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Report of work done on cluster at Biocomputing Research Lab

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This work was done as part of project work to setup a private cloud
using open source tools and study various programming modes for the cloud.

28-07-2011 Correcting E1422 (Machine Check Error) on a node

The error may have been caused due to wrong power supply, or cpu temprature. The error was corrected by switching off the system and rebooted after 10 seconds.

References: Dell poweredge 1950 Administrators Guide, page 24

29-07-2011 Installing Open Manage Server Administrator

Logged in to the node as root

```
su - root
password:
```

Enabling plugins for yum

```
sudo nano /etc/yum.conf
```

Added this line to enable plugins

```
plugins = 1
```

Downloaded the files from the Dell OpenMAnage repository

```
wget -q -O - http://linux.dell.com/repo/hardware/latest/bootstrap.cgi | bash
```

Installed using yum

```
yum install srvadmin-all
```

Starting OMSA

```
/opt/dell/srvadmin/sbin/srvadmin-services.sh start
```

Accessing Web Interface
```
https://nodeip:1311/ in the web browser
```
Login as root (use the credentials of the root user of the server)

References:
http://www.thegeekstuff.com/2008/11/how-to-manage-dell-servers-using-omsa-openmanage-server-administrator-on-linux/
http://linux.dell.com/wiki/index.php/Repository/hardware

29-07-2011 DELL PERC 6/i firmware update from 6.1.147 to 6.3.0

Checked the latest firmware version in OMSA.
Downloaded latest PERC 6/i firmware version from support.dell.com for the specific server (PowerEdge 1950)

```
chmod +x RAID_FRMW_LX_R278433.BIN
```

```
./RAID_FRMW_LX_R278433.BIN
```

Reboot the node.

References:
http://support.us.dell.com/support/downloads/format.aspx?releaseid=R278433&c=us&l=en&cs=&s=gen
http://ihazem.wordpress.com/2011/06/17/upgrading-driverfirmware-for-perc-6e-raid-controller/

30-07-2011 Correcting PXE Configuration to reinstall Rocks on certain nodes.

PXE Booting not working on some nodes. PXE Configuration was edited. *Filenames in the configuration folder corresponds to the IP address in Hex.*

```
cd /tftpboot/pxelinux/pxelinux.cfg
```

Replaced `Localboot 0` with

```
kernel vmlinuz−5.3−i386 append ks ramdisk_size=150000 lang= devfs=
    nomount pxe kssendmac selinux=0 noipv6 initrd=initrd.img−5.3−
    i386
```

31-07-2011 Reinstallation of Rocks HPC Roll.

Encountered a problem in running parallel programs, due to missing environment variables with HPC roll installation.
Download HPC Roll i386 for Rocks from rocksclusters.org

```
su - root
rocks add roll hpc-5.3-0.i386.disk1.iso
rocks enable roll hpc
cd /export/rocks/install
rocks create distro
rocks run roll hpc | bash
init 6
```

31-07-2011 Running a sampe MPI program

Sample Program (*sample.c*) :

```c
#include <stdio.h>
#include <mpi.h>

int main(int argc, char *argv[]) {
  int numprocs, rank, namelen;
  char processor_name[MPI_MAX_PROCESSOR_NAME];

  MPI_Init(&argc, &argv);
  MPI_Comm_size(MPI_COMM_WORLD, &numprocs);
  MPI_Comm_rank(MPI_COMM_WORLD, &rank);
  MPI_Get_processor_name(processor_name, &namelen);

  printf("Process %d on %s out of %d\n", rank, processor_name, numprocs);

  MPI_Finalize();
}
```

Compile the program.

```
mpicc -o sample sample.c
```

Created a machinefile (*machines*) with the names of the compute nodes
Run the program

```
mpirun -machinefile machines -np 10 sample
```

1-07-2011 Making a custom partition on a node

Tested out the procedure to make a custom partition in one of the nodes using `replace-partition.xml` file of Rocks. Created a custom partition `/mydata` in node `compute-0-6`

```
cd /export/rocks/install/site-profiles/5.3/nodes/
cp skeleton.xml replace-partition.xml
```

Inside replace-partition.xml, add the following section right after the ¡main¿ ¡/main¿ section:

```
<main>
<!-- kickstart 'main' commands go here -->
</main>

<pre>
echo "clearpart --all --initlabel --drives=sda
part / --size 8000 --ondisk sda
part swap --size 1000 --ondisk sda
part /mydata --size 1 --grow --ondisk sda" > /tmp/user_partition_info
</pre>
```

On the front end,

```
# cd /export/rocks/install
# rocks create distro
# rocks remove host partition compute-0-6
```

Script for removing .rocks-release from the partition.

```
for file in $(mount | awk '{print $3}')
do
if [ -f $file/.rocks-release ]
then
rm -f $file/.rocks-release
fi
done
```

Saved the file as /share/apps/nukeit.sh

```
# ssh compute-0-6 'sh /share/apps/nukeit.sh'
# ssh compute-0-6 '/boot/kickstart/cluster-kickstart'
```

1-08-2011 Installed Bio (Bioinformatics Utilities) Roll of Rocks Clusters

Bioinformatics Roll consists of many common Bio Informatics utilities like MPIBlast, GROMACS etc.
Download Bio Roll i386 for Rocks from rocksclusters.org

```
$ su - root
# rocks add roll bio-5.3-0.i386.disk1.iso
# rocks enable roll bio
# cd /export/rocks/install
# rocks create distro
# rocks run roll bio | bash
# init 6
```

1-08-2011 Testing mpiBLAST program from BioRoll

mpiBLAST was a program packaged with Bio Roll of Rocks Clusters. The program compares neucleotide sequences with a database of sequences to find the best possible match

```
$ cd $BLASTDB
$ pwd
/home/bclab/bio/ncbi/db
$ wget ftp://ftp.ncbi.nlm.nih.gov/blast/db/FASTA/yeast.nt.gz
```

```
$ gunzip yeast.nt.gz
$ ls
yeast.nt
$ mpiformatdb --nfrags=8 -i yeast.nt -pF --quiet
Reading input file
Done, read 151963 lines
Reordering 17 sequence entries
Breaking yeast.nt into 8 fragments
Executing: formatdb -p F -i /tmp/reorderlvj42Y -N 8 -n
/home/bclab/bio/ncbi/db/yeast.nt -o T
Removed /tmp/reorderlvj42Y
Created 8 fragments.
$ cat > test.txt
>Test
AGCTTTTCATTCTGACTGCAACGGGCAATATGTCTCTGTGTGGATTAAAAAAAGAGTGTCTGATAGCAGC
TTCTGAACTGGTTACCTGCCGTGAGTAAATTAAAATTTTATTGACTTAGGTCACTAAATACTTTAACCAA
TATAGGCATAGCGCACAGACAGATAAAAATTACAGAGTACACAACATCCATGAAACGCATTAGCACCACC
ATTACCACCACCATCACCATTACCACAGGTAACGGTGCGGGCTGACGCGTACAGGAAACACAGAAAAAAG
CCCGCACCTGACAGTGCGGGCTTTTTTTTTCGACCAAAGGTAACGAGGTAACAACCATGCGAGTGTTGAA
GTTCGGCGGTACATCAGTGGCAAATGCAGAACGTTTTCTGCGTGTTGCCGATATTCTGGAAAGCAATGCC
AGGCAGGGGCAGGTGGCCACCGTCCTCTCTGCCCCCGCCAAAATCACCAACCACCTGGTGGCGATGATTG
AAAAAACCATTAGCGGCCAGGATGCTTTACCCAATATCAGCGATGCCGAACGTATTTTTGCCGAACTTTT

$ /opt/openmpi/bin/mpirun -np 4 /opt/Bio/mpiblast/bin/mpiblast -d ecoli.nt
-i $HOME/test.txt -p blastn -o $HOME/result.txt
```

6-08-2011 Changing IP address of front end

The frontend IP was set to 192.168.41.203 which was mapped to a public IP. The cluster is
now accessible from a public network.

```
$ su - root
# rocks set host interface ip csedcluster eth1 192.168.41.203
# rocks sync config
# service network restart
```

6-08-2011 Enabling VNC Server

Enabling VNC server on the frontend

```
# nano /etc/sysconfig/vncservers
```

Uncomment the lines

```
    VNCSERVERS="2:root" # display port and username
    VNCSERVERARGS[2]=...
```

In the terminal:

```
# vncpasswd
# vncserver -kill :2
# nano ~/.vnc/xstartup
```

Replace `twm &` with

```
 gnome-session &
```

Reboot the node.

References: http://howto.webbynode.com/topic.php?id=18

10-08-2011 Configured nodes to manual partitioning mode on kickstart

---

Testing manual confiuguration mode for the nodes.

```
$ su - root
# nano /export/rocks/install/site-profiles/5.3/nodes/replace-partition.xml
```

Replace the contents of the `<pre>...</pre>` section with the following

```
echo "rocks manual" > /tmp/user_partition_info
```

From the frontend:

```
# cd /export/rocks/install
# rocks create distro
```

11-08-2011 Generating Hosts File

Generated a missing hosts file `/etc/hosts`

```
$ su - root
rocks report host > /etc/hosts
```

11-08-2011 Disabling firewall to prepare for Eucalyptus installation

---

Eucalyptus manages its own firewall rules and hence the default firewall must be disaled

```
$ su - root
# system-config-securitylevel-tui
```

Select "Disable Firewall"

6

```
$ su - root
# service network restart
# service dhcpd restart
# service xinetd restart
```

/etc/sysconfig/iptables files will be removed and backup file will be saved as
/etc/sysconfig/iptables.save

18-08-2011 Changing partition mode to default for all nodes

Changed the partitioning mode to defualt for all the nodes.

`nano /export/rocks/install/site-profiles/5.3/nodes/replace-partition.xml`

Replace the contents of the `<pre>...</pre>` section with the following

`echo "rocks force-default" > /tmp/user_partition_info`

From the frontend:

```
# cd /export/rocks/install
# rocks create distro
```

18-08-2011 Configure all nodes as VM Containers

Changed the Nodes from Compute Nodes to VM Containers to facilitate the running of
Virtual Intsances Remove the compute nodes from Rocks:

`rocks remove host compute-X`

X - is the node to be removed
Reboot the nodes.
On the frontend use the command:

`insert-ethers`

Select option as VM Container.
The names are automatically assigned as vm-container-X.

20-08-2011 Installing Eucalyptus 1.6.2 on frontend

Installed the required prerequisites and synchronize the time on the servers.

```
yum install -y ntp
ntpdate pool.ntp.org
```

Create `/etc/yum.repos.d/euca.repo` file with the following four lines:

```
[euca]
name=Eucalyptus
baseurl=http://www.eucalyptussoftware.com/downloads/repo/eucalyptus/1.6.2/yum/centos/
enabled=1
```

Install the required components.

```
export $ARCH=i386
yum install eucalyptus-cloud.$ARCH eucalyptus-cc.$ARCH eucalyptus-walrus.$ARCH
eucalyptus-sc.$ARCH --nogpgcheck
```

References:
Eucalyptus 1.6 Administrator's Guide

20-08-2011 Installing Eucalyptus 1.6.2 on compute nodes

Installed the required eucalyptus packages on compute nodes. Compute nodes didn't have internet connection as iptables file was removed from frontend which disabled NAT. The required packages were copied to the nodes and then manually installed. Copied the rpms to / of vm-container-0-1
On vm-container-0-1,

```
cd eucalyptus-$VERSION*-rpm-deps-x86_64
rpm -Uvh aoetools-21-1.el4.x86_64.rpm \
        euca-axis2c-1.6.0-1.x86_64.rpm \
        euca-rampartc-1.3.0-1.x86_64.rpm
cd ..

rpm -Uvh eucalyptus-$VERSION-*.x86_64.rpm \
        eucalyptus-gl-$VERSION-*.x86_64.rpm \
        eucalyptus-nc-$VERSION-*.x86_64.rpm
```

HTTPD depenedancy was required.

```
yum install httpd
```

References:
Eucalyptus 1.6 Administrator's Guide

20-08-2011 First time Eucalyptus configuration and attempt to run instances. Failed.

Eucalyptus was configured with basic configuration as described in eucalyptus manual. However the configuration failed, and on starting an instance the IP returned a 0.0.0.0.

References:
Eucalyptus 1.6 Administrator's Guide

26-08-2011 Setting permissions of the user "eucalyptus" for libvirtd

The eucalyptus user was granted access for running libvirtd. In Node:
Group "libvirt" missing in /etc/group. Command to insert the group:

```
groupadd libvirt
```

Open the file /etc/group and edit:
add "eucalyptus" to the line "libvirt"

```
-libvirt:x:504:eucalyptus
```

Uncomment the following lines in libvirt.conf (/etc/libvirt/libvirt.conf)

```
unix_sock_group = "libvirt"
unix_sock_rw_perms = "0770"
auth_unix_ro = "none"
auth_unix_rw = "none"
```

Stop all Eucalyptus services:
On nodes:

```
/etc/init.d/eucalyptus-nc stop
```

On frontend:

```
/etc/init.d/eucalyptus-cc stop
/etc/init.d/eucalyptus-cloud stop
```

On both frontend and nodes:
Enable '(xend-http-server yes)' in /etc/xen/xend-config.sxp
Restart xend

```
/etc/init.d/xend restart
```

Start all Eucalyptus services:
On nodes:

```
/etc/init.d/eucalyptus-nc start
```

On frontend:

```
/etc/init.d/eucalyptus-cc start
/etc/init.d/eucalyptus-cloud start
```

18-10-2011 Configuring some nodes as compute nodes

7 nodes were configured back to compute nodes for running parallel programs.

```
rocks remove host compute-X
```

X - is the node to be removed
Reboot the nodes.
On the frontend use the command:

```
insert-ethers
```

Select option as Compute nodes
The names are automatically assigned as compute-0-x.

10-11-2011 Reinstallation of Eucalyptus on Node and Frontend

Eucalyptus was reinstalled on nodes and frontend.

References:
Eucalyptus 1.6 Administrator's Guide

11-11-2011 Eucalyptus Initial Setup

Register the components (cluster,walrus,sc and nodes)
On Frontend,

```
$EUCALYPTUS/usr/sbin/euca_conf --register-walrus 10.1.1.1
$EUCALYPTUS/usr/sbin/euca_conf --register-cluster ZEUS 10.1.1.1
$EUCALYPTUS/usr/sbin/euca_conf --register-sc ZEUS 10.1.1.1
$EUCALYPTUS/usr/sbin/euca_conf --register-nodes "10.1.255.253"
```

Goto http://csedcluster.nitc.ac.in:8443 on the frontend and login using Administrator credentials
In the configuration tab, change cloud host to 192.168.41.203.
Click on Credentials, and download the credentials zip file. Unzip and source the keyfile.
(Keys needs to be sourced after booting if we want to use euca2ools, which is a client side implementation of Eucalyptus)

```
$ mkdir $HOME/.euca
$ unzip euca2-admin-x509.zip -d $HOME/.euca
. $HOME/.euca/eucarc
```

References:
Eucalyptus 1.6 Administrator's Guide

11-11-2011 Eucalyptus Network Configuration

Configuring the Eucalyptus Network settings. Selected the Network Mode - MANAGED-NOVLAN amongst he four modes of Eucalyptus network configurations. (SYSTEM,STATIC,MANAGED,MANAGED-NOVLAN)
Edit the eucalyptus config file (/etc/eucalyptus/eucalyptus.conf)
In Front End:

```
VNET_PRIVINTERFACE="eth0"
VNET_PUBINTERFACE="eth1"
VNET_DHCPDAEMON="/usr/sbin/dhcpd"
VNET_MODE="MANAGED-NOVLAN"
VNET_SUBNET="10.1.0.0"
VNET_NETMASK="255.255.0.0"
VNET_DNS="192.168.254.2"
VNET_ADDRSPERNET="32"
```

Above configuration led to creation of instances. But access was limited to only the cluster network. Addition of public IP's (IP's of NSL Domain) made access from NSL possible.

```
VNET_PUBLICIPS="192.168.41.211 192.168.41.212 192.168.41.213"
```

On each node:

```
VNET_MODE="MANAGED-NOVLAN"
VNET_PUBINTERFACE="xenbr.eth0"
VNET_PRIVINTERFACE="xenbr.eth0"
VNET_BRIDGE="xenbr.eth0"
```

xenbr.eth0 is a Xen bridge. List of bridges is obtained by the command "brctl show". Ignore the bridge named "virbr" as it is created by libvirtd.

References:
Eucalyptus Network Configuration 1.6.2

On a client,

```
export VERSION=1.2
```

```
[euca2ools]
name=Euca2ools
baseurl=http://www.eucalyptussoftware.com/downloads/repo/euca2ools/1.2/yum/centos/
enabled=1
```

```
yum install euca2ools.i386 --nogpgcheck
```

Source the keys before running Euca2ools

```
mkdir ~/.euca
cd ~/.euca
unzip name-of-the-key-zip.zip
chmod 0700 ~/.euca
chmod 0600 ~/.euca/*
. ~/.euca/euca2-*/eucarc
```

Similarly Euca2ools maybe setup on any other client running on a different OS.

References:
Eucalyptus Users Guide 1.6.2

Creation, bundling and uploading of images.Running instances with images.
Download an Eucalyptus Image.
Do the following commands for each file:

Kernel:

```
euca-bundle-image -i <kernel file> --kernel true
euca-upload-bundle -b <kernel bucket> -m /tmp/<kernel file>.manifest.xml
euca-register <kernel-bucket>/<kernel file>.manifest.xml
```

where `<kernel-bucket>` is the upload name.

Root Disk Image:

```
euca-bundle-image -i <vm image file>
euca-upload-bundle -b <image bucket> -m /tmp/<vm image file>.manifest.xml
euca-register <image bucket>/<vm image file>.manifest.xml
```

where `<image-bucket>` is the upload name.

Ramdisk:

```
euca-bundle-image -i <initrd file> --ramdisk true
euca-upload-bundle -b <initrd bucket> -m /tmp/<initrd file>.manifest.xml
euca-register <initrd bucket>/<initrd file>.manifest.xml
```

where `<initrd-bucket>` is the upload name.

Adding Keypair to authorize access to Instances:

```
euca-add-keypair mykey >mykey.private
```

where "mykey" is the name of Eucalyptus key, "mykey.private" is file used for ssh.

```
chmod 0600 mykey.private
```

Starting Instances:

```
euca-run-instances -k mykey -n <number of instances to start> --kernel <eki-id>
--ramdisk <eri-id> <emi-id>
```

where `<eki-id>`, `<eri-id>` and `<emi-id>` are the image ID's of Kernel,Ramdisk and VM
Image respectively.
Describing the Instances:

```
euca-describe-instances
```

Accessing the Instance:

```
ssh -i mykey.private root@<accessible-instance-ip>
```

This gives Root login for the Instance.
Terminating the Instance:

```
euca-terminate-instances <instance-id>
```