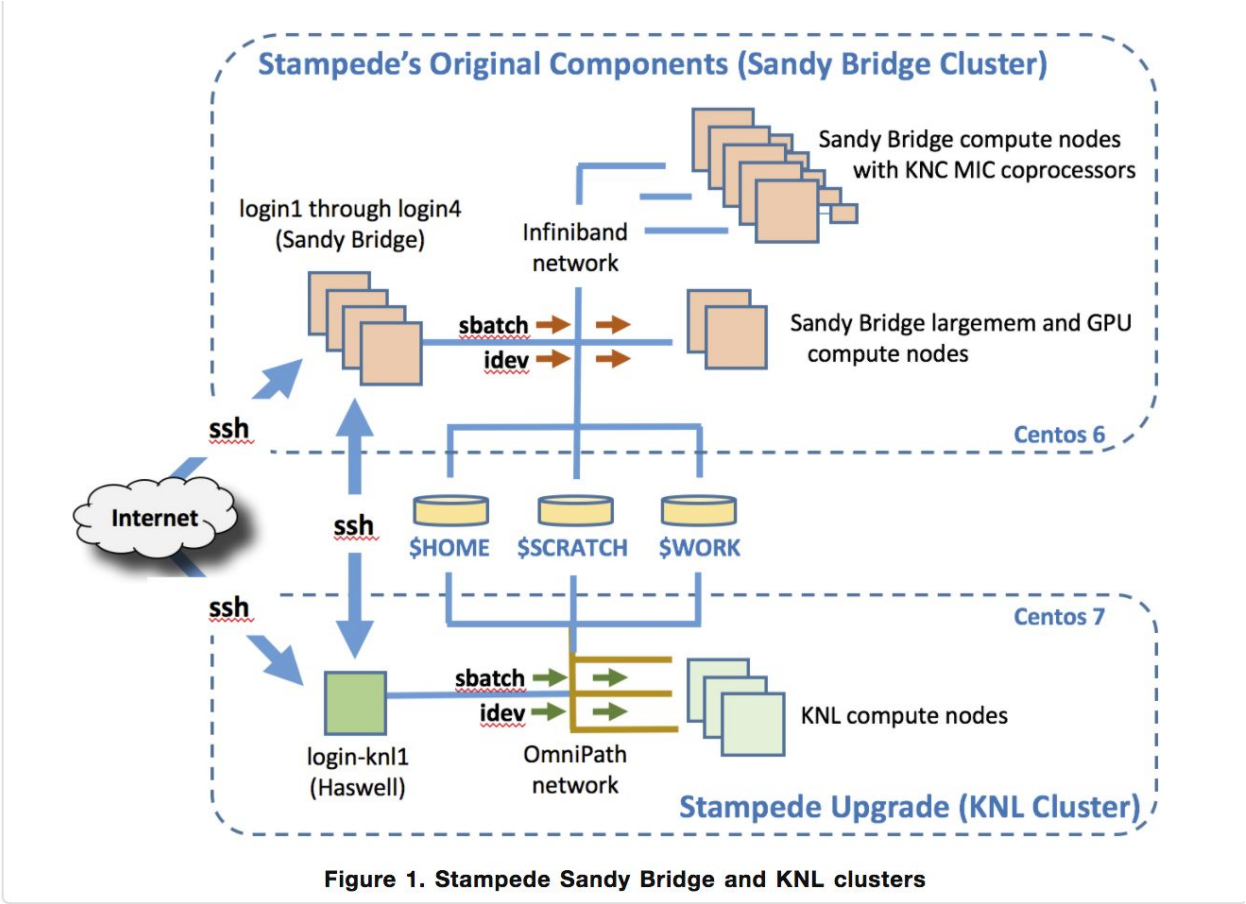

Figure 1. Stampede Sandy Bridge and KNL clusters

Figure 4.

In Stampede, there are three types of nodes. These nodes are storage nodes designated by HOME,WORK,and SCRATCH and compute nodes designated by Sandy Bridge compute nodes , Sandy Bridge largemem GPU compute nodes and KNL compute nodes and login nodes. And in our basic setup of the cloudlab nodes. There are two distinct node types in our version of the distribution. These nodes are storage nodes designated by HOME,WORK,and SCRATCH and compute nodes designated by COMPUTE_1 and COMPUTE_2 as Figure1. And HOME node serve as login nodes also.

Table 2. Dell DCS (Dell Custom Solution) C8220z Compute Node

COMPONENT	TECHNOLOGY
Sockets per Node/Cores per Socket Coprocessors/Cores	2/8 Xeon E5-2680 2.7GHz (turbo, 3.5) 1/61 Xeon Phi SE10P 1.1GHz
Motherboard	Dell C8220, Intel PQI, C610 Chipset
Memory Per Host Memory per Coprocessor	32GB 8x4G 4 channels DDR3-1600MHz 8GB GDDR5
Interconnect Processor-Processor Processor-Coprocessor	 QPI 8.0 GT/s PCI-e
PCI Express Processor PCI Express Coprocessor	x40 lanes, Gen 3 x16 lanes, Gen 2 (extended)
250GB Disk	7.5K RPM SATA

Figure 5.

Looking the compute nodes of Stampede, we could not access the exact same nodes but we use the similar compute power nodes from UtahIDDC Cloudlab, as shown in Figure 2., in our distribution.

Table 4. Storage Systems

STORAGE CLASS	SIZE	ARCHITECTURE	FEATURES
Local (each node)	Login: 1TB Compute: 250GB Big Mem: 600GB	SATA SATA SATA	Login: 432GB partition mounted on `/tmp` 80GB partition mounted on `/tmp` 398GB partition mounted on `/tmp`
Parallel	14PB	Lustre	72 Dell R610 data servers (OSS) through IB user striping allowed MPI-IO, XPB, YPB, and ZPB partitions on `$HOME/$WORK/$SCRATCH` 4 Dell R710 meta data servers with 2 Dell MD 3220 Storage Arrays
Ranch (Tape Storage)	60PB	SAM-FS (Storage Archive Manager)	10GB/s connection through 4 GridFTP Servers

Figure 6.

In the storage nodes, we couldn't find the node has large memory that Stampede has. All nodes on the Sandy Bridge cluster run CentOS 6.3 and are managed with batch services through Slurm 2.4. Global $HOME, $WORK and $SCRATCH storage areas are supported by three Lustre parallel distributed file systems with 76 IO servers. In our distribution, we are using 64 bit CentoOS 6.6 nodes from Wisconsin cloudlab because we can not use CentOS 6.3 in our distribution. Similar to Stampede, the storage nodes implement 3 connected Lustre File systems.

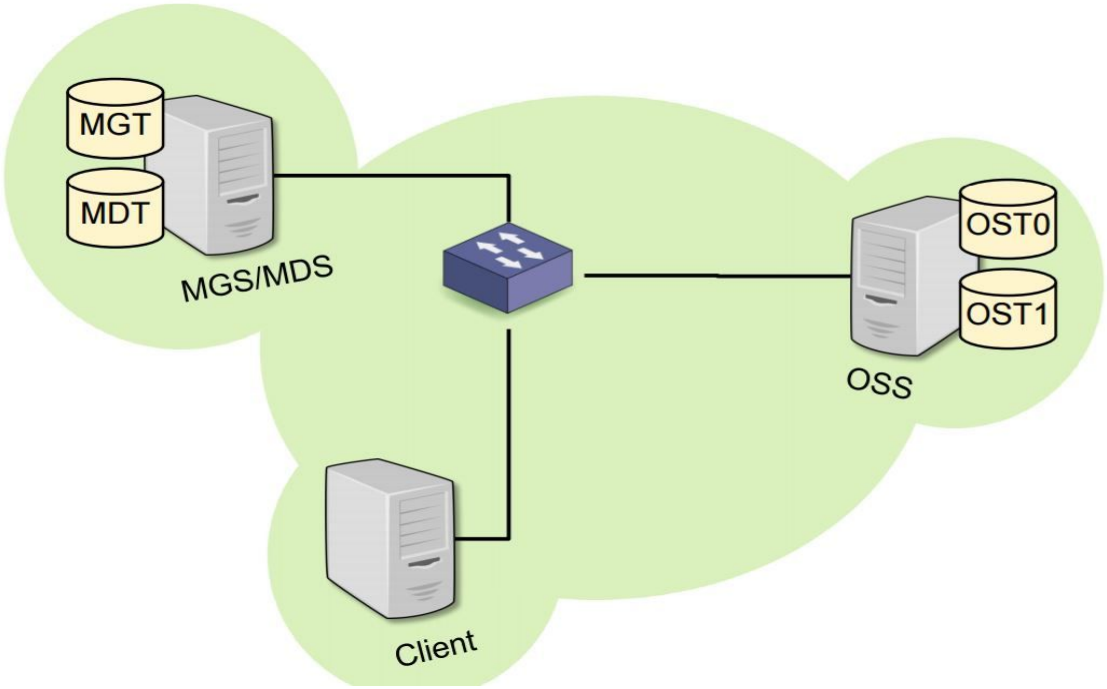

Figure 7.

Scripts Used

Note: All lustre scripts used were derived from the LustreBasicInstall guide.

- client-setup.sh
    - Downloads lustre client kernel RPM, installs the kernel RPM, and installs the kernel.
- client-setup2.sh
    - Downloads lustre client modules, and installs client modules.
- client_config.sh
    - This file mounts the lustre file system and creates file to ensure that the system is working.
- lustre-presetup1.sh
    - This file disables SELINUX and iptables
- lustre-presetup2.sh
    - This file updates kernel-firmware and creates an entry in /etc/modporde.d/lustre.conf.
- mgs_mds_config.sh
    - This file formats and mounts the mdt and mgt
- mpi-install.sh
    - This file opens and installs openmpi, and deletes excess files and folders after this installation.
- oss_config.sh
    - This file formats the ost's on the oss and mounts the ost's.
- python-install.sh
    - This file downloads and runs Anaconda, and installs mpi4py
- server-setup.sh
    - This file downloads lustre client kernel RPM, installs the kernel RPM, and installs the kernel.
- server-setup2.sh
    - This file downloads Lustre server modules and e2fsprogs, updates/installs e2fsprogs, and installs lustre RPMs.

Script Usage Order

1. python-install.sh (on all machines)
2. mpi-install.sh (on all machines)
3. lustre-presetup1.sh (on all lustre nodes)
4. lustre-presetup2.sh (on all lustre nodes)
5. server-setup.sh (on HOME and SCRATCH)
6. server-setup2.sh (on HOME and SCRATCH)
7. client-setup.sh (on WORK)
8. client-setup2.sh (on WORK)
9. mgs_mds_config.sh (on HOME)
10. oss_config.sh (on SCRATCH)

11. client_config.sh (on WORK)

Validation and Problems - Issues with the setup

We did not reach the validation stage of our project, as we were unable to fully set up the Lustre file system. In the client setup and server setup scripts we run into an issue with the third command we try to run. The specific commands are as follows:

Client Setup

In client_setup.sh, the following line results in an error:

/sbin/new-kernel-pkg --package kernel --mkinitrd \ --dracut --depmod --install 2.6.32-696.1.1.el6.x86_64.rpm

Running this command leads to a number of errors referring to libraries that were not found such as:

```
 Failed dependencies:
       dracut-kernel >= 004-408.el6 is needed by kernel-2.6.32-696.1.1.el6.x86_64
Usage: new-kernel-pkg [-v] [--mkinitrd] [--rminitrd] [--dracut]
       [--initrdfile=<initrd-image>] [--depmod] [--rmmoddep]
       [--kernel-args=<args>] [--remove-args=<args>]
       [--banner=<banner>] [--multiboot=multiboot]
       [--mbargs=mbargs] [--make-default] [--add-dracut-args]
       [--add-plymouth-initrd]
       [--host-only]
       <--install | --remove | --update | --rpmposttrans> <kernel-version>
       (ex: new-kernel-pkg --mkinitrd --depmod --install 2.4.7-2)
```

This most likely leads to an issue when running Client
When we try to adjust the command for the sbin install we get errors like the one in the server setup below.

Server Setup

In server_setup.sh, the line:

```
/sbin/new-kernel-pkg --package kernel --mkinitrd \
 --dracut --depmod \
 --install 2.6.32-504.8.1.e16_lustre.x86_64
```

The failure errors look like this:

```
FATAL: Could not open '/boot/System.map-2.6.32-504.8.1.e16_lustre.x86_64': No such file or directory
find: `/lib/modules/2.6.32-504.8.1.e16_lustre.x86_64/': No such file or directory
```

find: `/lib/modules/2.6.32-504.8.1.e16_lustre.x86_64/': No such file or directory
find: `/lib/modules/2.6.32-504.8.1.e16_lustre.x86_64/': No such file or directory

Nodes and Passwords

compute1 ssh -p 22 root@pc31.utahddc.geniracks.net

compute2 ssh -p 22 root@pc18.utahddc.geniracks.net

Home ssh -p 22 root@c220g1-030612.wisc.cloudlab.us 3f518000587b

scratch ssh -p 22 root@c220g1-030616.wisc.cloudlab.us 7312a558f947

Work ssh -p 22 root@c220g1-030610.wisc.cloudlab.us 5e021c2833e3

Works Cited

- For some of the installation scripts we looked at examples in Ben Coomes public git hub repository.
- “Stampede User Guide.” XSEDE User Portal | TACC Stampede. N.p., n.d. Web. 16 Apr. 2017.
- "Section 10: Hardware." The Cloudlab Manual. N.p., n.d. Web. 16 Apr. 2017.
- Rossiter, Jeffrey, Rick Mohr, Sarp Oral, Michael Brim, Jason Hill, Joel Reed, and Neena Imam. Basic Lustre Installation and Setup from Stock RPMs. N.p.: n.p., n.d. Pdf.