Aim: Installation and configuration of private cloud using Eucalyptus.

Theory:

- Eucalyptus is a paid and open-source computer software for building Amazon Web Services (AWS)-compatible private and hybrid cloud computing environments, originally developed by the company Eucalyptus Systems.
- Eucalyptus is an acronym for Elastic Utility Computing Architecture for Linking Your Programs To Useful Systems. Eucalyptus enables pooling compute, storage, and network resources that can be dynamically scaled up or down as application workloads change.

Main Components of Eucalyptus:

- The Cloud Controller (CLC) is a Java program that offers EC2-compatible interfaces, as well as a web interface to the outside world. In addition to handling incoming requests, the CLC acts as the administrative interface for cloud management and performs high-level resource scheduling and system accounting.
- The Node Controller (NC) is written in C and hosts the virtual machine instances and manages the virtual network endpoints. It downloads and caches images from Walrus as well as creates and caches instances. While there is no theoretical limit to the number of Node Controllers per cluster, performance limits do exist.
- The Cluster Controller (CC) is written in C and acts as the front end for a cluster within a Eucalyptus cloud and communicates with the Storage Controller and Node Controller. It manages instance execution and Service Level Agreements (SLAs) per cluster.
- The Storage Controller (SC) is written in Java and is the Eucalyptus equivalent to AWS EBS. It communicates with the Cluster Controller and Node Controller and manages Eucalyptus block volumes and snapshots to the instances within its specific cluster.
- Walrus, also written in Java, is the Eucalyptus equivalent to AWS Simple Storage Service (S3). Walrus offers persistent storage to all of the virtual machines in the Eucalyptus cloud and can be used as a simple HTTP put/get storage as a service solution.

Architecture:

Installation steps for node controller:

- boot from bootable USB device.
- Select node controller. Select Language.
- Select removable disk for installation.
- Enter network details such as network interface, mode, IP address,etc.
- Select password
- Choose space for installation.
- Let it install. Reboot once done.

Installation steps for cloud controller:

- boot from bootable USB device.

- Select front end installation.
- Enter network details.
- Enter time zone and select password
- Enter public IP range.
- Let it install. Reboot once done.
- Enter node registration IP, create user.
- Enter synchronization mode for date and time.

Installation steps for VM instance and virtual storage:

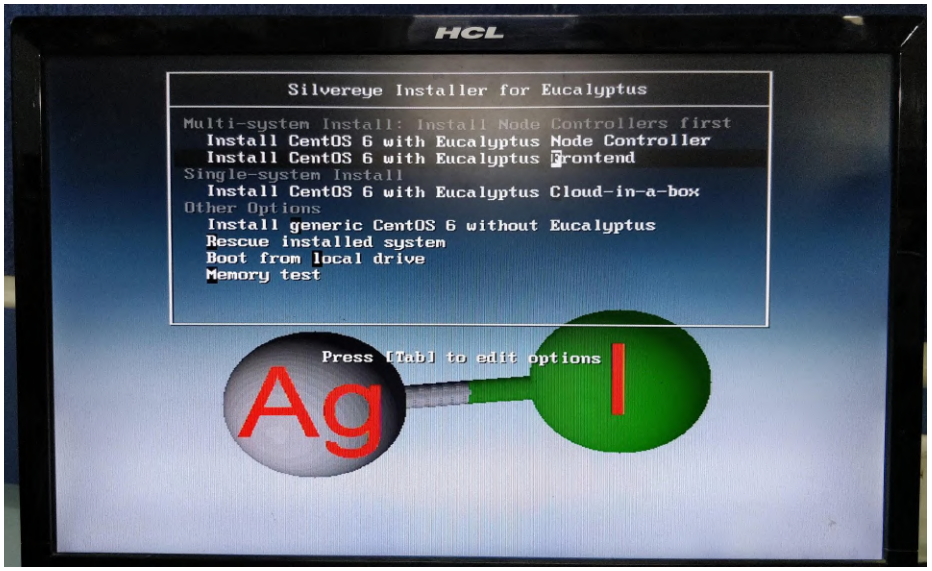
- open browser and log into Eucalyptus.
- Create instance of required configuration. Downloa the key.
- Open terminal and go to directory containing key. Enter command:

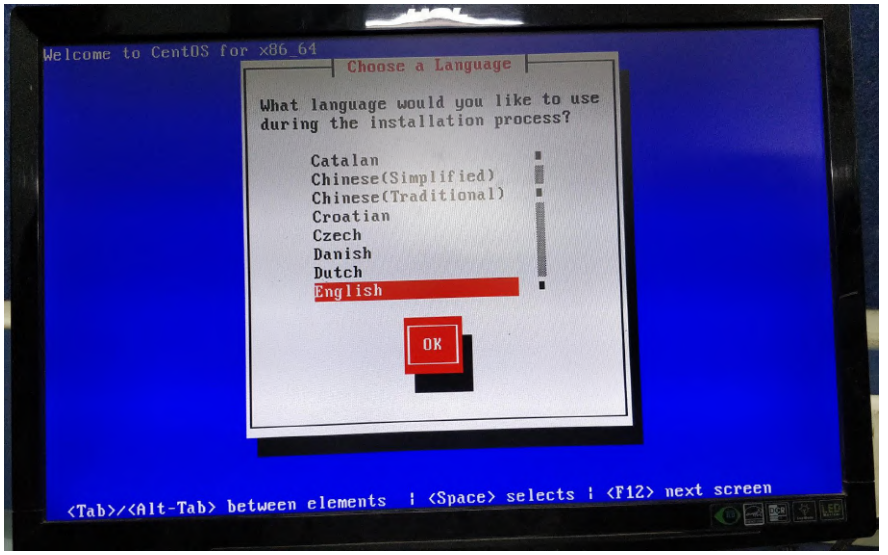
#chmod 400 <keyname>

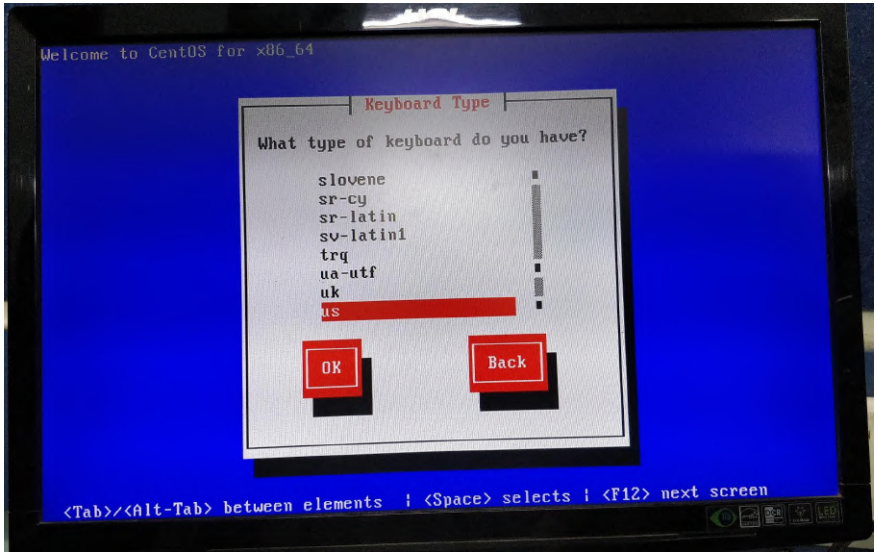
- Enter command: #ssh -i <keyname>
- On Eucalyptus web app go to storage.
- Create a volume and attach it to previously created VM instance.
- Open terminal and go to directory '/dw'. Enter command: ls to ensure it contains 'vdb' which refers to virtual volume.
- Detach the volume. 'vdb' is not shown then.

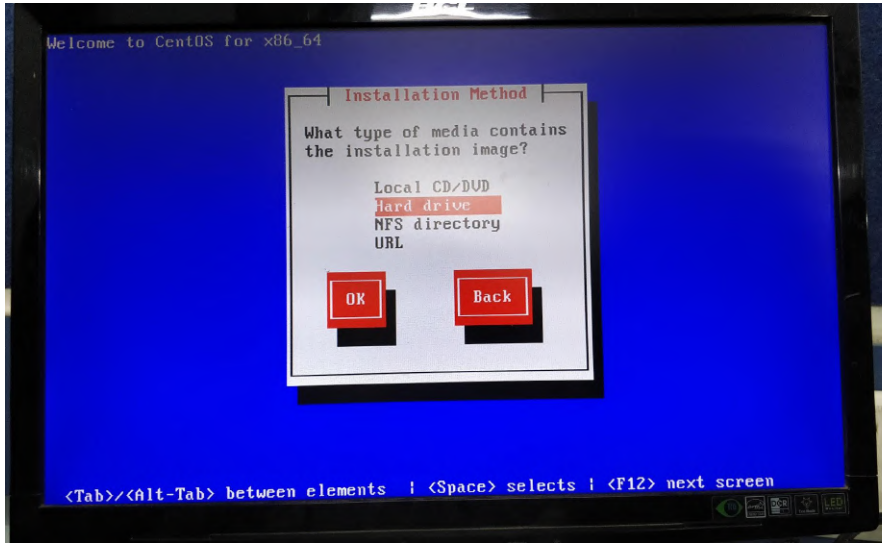
Conclusion:

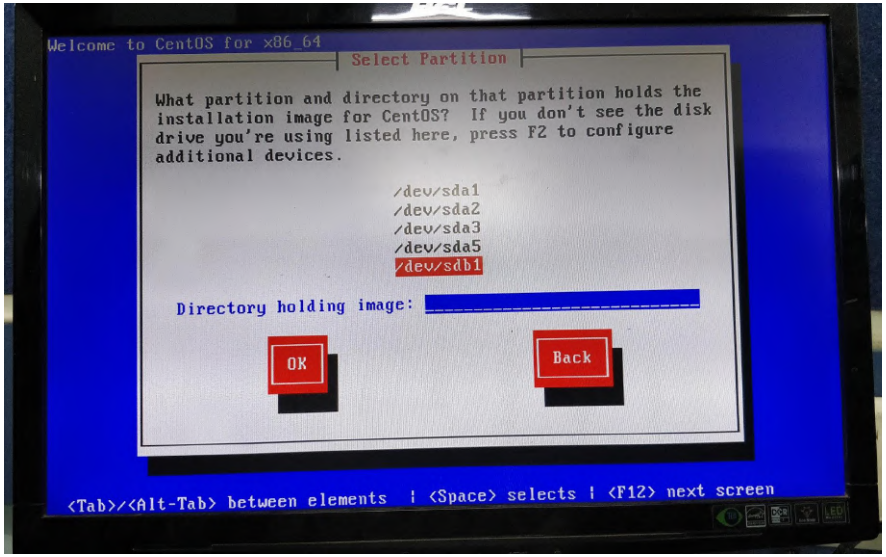
Hence, we have successfully implemented Eucalyptus private cloud, installed node controller and cloud controller on two different machines.

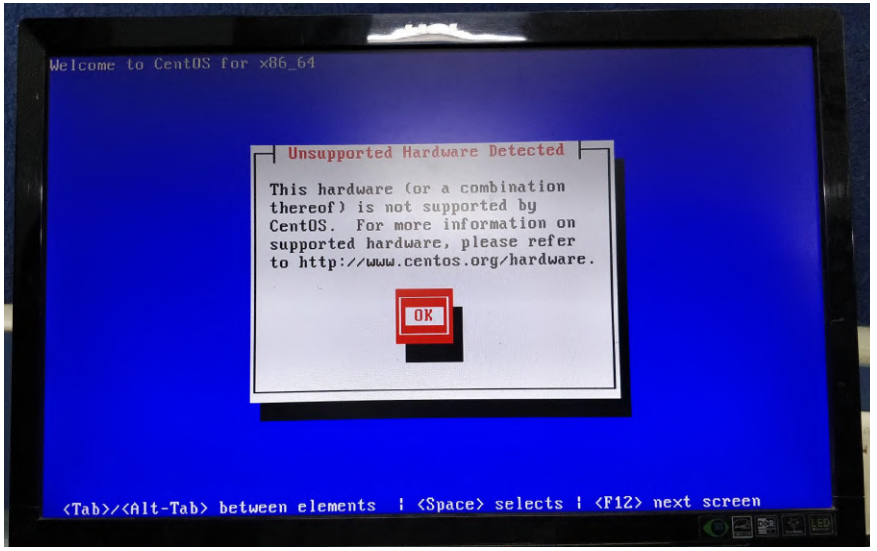

HCL
Silvereye Installer for Eucalyptus
Multi-system Install: Install Node Controllers first
Install CentOS 6 with Eucalyptus Node Controller
Install CentOS 6 with Eucalyptus Frontend
Single-system Install
Install CentOS 6 with Eucalyptus Cloud-in-a-box
Other Options
Install generic CentOS 6 without Eucalyptus
Rescue installed system
Boot from local drive
Memory test
Press [Tab] to edit options
Ag

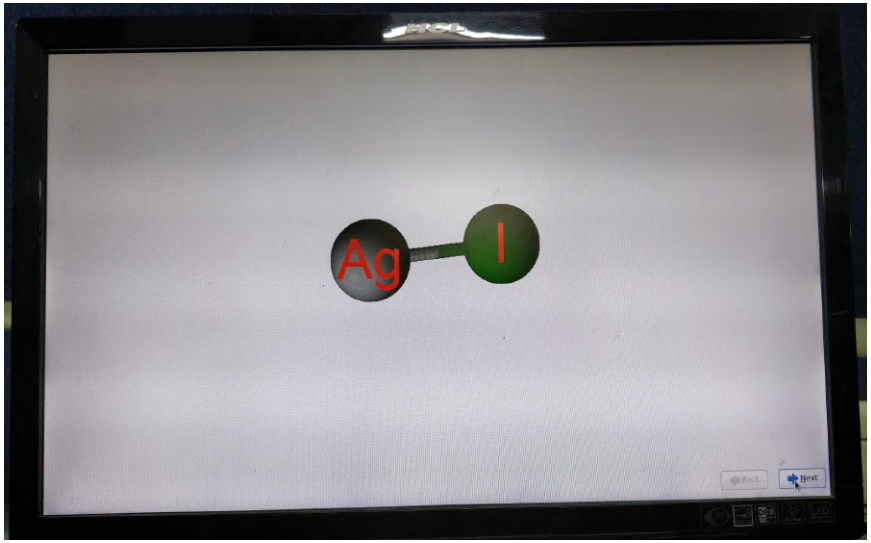

Welcome to CentOS for x86_64
Choose a Language
What language would you like to use during the installation process?
Catalan
Chinese(Simplified)
Chinese(Traditional)
Croatian
Czech
Danish
Dutch
English
OK
<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen

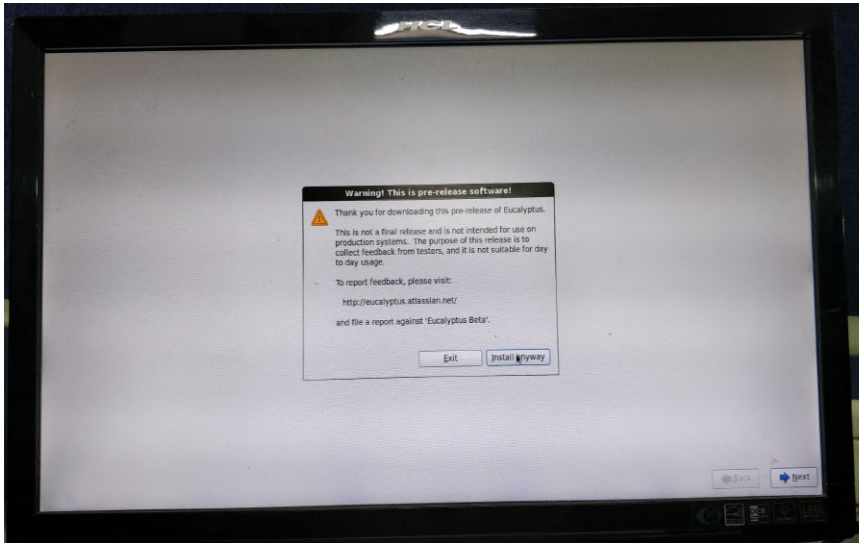

Welcome to CentOS for x86_64
Keyboard Type
What type of keyboard do you have?
slovene
sr-cy
sr-latin
sv-latin1
trq
ua-utf
uk
us
OK
Back
<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen

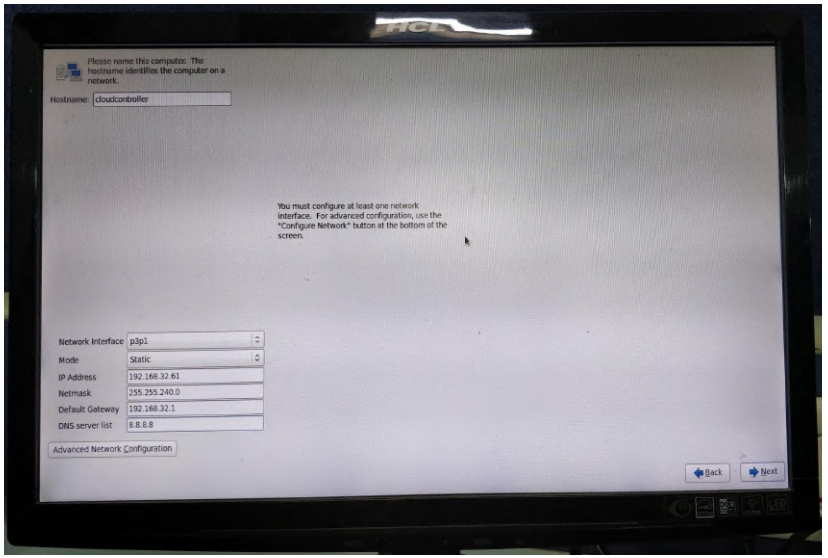

Welcome to CentOS for x86_64
Installation Method
What type of media contains the installation image?
Local CD/DVD
Hard drive
NFS directory
URL
OK
Back
<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen

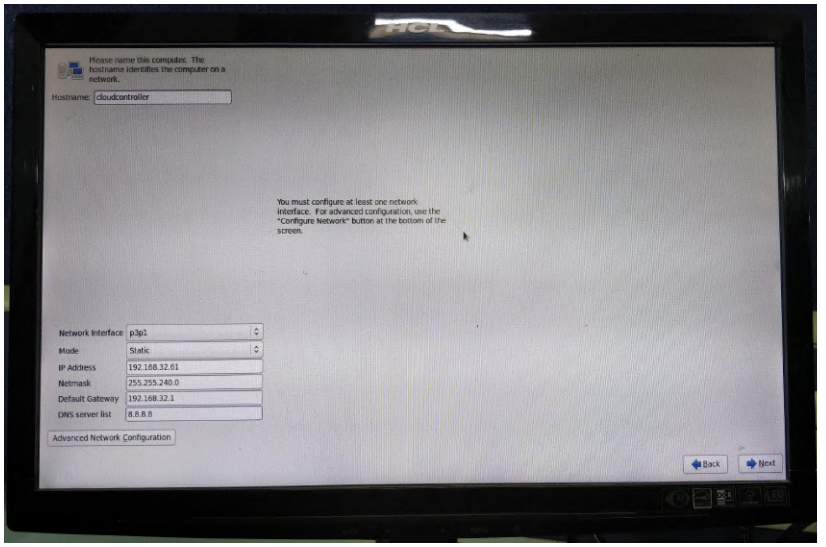

Welcome to CentOS for x86_64
Select Partition
What partition and directory on that partition holds the installation image for CentOS? If you don't see the disk drive you're using listed here, press F2 to configure additional devices.
/dev/sda1
/dev/sda2
/dev/sda3
/dev/sda5
/dev/sdb1
Directory holding image:
OK
Back
<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen

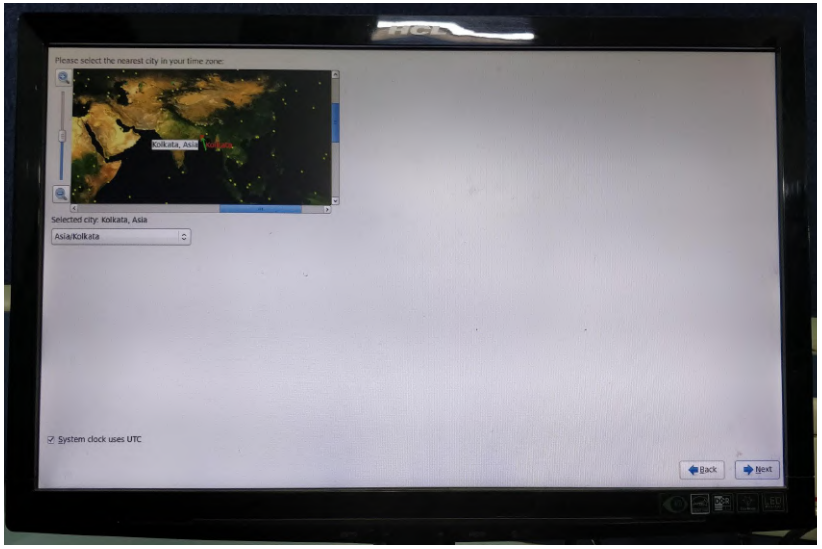

Welcome to CentOS for x86_64
Unsupported Hardware Detected
This hardware (or a combination thereof) is not supported by CentOS. For more information on supported hardware, please refer to http://www.centos.org/hardware.
OK
<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen


Ag
I

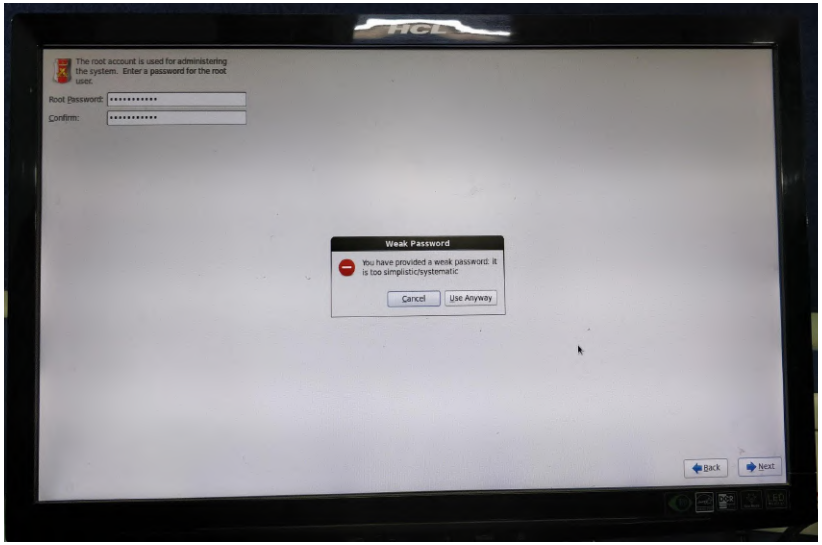

Warning! This is pre-release software!
Thank you for downloading this pre-release of Eucalyptus.
This is not a final release and is not intended for use on production systems. The purpose of this release is to collect feedback from testers, and it is not suitable for day to day usage.
To report feedback, please visit:
http://eucalyptus.atlassian.net/
and file a report against 'Eucalyptus Beta'.
Exit
Install anyway

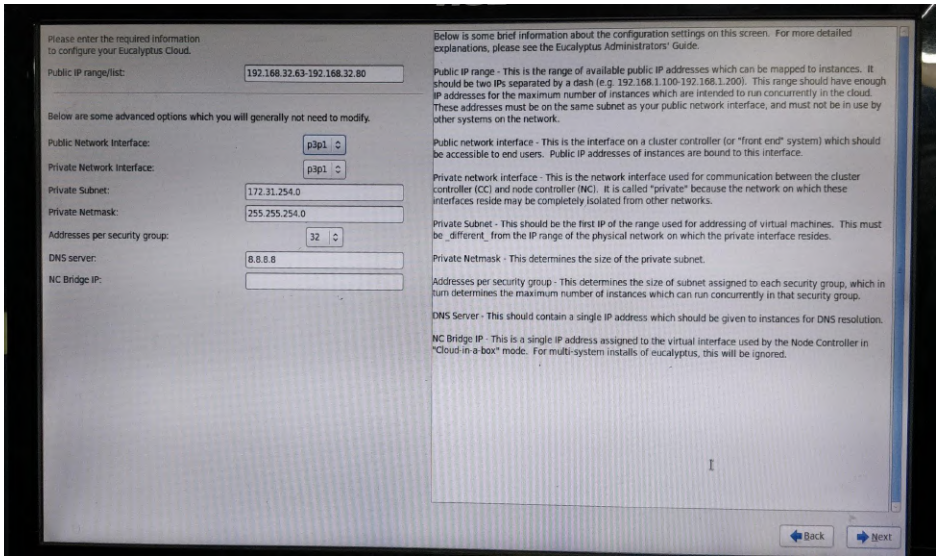

Please name this computer. The hostname identifies the computer on a network.
Hostname: cloudcontroller
You must configure at least one network interface. For advanced configuration, use the "Configure Network" button at the bottom of the screen.
Network Interface p3p1
Mode Static
IP Address 192.168.32.61
Netmask 255.255.240.0
Default Gateway 192.168.32.1
DNS server list 8.8.8.8
Advanced Network Configuration
Back
Next

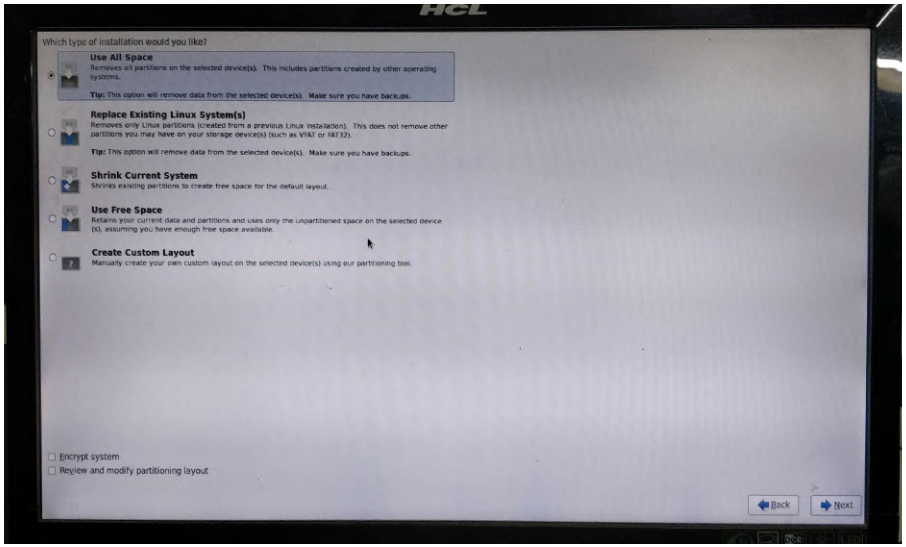

Please name this computer. The hostname identifies the computer on a network.
Hostname: cloudcontroller
You must configure at least one network interface. For advanced configuration, use the "Configure Network" button at the bottom of the screen.
Network Interface p3p1
Mode Static
IP Address 192.168.32.61
Netmask 255.255.240.0
Default Gateway 192.168.32.1
DNS server list 8.8.8.8
Advanced Network Configuration
Back
Next

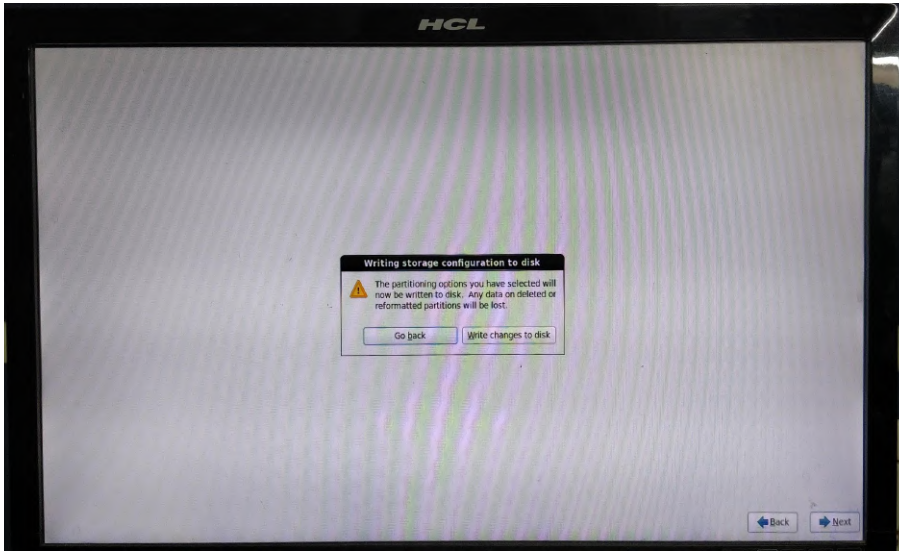

Please select the nearest city in your time zone:
Kolkata, Asia
Selected city: Kolkata, Asia
Asia/Kolkata
System clock uses UTC
Back
Next

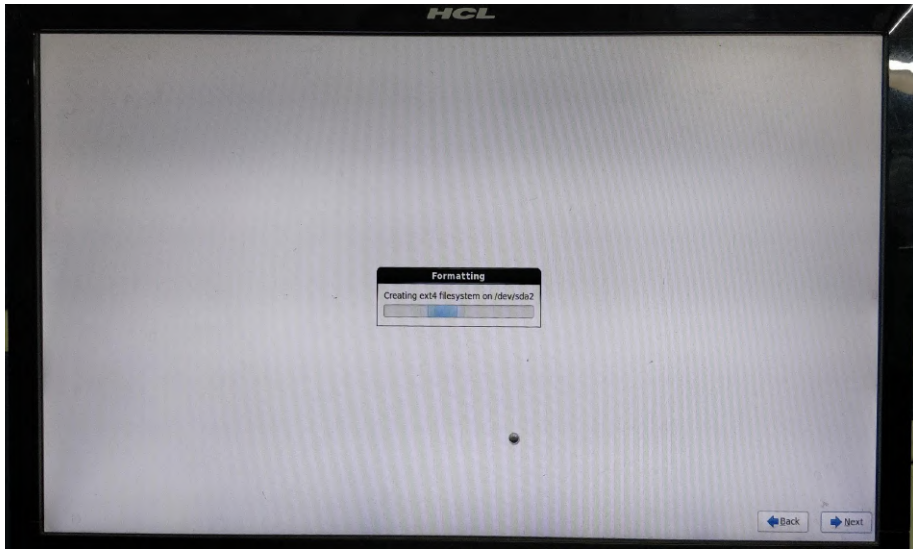

The root account is used for administering the system. Enter a password for the root user.
Root Password:
Confirm:
Back
Next

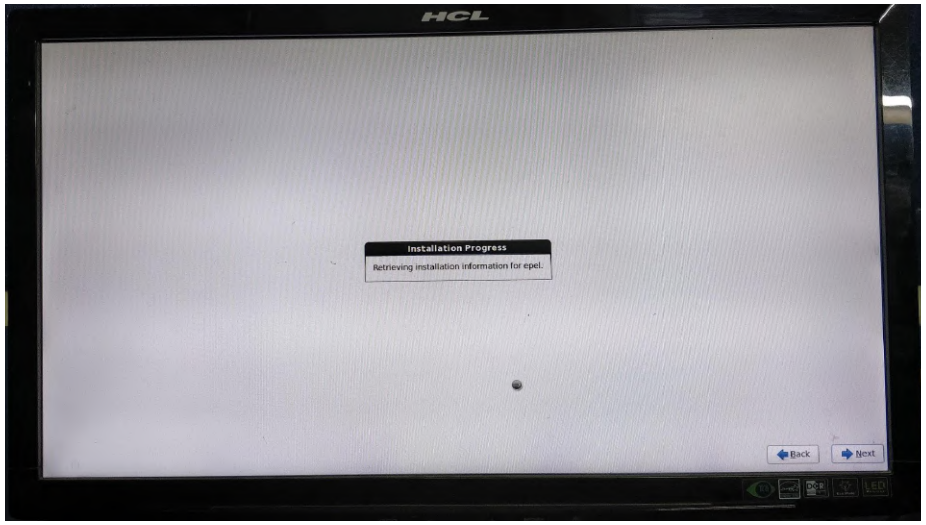

HCL
The root account is used for administering the system. Enter a password for the root user.
Root Password:
Confirm:
Weak Password
You have provided a weak password: it is too simplistic/systematic
Cancel
Use Anyway
Back
Next


Please enter the required information to configure your Eucalyptus Cloud.
Public IP range/list:
192.168.32.63-192.168.32.80
Below are some advanced options which you will generally not need to modify.
Public Network Interface:
p3p1
Private Network Interface:
p3p1
Private Subnet:
172.31.254.0
Private Netmask:
255.255.254.0
Addresses per security group:
32
DNS server:
8.8.8.8
NC Bridge IP:
Below is some brief information about the configuration settings on this screen. For more detailed explanations, please see the Eucalyptus Administrators' Guide.
Public IP range - This is the range of available public IP addresses which can be mapped to instances. It should be two IPs separated by a dash (e.g. 192.168.1.100-192.168.1.200). This range should have enough IP addresses for the maximum number of instances which are intended to run concurrently in the cloud. These addresses must be on the same subnet as your public network interface, and must not be in use by other systems on the network.
Public network interface - This is the interface on a cluster controller (or "front end" system) which should be accessible to end users. Public IP addresses of instances are bound to this interface.
Private network interface - This is the network interface used for communication between the cluster controller (CC) and node controller (NC). It is called "private" because the network on which these interfaces reside may be completely isolated from other networks.
Private Subnet - This should be the first IP of the range used for addressing of virtual machines. This must be _different_ from the IP range of the physical network on which the private interface resides.
Private Netmask - This determines the size of the private subnet.
Addresses per security group - This determines the size of subnet assigned to each security group, which in turn determines the maximum number of instances which can run concurrently in that security group.
DNS Server - This should contain a single IP address which should be given to instances for DNS resolution.
NC Bridge IP - This is a single IP address assigned to the virtual interface used by the Node Controller in "Cloud-in-a-box" mode. For multi-system installs of eucalyptus, this will be ignored.
Back
Next


HCL
Which type of installation would you like?
Use All Space
Removes all partitions on the selected device(s). This includes partitions created by other operating systems.
Tip: This option will remove data from the selected device(s). Make sure you have backups.
Replace Existing Linux System(s)
Removes only Linux partitions (created from a previous Linux installation). This does not remove other partitions you may have on your storage device(s) (such as VFAT or FAT32).
Tip: This option will remove data from the selected device(s). Make sure you have backups.
Shrink Current System
Shrinks existing partitions to create free space for the default layout.
Use Free Space
Retains your current data and partitions and uses only the unpartitioned space on the selected device (s), assuming you have enough free space available.
Create Custom Layout
Manually create your own custom layout on the selected device(s) using our partitioning tool.
Encrypt system
Review and modify partitioning layout
Back
Next

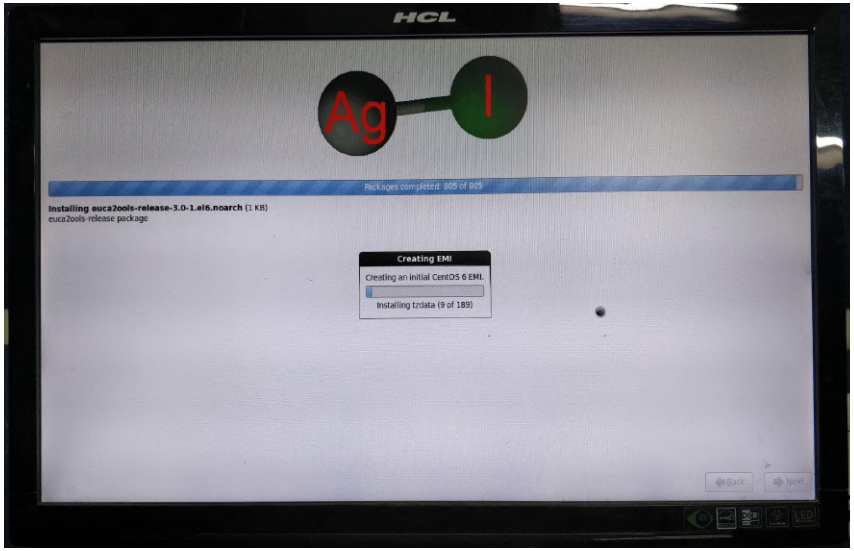

HCL
Writing storage configuration to disk
The partitioning options you have selected will now be written to disk. Any data on deleted or reformatted partitions will be lost.
Go back
Write changes to disk
Back
Next

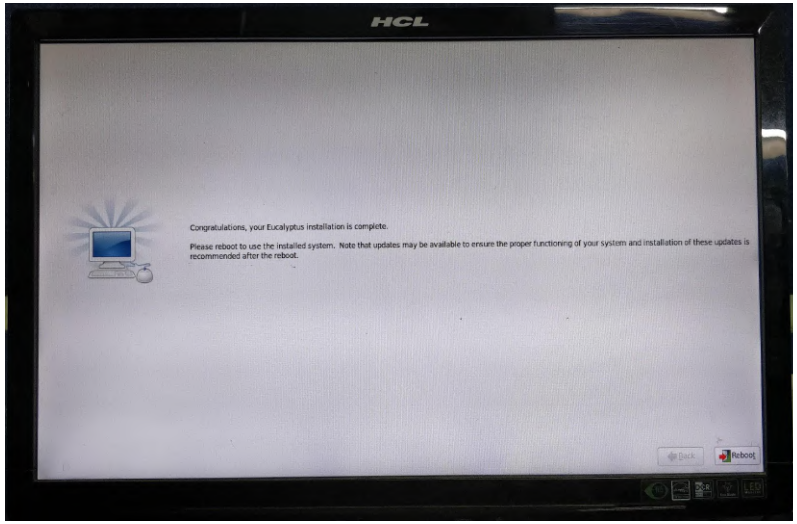

HCL
Formatting
Creating ext4 filesystem on /dev/sda2
Back
Next

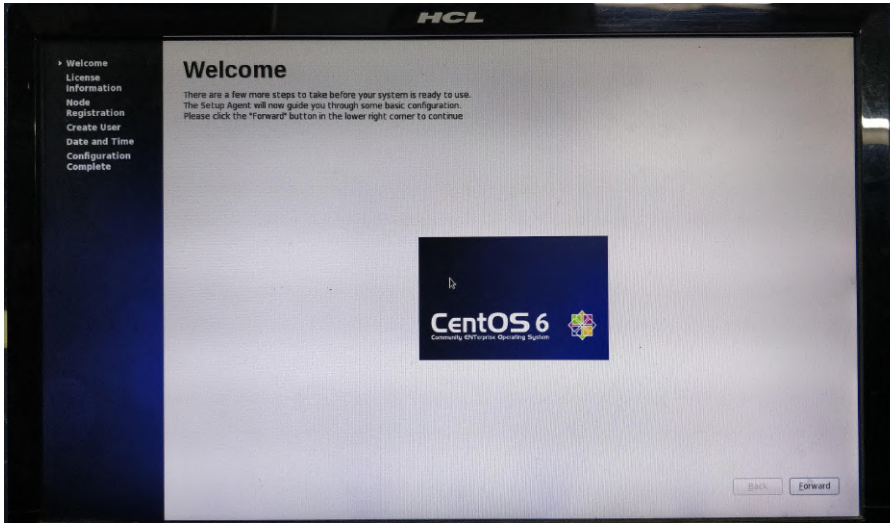

HCL
Installation Progress
Retrieving installation information for epel.
Back
Next

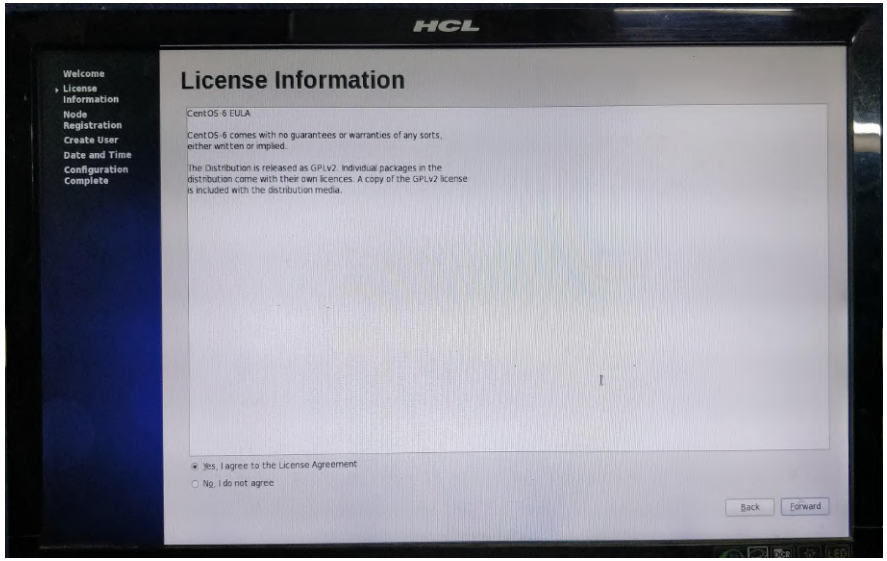

HCL
Dependency Check
Checking dependencies in packages selected for installation
Back
Next

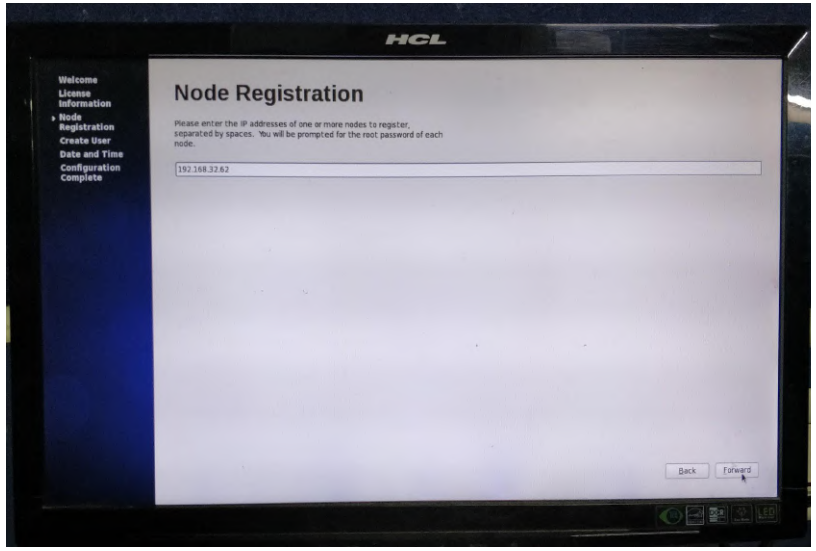

HCL
Ag
I
Installation Starting
Starting installation process

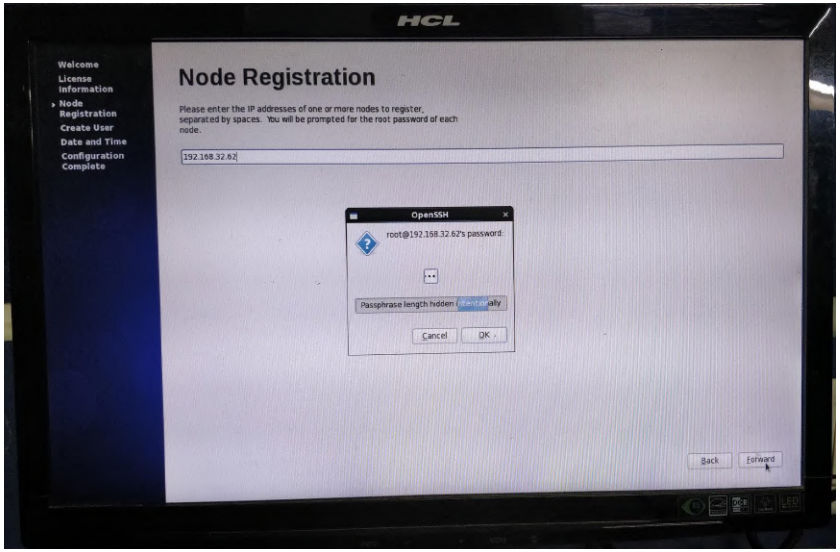

HCL
Ag
I
Packages completed: 805 of 805
Installing euca2ools-release-3.0-1.el6.noarch (3 KB)
euca2ools-release package
Creating EMI
Creating an initial CentOS 6 EMI.
Installing tzdata (9 of 189)
Back
Next

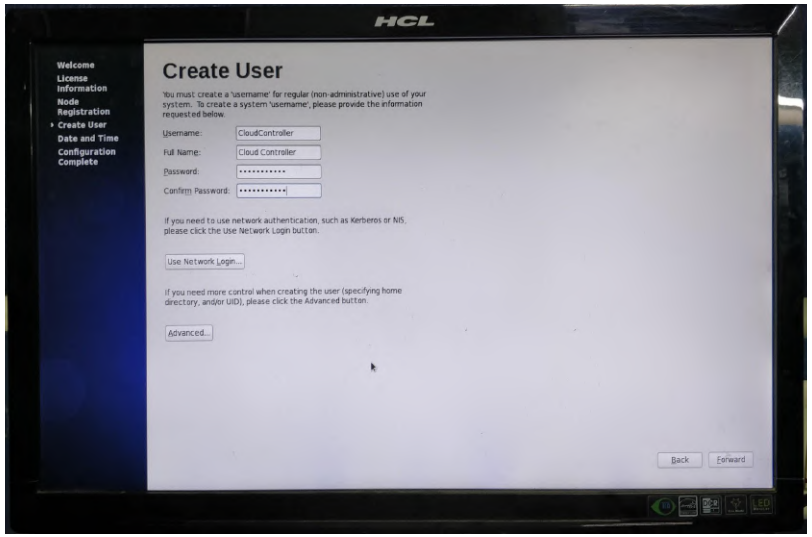

HCL
Congratulations, your Eucalyptus installation is complete.
Please reboot to use the installed system. Note that updates may be available to ensure the proper functioning of your system and installation of these updates is recommended after the reboot.
Back
Reboot

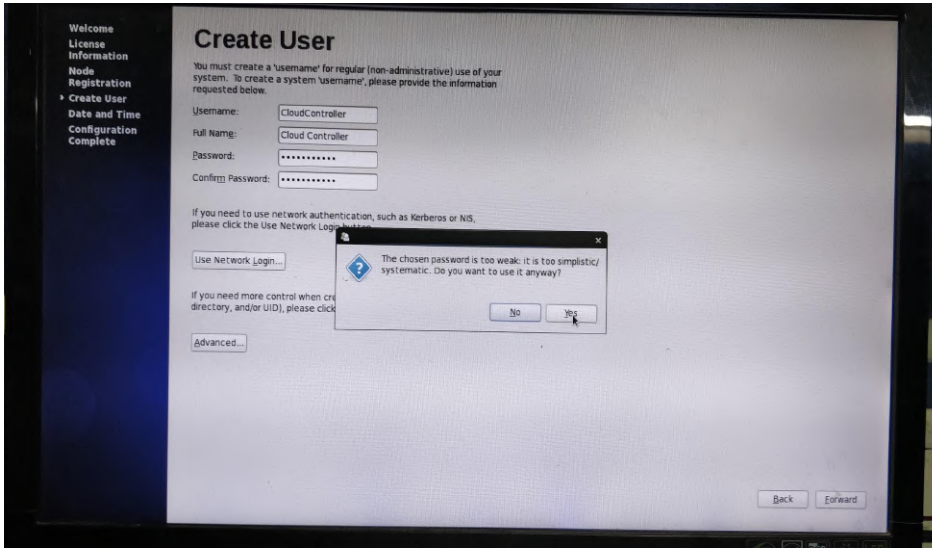

HCL
Welcome
License Information
Node Registration
Create User
Date and Time
Configuration Complete
Welcome
There are a few more steps to take before your system is ready to use.
The Setup Agent will now guide you through some basic configuration.
Please click the "Forward" button in the lower right corner to continue
CentOS 6
Community ENTerprise Operating System
Back
Forward

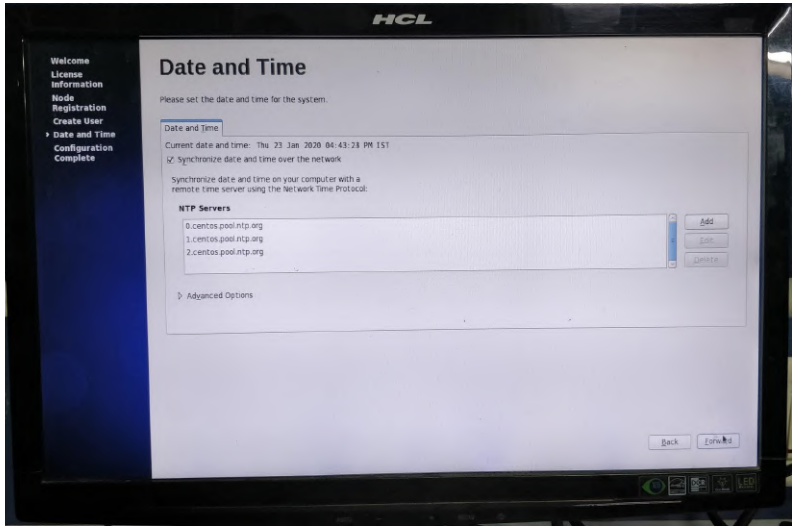

HCL
Welcome
License Information
Node Registration
Create User
Date and Time
Configuration Complete
License Information
CentOS-6 EULA
CentOS-6 comes with no guarantees or warranties of any sorts, either written or implied.
The Distribution is released as GPLv2. Individual packages in the distribution come with their own licences. A copy of the GPLv2 license is included with the distribution media.
Yes, I agree to the License Agreement
No, I do not agree
Back
Forward

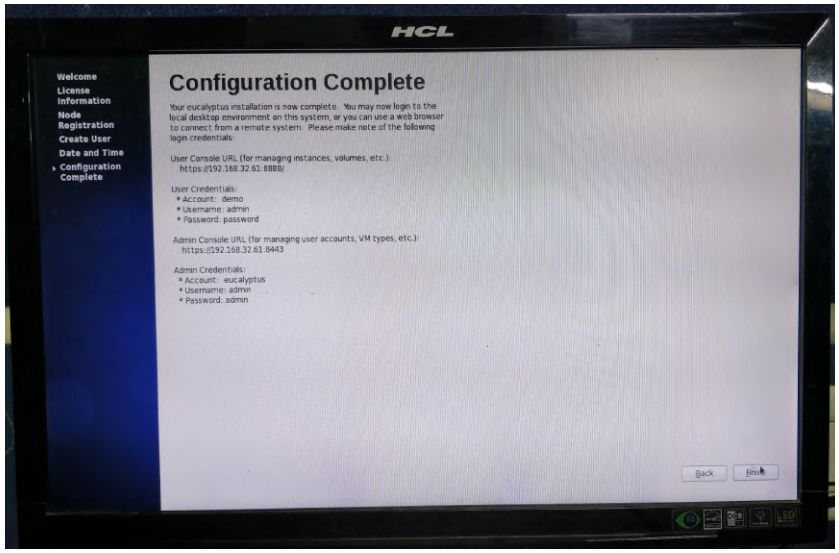

HCL
Welcome
License Information
Node Registration
Create User
Date and Time
Configuration Complete
Node Registration
Please enter the IP addresses of one or more nodes to register, separated by spaces. You will be prompted for the root password of each node.
192.168.32.62
Back
Forward

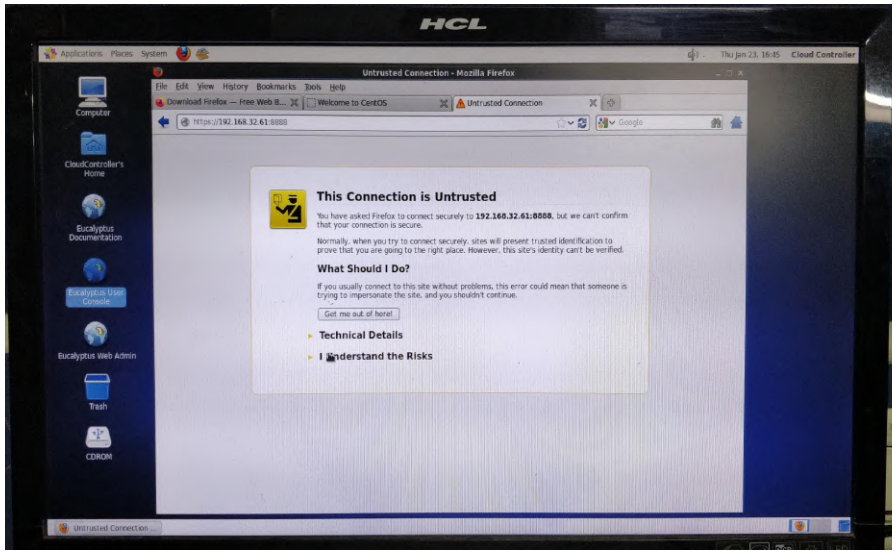

HCL
Welcome
License Information
Node Registration
Create User
Date and Time
Configuration Complete
Node Registration
Please enter the IP addresses of one or more nodes to register, separated by spaces. You will be prompted for the root password of each node.
192.168.32.62
OpenSSH
root@192.168.32.62's password:
Passphrase length hidden (Caps Lock is on)
Cancel
OK
Back
Forward

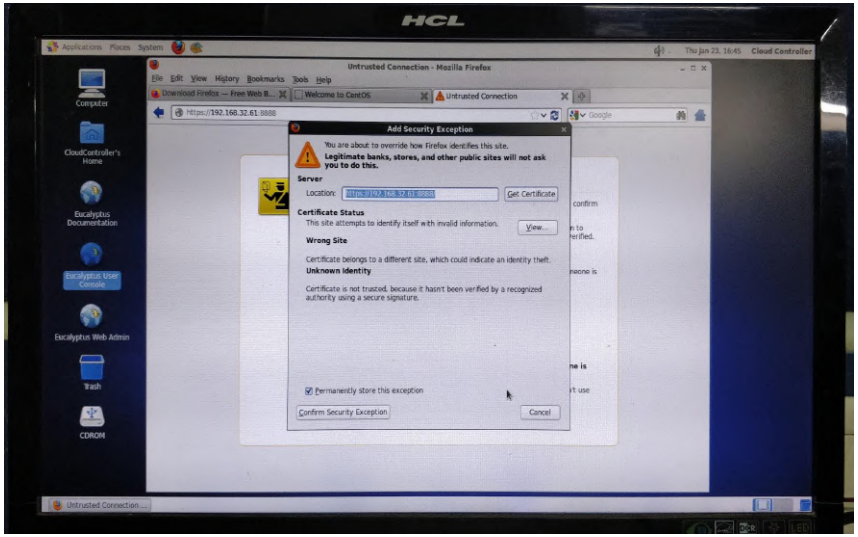

HCL
Welcome
License Information
Node Registration
Create User
Date and Time
Configuration Complete
Create User
You must create a 'username' for regular (non-administrative) use of your system. To create a system 'username', please provide the information requested below.
Username: CloudController
Full Name: Cloud Controller
Password:
Confirm Password:
If you need to use network authentication, such as Kerberos or NIS, please click the Use Network Login button.
Use Network Login...
If you need more control when creating the user (specifying home directory, and/or UID), please click the Advanced button.
Advanced...
Back
Forward

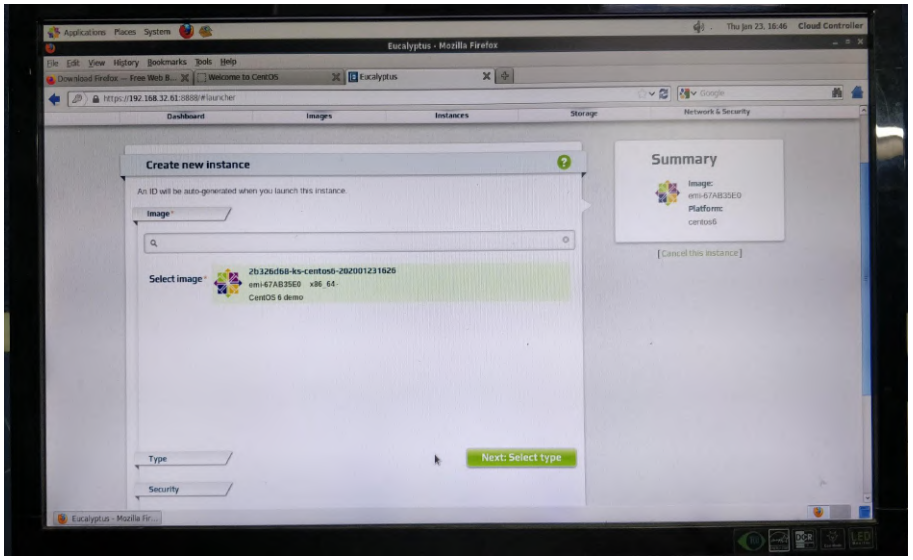

Welcome
License Information
Node Registration
Create User
Date and Time
Configuration Complete
Create User
You must create a 'username' for regular (non-administrative) use of your system. To create a system 'username', please provide the information requested below.
Username: CloudController
Full Name: Cloud Controller
Password:
Confirm Password:
If you need to use network authentication, such as Kerberos or NIS, please click the Use Network Login button.
Use Network Login...
The chosen password is too weak: it is too simplistic/systematic. Do you want to use it anyway?
No
Yes
If you need more control when cre
directory, and/or UID), please click
Advanced...
Back
Forward

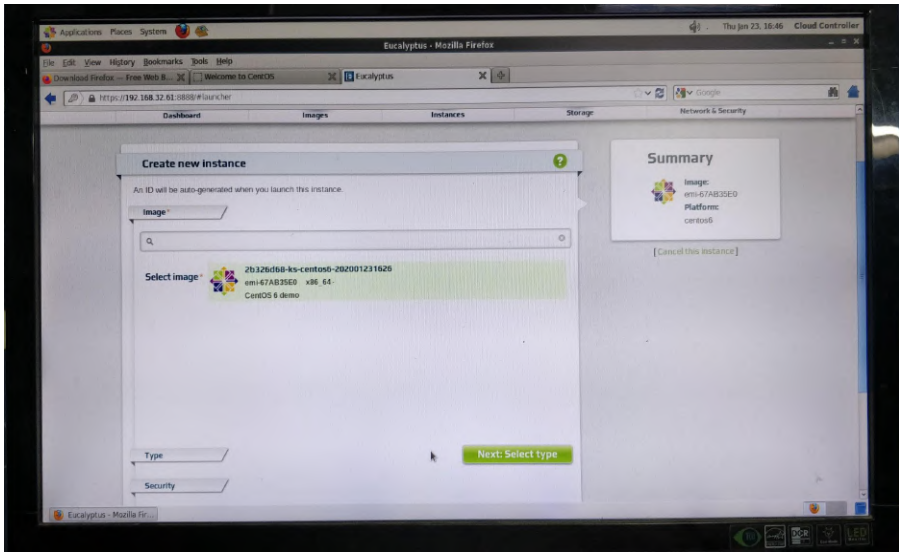

HCL
Welcome
License Information
Node Registration
Create User
Date and Time
Configuration Complete
Date and Time
Please set the date and time for the system.
Date and Time
Current date and time: Thu 23 Jan 2020 04:43:23 PM IST
Synchronize date and time over the network
Synchronize date and time on your computer with a remote time server using the Network Time Protocol:
NTP Servers
0.centos.pool.ntp.org
1.centos.pool.ntp.org
2.centos.pool.ntp.org
Add
Edit
Delete
Advanced Options
Back
Forward


HCL
Welcome
License Information
Node Registration
Create User
Date and Time
Configuration Complete
Configuration Complete
Your eucalyptus installation is now complete. You may now login to the local desktop environment on this system, or you can use a web browser to connect from a remote system. Please make note of the following login credentials:
User Console URL (for managing instances, volumes, etc.):
https://192.168.32.61:8888/
User Credentials:
* Account: demo
* Username: admin
* Password: password
Admin Console URL (for managing user accounts, VM types, etc.):
https://192.168.32.61:8443
Admin Credentials:
* Account: eucalyptus
* Username: admin
* Password: admin
Back
Finish


HCL
Applications Places System
Thu Jan 23, 16:45
Cloud Controller
Untrusted Connection - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Download Firefox — Free Web B...
Welcome to CentOS
Untrusted Connection
https://192.168.32.61:8888
Google
Computer
CloudController's Home
Eucalyptus Documentation
Eucalyptus User Console
Eucalyptus Web Admin
Trash
CDROM
This Connection is Untrusted
You have asked Firefox to connect securely to 192.168.32.61:8888, but we can't confirm that your connection is secure.
Normally, when you try to connect securely, sites will present trusted identification to prove that you are going to the right place. However, this site's identity can't be verified.
What Should I Do?
If you usually connect to this site without problems, this error could mean that someone is trying to impersonate the site, and you shouldn't continue.
Get me out of here!
Technical Details
I Understand the Risks
Untrusted Connection ...


HCL
Applications Places System
Thu Jan 23, 16:45
Cloud Controller
Untrusted Connection - Mozilla Firefox
File Edit View History Bookmarks Tools Help
Download Firefox — Free Web B...
Welcome to CentOS
Untrusted Connection
https://192.168.32.61:8888
Google
Computer
CloudController's Home
Eucalyptus Documentation
Eucalyptus User Console
Eucalyptus Web Admin
Trash
CDROM
Add Security Exception
You are about to override how Firefox identifies this site.
Legitimate banks, stores, and other public sites will not ask you to do this.
Server
Location:
Get Certificate
Certificate Status
This site attempts to identify itself with invalid information.
View...
Wrong Site
Certificate belongs to a different site, which could indicate an identity theft.
Unknown Identity
Certificate is not trusted, because it hasn't been verified by a recognized authority using a secure signature.
Permanently store this exception
Confirm Security Exception
Cancel
Untrusted Connection ...


Eucalyptus - Mozilla Firefox
Dashboard
Images
Instances
Storage
Network & Security
Create new instance
An ID will be auto-generated when you launch this instance.
Image
Select image
2b326d68-ks-centos6-202001231626
emi-67AB35E0 x86_64
CentOS 6 demo
Summary
Image:
emi-67AB35E0
Platform:
centos6
[Cancel this instance]
Type
Security
Next: Select type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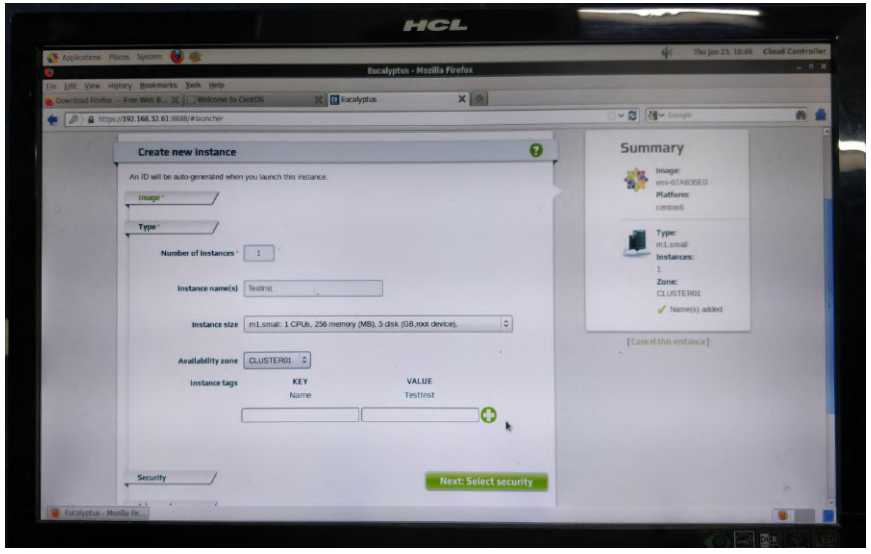
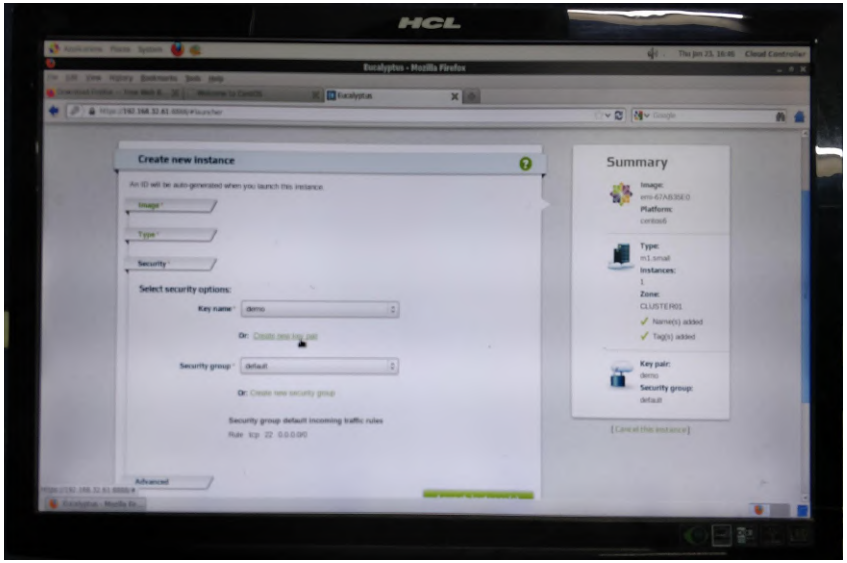
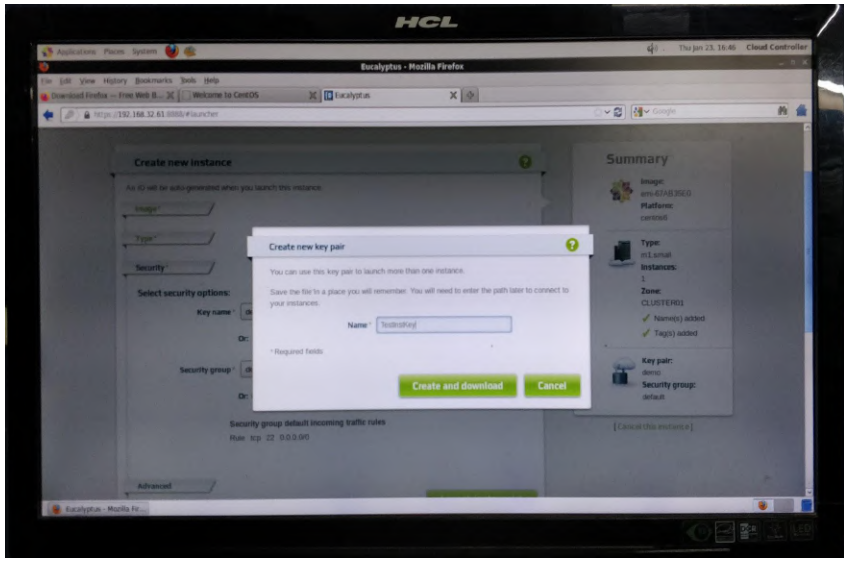
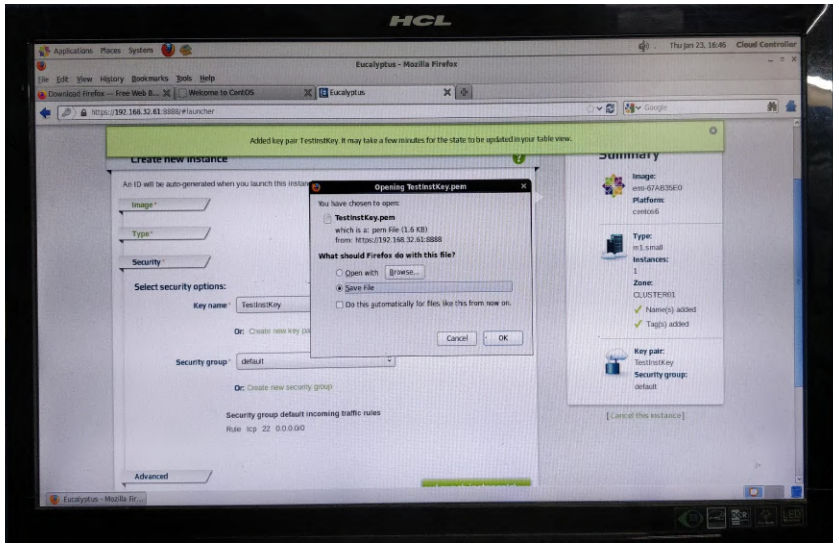
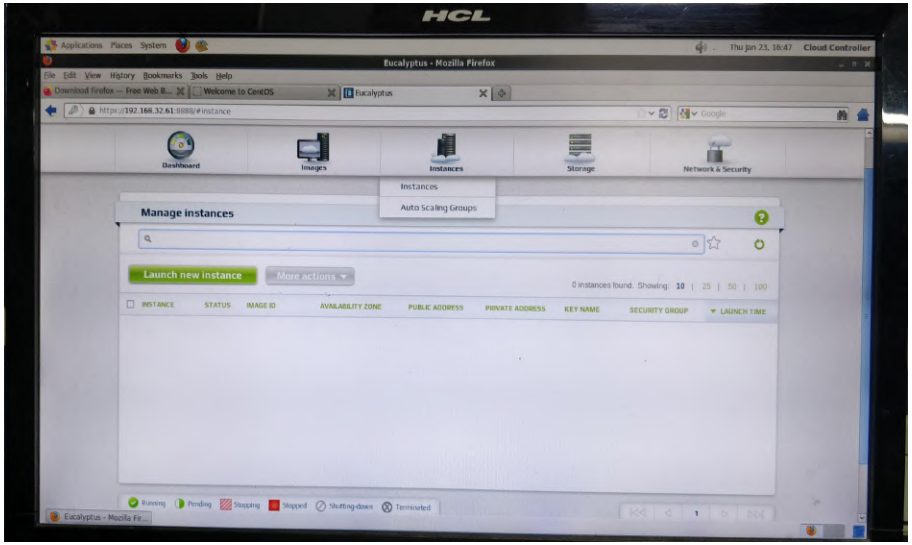
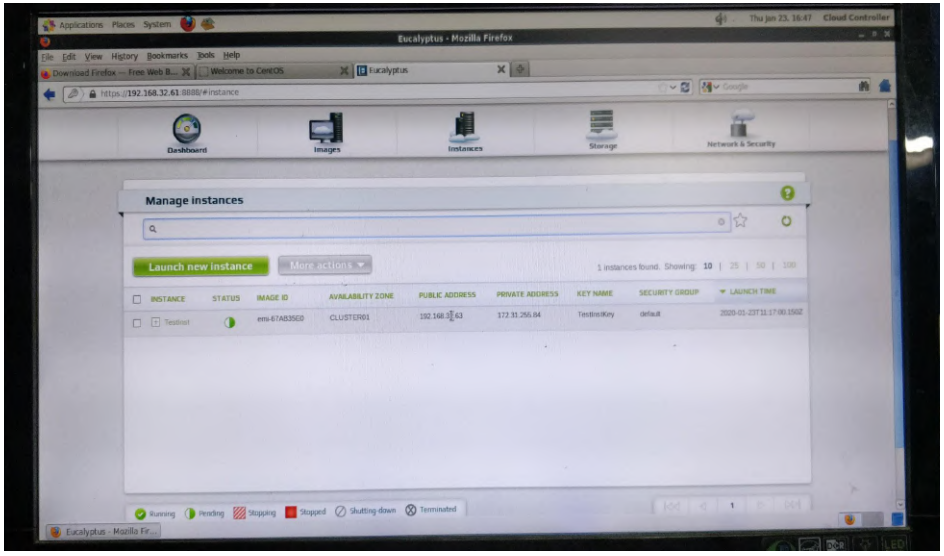

HCL
Eucalyptus - Mozilla Firefox
Create new instance
An ID will be auto-generated when you launch this instance.
Image
Type
Number of instances
1
Instance name(s)
Testinst
Instance size
m1.small: 1 CPUs, 256 memory (MB), 5 disk (GB,root device),
Availability zone
CLUSTER01
Instance tags
KEY
Name
VALUE
Testinst
Security
Next: Select security
Summary
Image:
emi-67AB35E0
Platform:
centos6
Type:
m1.small
Instances:
1
Zone:
CLUSTER01
Name(s) added
[Cancel this instance]

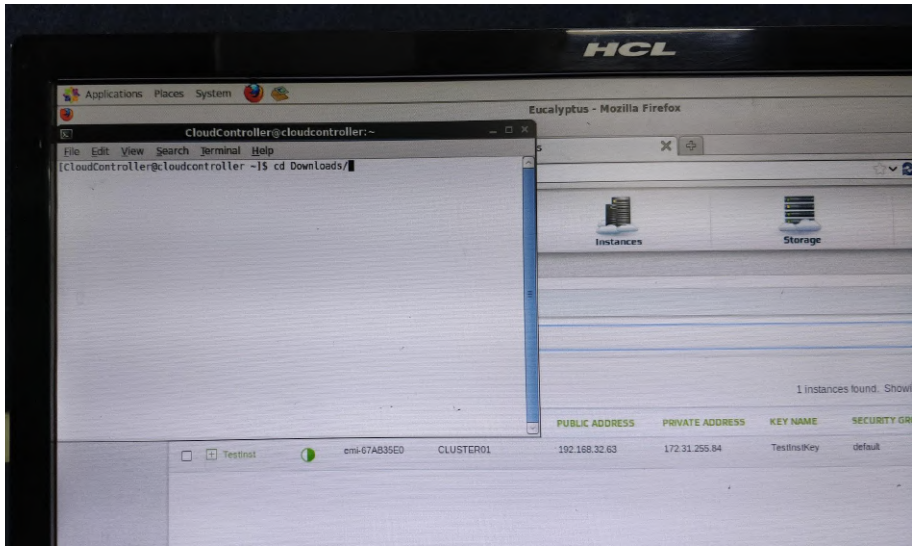

HCL
Eucalyptus - Mozilla Firefox
Create new instance
An ID will be auto-generated when you launch this instance.
Image
Type
Security
Select security options:
Key name
demo
Security group
default
Security group default incoming traffic rules
Advanced
Summary
Image:
emi-67AB35E0
Platform:
centos6
Type:
m1.small
Instances:
1
Zone:
CLUSTER01
Name(s) added
Tag(s) added
Key pair:
demo
Security group:
default
[Cancel this instance]

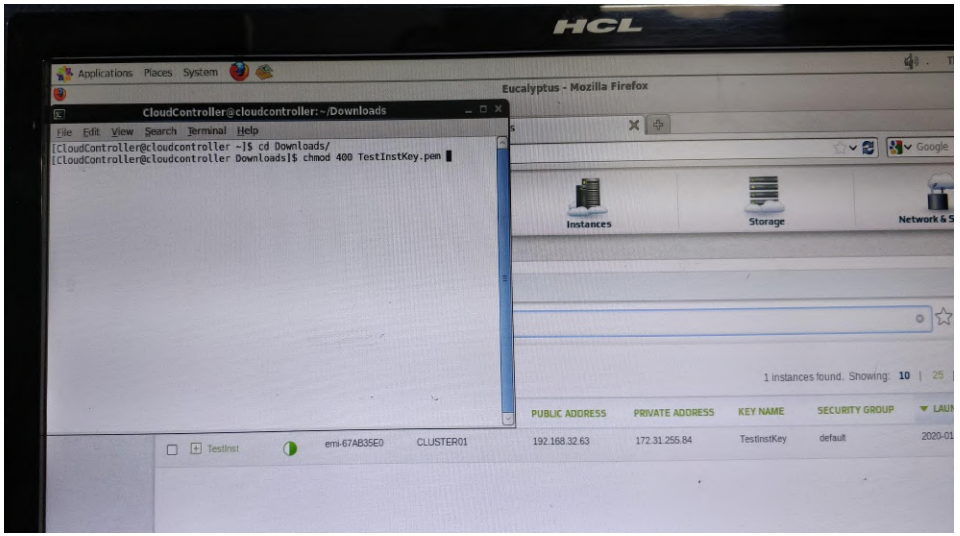

HCL
Eucalyptus - Mozilla Firefox
Create new instance
Summary
Create new key pair
You can use this key pair to launch more than one instance.
Save the file to a place you will remember. You will need to enter the path later to connect to your instances.
Name: TestInstKey
* Required fields
Create and download
Cancel
Select security options:
Security group default incoming traffic rules
Advanced

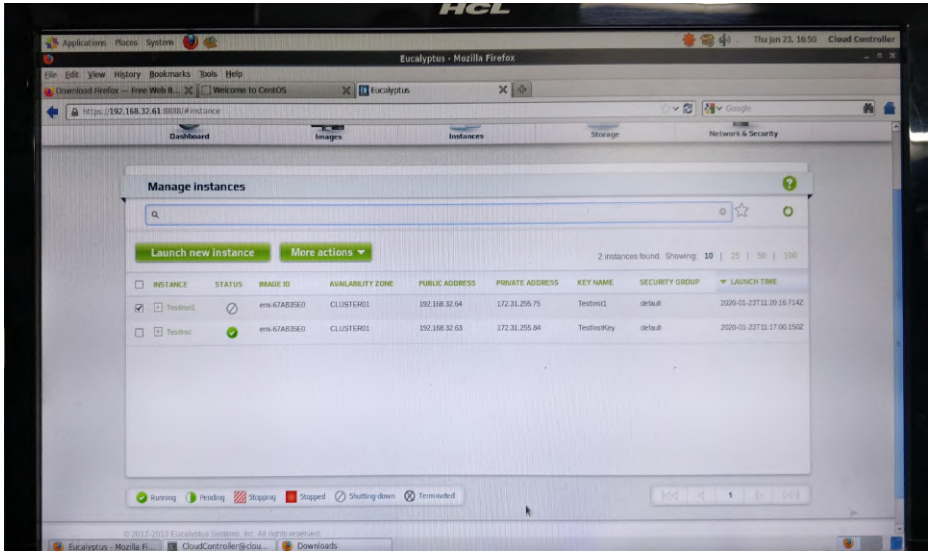

HCL
Eucalyptus - Mozilla Firefox
Added key pair TestInstKey. It may take a few minutes for the state to be updated in your table view.
Create new instance
Summary
Opening TestInstKey.pem
You have chosen to open:
TestInstKey.pem
which is a: pem File (1.6 KB)
from: https://192.168.32.61:8888
What should Firefox do with this file?
Open with
Browse...
Save File
Do this automatically for files like this from now on.
Cancel
OK
Select security options:
Key name: TestInstKey
Security group: default
Security group default incoming traffic rules
Advanced


HCL
Eucalyptus - Mozilla Firefox
Dashboard
Images
Instances
Storage
Network & Security
Instances
Auto Scaling Groups
Manage instances
Launch new instance
More actions
0 instances found. Showing: 10 | 25 | 50 | 100
INSTANCE
STATUS
IMAGE ID
AVAILABILITY ZONE
PUBLIC ADDRESS
PRIVATE ADDRESS
KEY NAME
SECURITY GROUP
LAUNCH TIME
Running
Pending
Stopping
Stopped
Shutting-down
Terminated


Eucalyptus - Mozilla Firefox
Dashboard
Images
Instances
Storage
Network & Security
Manage instances
Launch new instance
More actions
1 instances found. Showing: 10 | 25 | 50 | 100
INSTANCE
STATUS
IMAGE ID
AVAILABILITY ZONE
PUBLIC ADDRESS
PRIVATE ADDRESS
KEY NAME
SECURITY GROUP
LAUNCH TIME
TestInst
ami-67AB35E0
CLUSTER01
TestInstKey
default
Running
Pending
Stopping
Stopped
Shutting-down
Terminated


HCL
Applications Places System
Eucalyptus - Mozilla Firefox
CloudController@cloudcontroller:~
File Edit View Search Terminal Help
[CloudController@cloudcontroller ~]$ cd Downloads/
Instances
Storage
1 instances found. Showi
PUBLIC ADDRESS
PRIVATE ADDRESS
KEY NAME
SECURITY GR
Testinst
emi-67AB35E0
CLUSTER01
192.168.32.63
172.31.255.84
TestInstKey
default


HCL
Applications Places System
Eucalyptus - Mozilla Firefox
CloudController@cloudcontroller:~/Downloads
File Edit View Search Terminal Help
[CloudController@cloudcontroller ~]$ cd Downloads/
[CloudController@cloudcontroller Downloads]$ chmod 400 TestInstKey.pem
Instances
Storage
1 instances found. Showing: 10 | 25
PUBLIC ADDRESS
PRIVATE ADDRESS
KEY NAME
SECURITY GROUP
Testinst
emi-67AB35E0
CLUSTER01
192.168.32.63
172.31.255.84
TestInstKey
default


HCL
Applications Places System
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Manage instances
Launch new instance
More actions
INSTANCE
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IMAGE ID
AVAILABILITY ZONE
PUBLIC ADDRESS
PRIVATE ADDRESS
KEY NAME
SECURITY GROUP
LAUNCH TIME
Running
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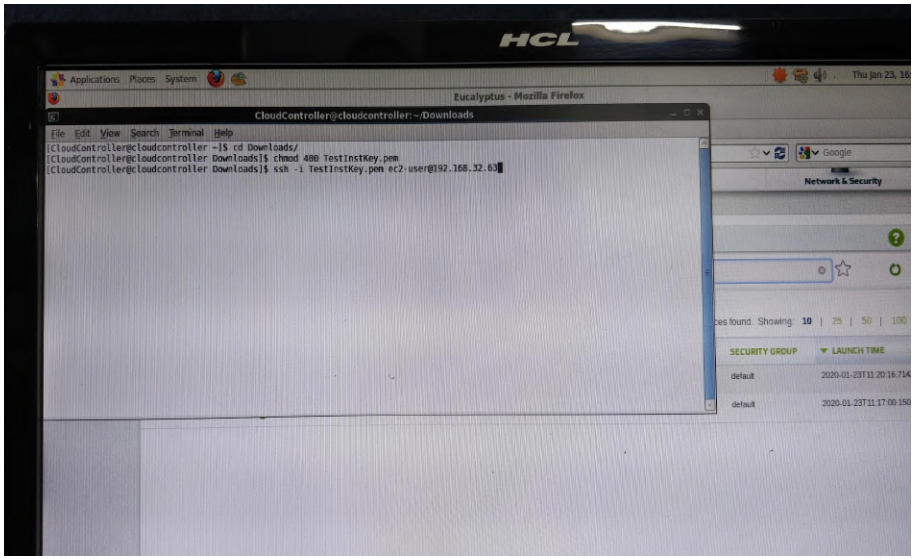
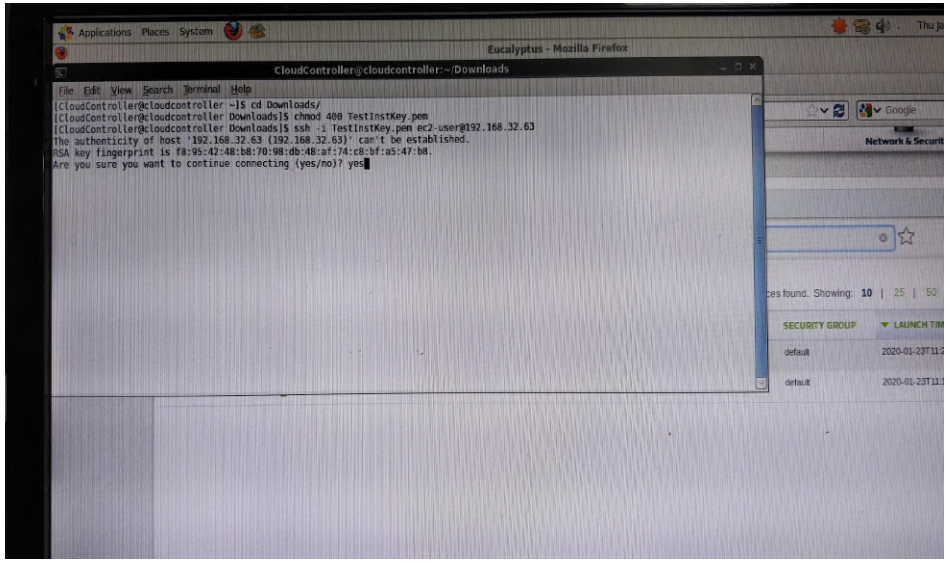
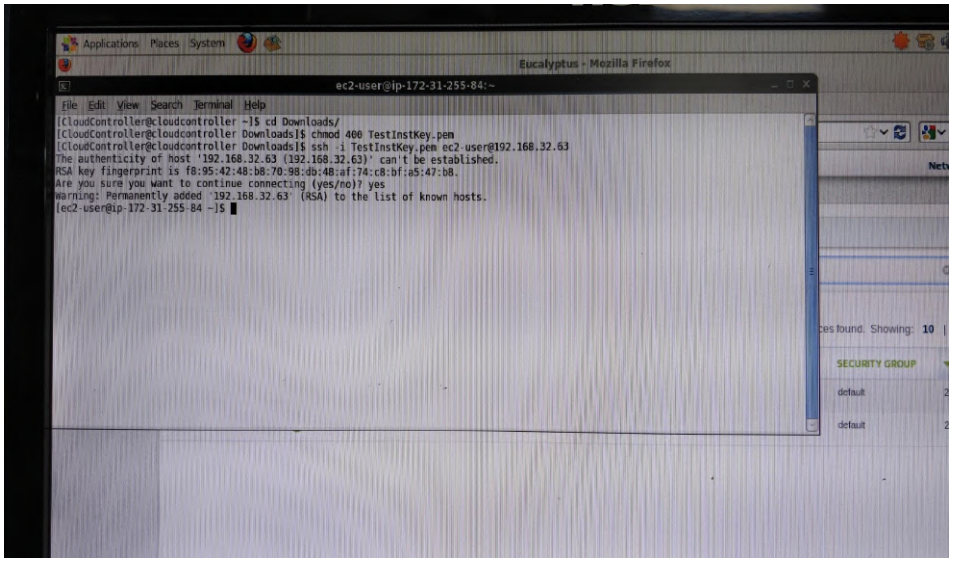
Shutting-down
Terminated


HCL
Applications Places System
Eucalyptus - Mozilla Firefox
CloudController@cloudcontroller:~/Downloads
File Edit View Search Terminal Help
[CloudController@cloudcontroller ~]$ cd Downloads/
[CloudController@cloudcontroller Downloads]$ chmod 400 TestInstKey.pem
[CloudController@cloudcontroller Downloads]$ ssh -i TestInstKey.pem ec2-user@192.168.32.63
Network & Security
SECURITY GROUP
LAUNCH TIME
default
default


Applications Places System
Eucalyptus - Mozilla Firefox
CloudController@cloudcontroller:~/Downloads
File Edit View Search Terminal Help
[CloudController@cloudcontroller ~]$ cd Downloads/
[CloudController@cloudcontroller Downloads]$ chmod 400 TestInstKey.pem
[CloudController@cloudcontroller Downloads]$ ssh -i TestInstKey.pem ec2-user@192.168.32.63
The authenticity of host '192.168.32.63 (192.168.32.63)' can't be established.
RSA key fingerprint is f8:95:42:48:b8:70:98:db:48:af:74:c8:bf:a5:47:b8.
Are you sure you want to continue connecting (yes/no)? yes
SECURITY GROUP
default
default


Applications Places System
Eucalyptus - Mozilla Firefox
ec2-user@ip-172-31-255-84:~
File Edit View Search Terminal Help
[CloudController@cloudcontroller ~]$ cd Downloads/
[CloudController@cloudcontroller Downloads]$ chmod 400 TestInstKey.pem
[CloudController@cloudcontroller Downloads]$ ssh -i TestInstKey.pem ec2-user@192.168.32.63
The authenticity of host '192.168.32.63 (192.168.32.63)' can't be established.
RSA key fingerprint is f8:95:42:48:b8:70:98:db:48:af:74:c8:bf:a5:47:b8.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.32.63' (RSA) to the list of known hosts.
[ec2-user@ip-172-31-255-84 ~]$
SECURITY GROUP
default
default