CPSC 3620 Group #7
Project #2 Documentation

compute_1	clnode042	c8220	`ssh -p 22 acausti@clnode042.clemson.cloudlab.us`
compute2	clnode060	c8220	`ssh -p 22 acausti@clnode060.clemson.cloudlab.us`
home	ms0441	m400	`ssh -p 22 acausti@ms0441.utah.cloudlab.us`
scratch	ms0408	m400	`ssh -p 22 acausti@ms0408.utah.cloudlab.us`
Work	ms0436	m400	`ssh -p 22 acausti@ms0436.utah.cloudlab.us`
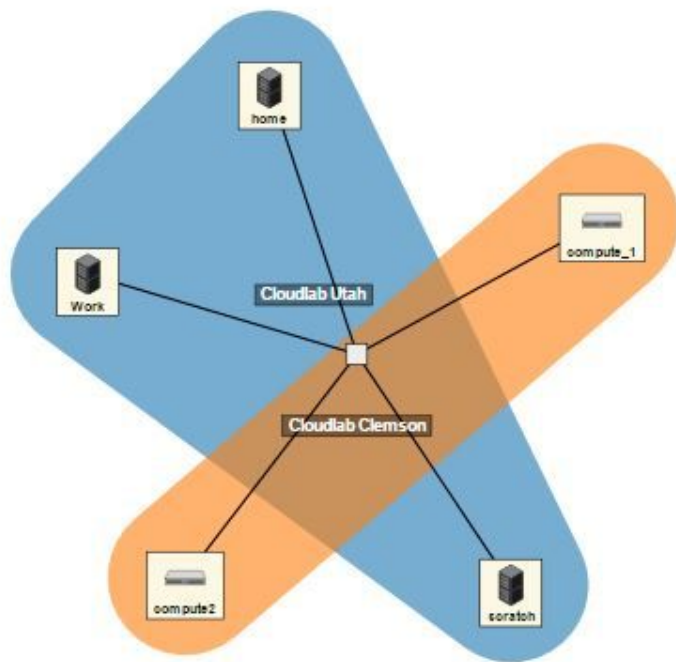
Our Diagram above is the basic setup of the cloudlab nodes for our project. There are two distinct node types in our version of the distribution. These nodes are storage nodes designated by HOME,WORK,and SCRATCH and compute nodes designated by COMPUTE_1 and COMPUTE_2. The Compute nodes are of hardware type c8220 which can be seen in figure 2. The storage nodes implement 3 connected Lustre File systems. The hardware for the storage nodes are shown in Figure 3. There are two types of nodes shown and we use a variety of both between our file systems.

c8220	96 nodes (Ivy Bridge, 20 core)
CPU	Two Intel E5-2660 v2 10-core CPUs at 2.20 GHz (Ivy Bridge)
RAM	256GB ECC Memory (16x 16 GB DDR4 1600MT/s dual rank RDIMMs
Disk	Two 1 TB 7.2K RPM 3G SATA HDDs
NIC	Dual-port Intel 10Gbe NIC (PCIe v3.0, 8 lanes
NIC	Qlogic QLE 7340 40 Gb/s Infiniband HCA (PCIe v3.0, 8 lanes)

Figure 2.

m400	315 nodes (64-bit ARM)
CPU	Eight 64-bit ARMv8 (Atlas/A57) cores at 2.4 GHz (APM X-GENE)
RAM	64GB ECC Memory (8x 8 GB DDR3-1600 SO-DIMMs)
Disk	120 GB of flash (SATA3 / M.2, Micron M500)
NIC	Dual-port Mellanox ConnectX-3 10 GB NIC (PCIe v3.0, 8 lanes

m510	270 nodes (Intel Xeon-D)
CPU	Eight-core Intel Xeon D-1548 at 2.0 GHz
RAM	64GB ECC Memory (4x 16 GB DDR4-2133 SO-DIMMs)
Disk	512 GB NVMe flash storage
NIC	Dual-port Mellanox ConnectX-3 10 GB NIC (PCIe v3.0, 8 lanes

Figure 3.
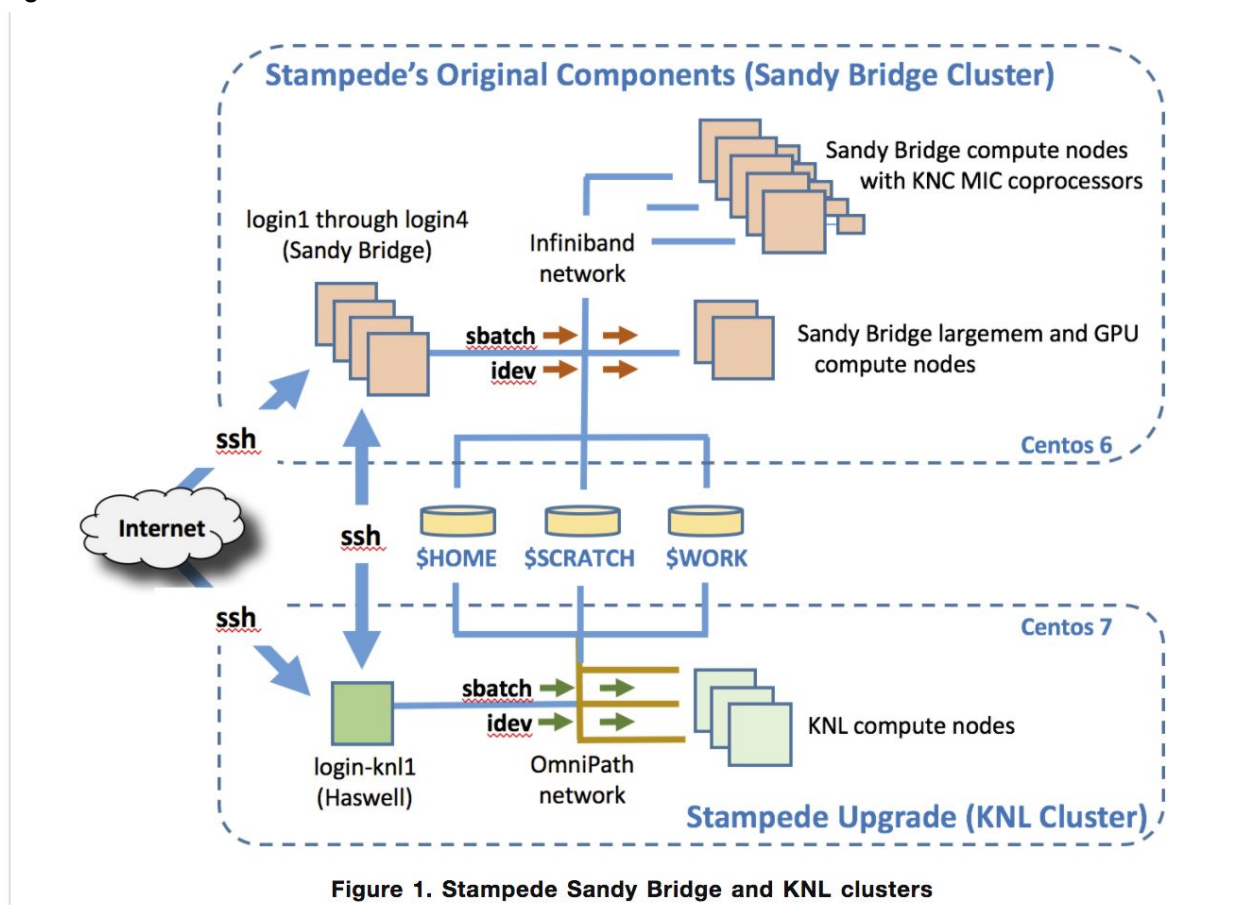

Figure 1. Stampede Sandy Bridge and KNL clusters

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

Looking the compute nodes of Stampede, we could not access the exact same nodes but we use the similar compute power nodes ,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

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 ubuntu 14.04. We can not use CentOS 6.3 in our distribution, but they are all 64 bit operating system. Similar to Stampede, the storage nodes implement 3 connected Lustre File systems.