



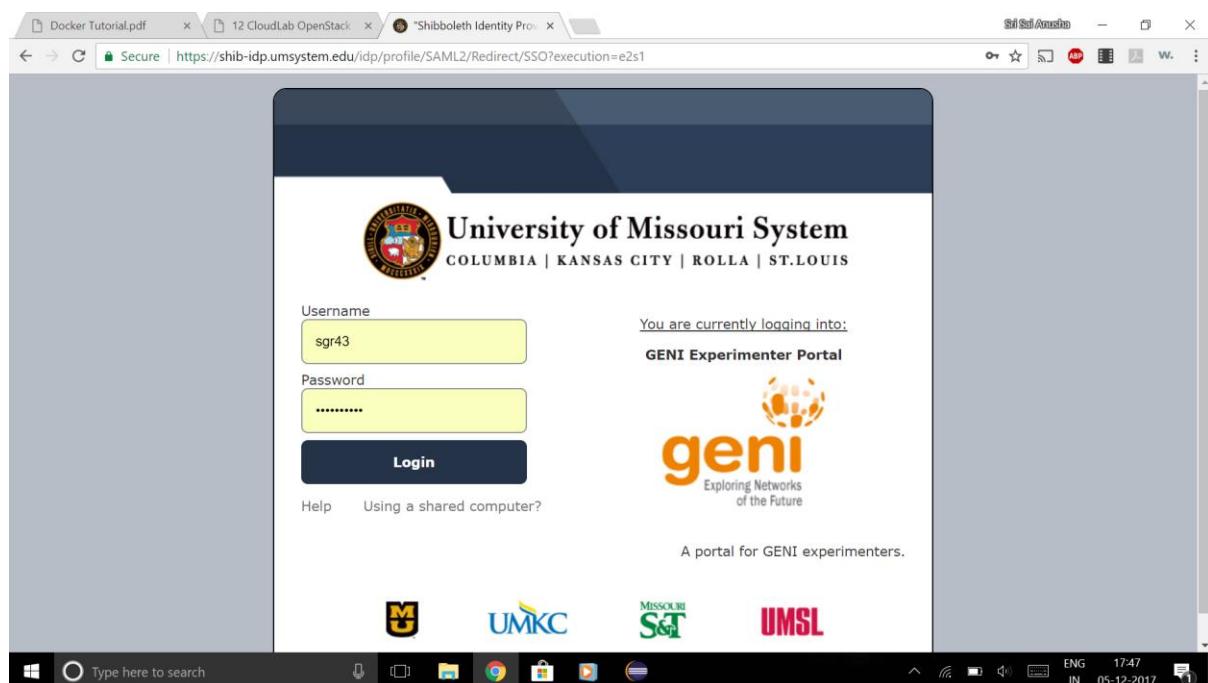
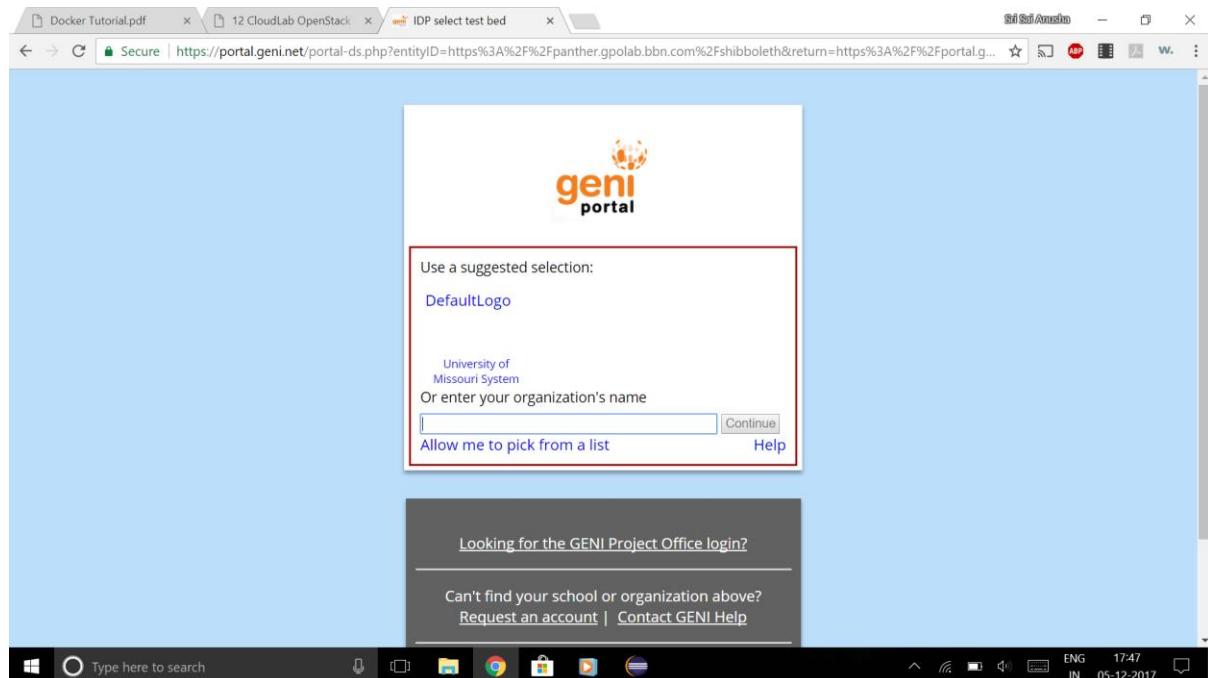
**CLOUD COMPUTING
CLOUDLAB OPENSTACK ASSIGNMENT**

**Submitted By:
Sri Sai Anusha Gandu (16230560)**

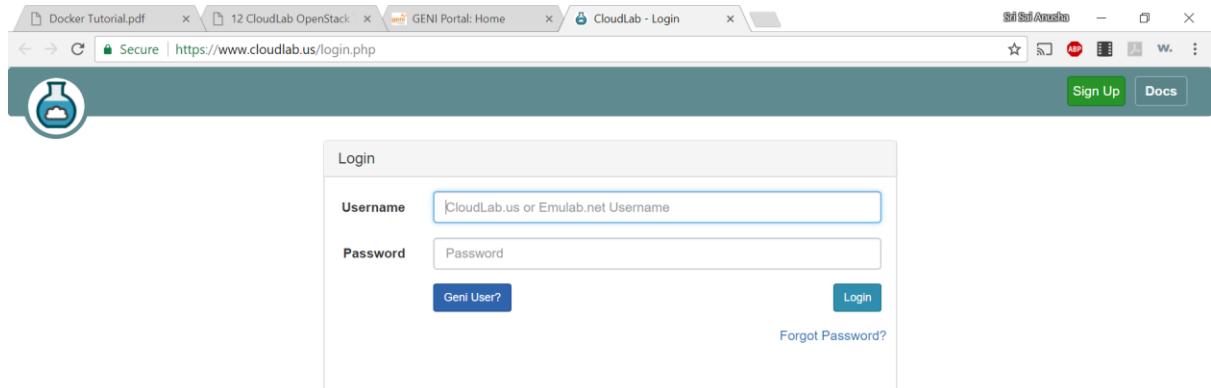
CloudLab is a flexible and scientific infrastructure used for research on the future of cloud computing. CloudLab is built from the software technologies that make up Emulab and parts of GENI, so it provides a familiar, consistent interface for researchers.

Logging in into CloudLab

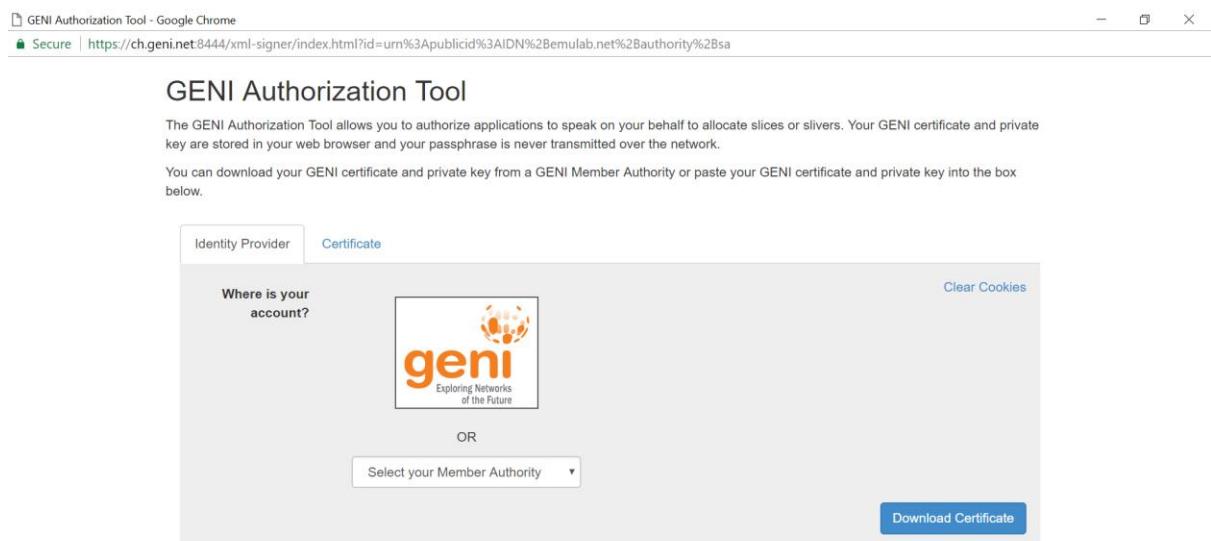
We can either create a new account related to CloudLab or can obtain the access if we have an existing GENI account. In this experiment, we make the use of existing GENI account.



As CloudLab is a partner cloud to GENI, we can log in into CloudLab with the same credentials.



As we already have a GENI account, we select the option of GENI User.



Authorizing the account provides us access to the CloudLab Dashboard.

GENI Authorization Tool

Once you authorize, the tool will be able to act on your behalf when talking to GENI infrastructure. Only authorize if you trust the tool.

Tool ID

urn:publicid:IDN+emulab.net+authority+sa

Show Advanced

Remember This Decision

Authorize

Creating a New Experiment

To create a new experiment in CloudLab, we need to follow the steps specified below.

- Select a Profile
- Parameterize
- Finalize

Select a Profile

Docker Tutorial.pdf

Secure | https://www.cloudlab.us/instantiate.php#

Experiments Storage Docs sgr430

New standard image now available: UBUNTU16-64-STD (Ubuntu 16.04 64-bit); also UBUNTU16-64-ARM (aarch64) [View Details](#)

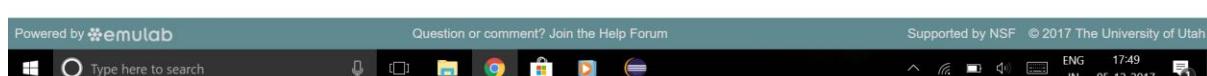
1. Select a Profile 2. Parameterize 3. Finalize

Selected Profile: OpenStack

This profile provides a highly-configurable OpenStack instance with a controller and one or more compute nodes (potentially at multiple Cloudlab sites) (and optionally a network manager node, in a split configuration). This profile runs x86 or ARM64 nodes. It sets up OpenStack Mitaka, Liberty, Kilo, or Juno (on Ubuntu 16.04, 15.10, 15.04, or 14.10) according to your choice, and configures all OpenStack services, pulls in some VM disk images, and creates basic networks accessible via floating IPs. You'll be able to create instances and access them over the Internet in just a few minutes. When you click the Instantiate button, you'll be presented with a list of parameters that you can change to control what your OpenStack instance will look like; **carefully** read the parameter documentation on that page (or in the Instructions) to understand the various features available to you.

Copy Profile Show Profile Change Profile

Previous Next



Parameterize

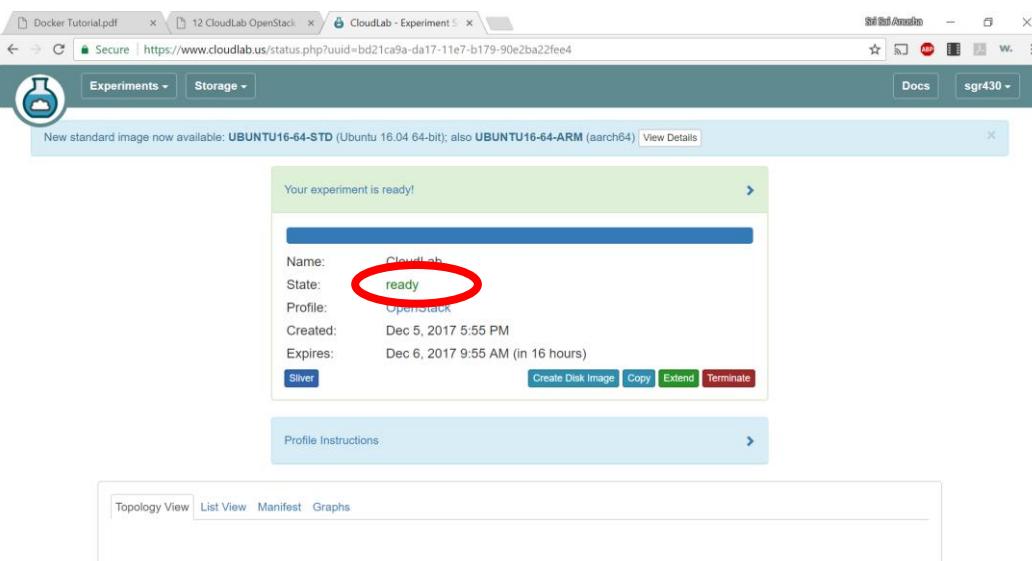
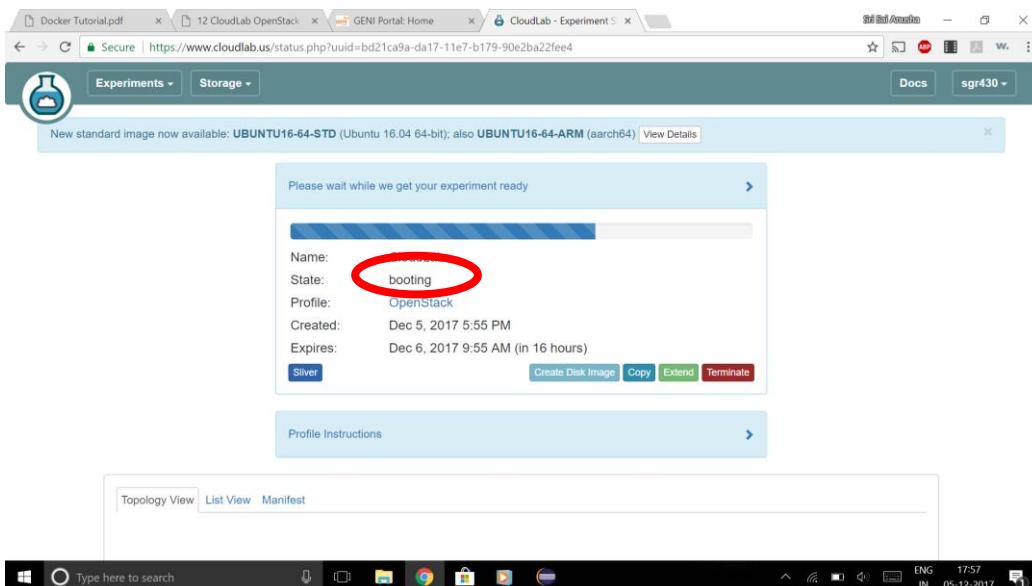
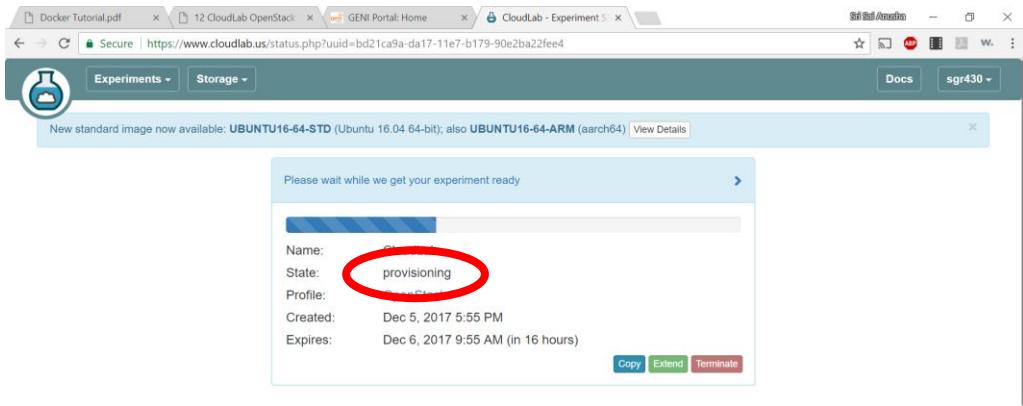
The screenshot shows the 'Parameterize' step of the CloudLab instantiation process. The top navigation bar includes tabs for 'Docker Tutorial.pdf', 'CloudLab OpenStack', 'GENI Portal: Home', and 'CloudLab - Instantiate a'. The user is identified as 'Sai Sri Anusha' and 'sgr430'. The main interface has three steps: '1. Select a Profile', '2. Parameterize' (which is active), and '3. Finalize'. A message at the top states: 'New standard image now available: UBUNTU16-64-STD (Ubuntu 16.04 64-bit); also UBUNTU16-64-ARM (aarch64) [View Details]'. The 'Parameterize' section contains fields for 'OpenStack Release' (Mitaka), 'Number of compute nodes (at Site 1)' (1), 'Hardware Type' (empty), 'Experiment Link Speed' (Any), 'ML2 Plugin' (OpenVSwitch), and 'Extra VM Image URLs' (empty). Below the form is a URL: <https://www.cloudlab.us/instantiate.php#stepsContainer-h-1>. The taskbar at the bottom shows various application icons and the system status.

Finalize

The screenshot shows the 'Finalize' step of the CloudLab instantiation process. The top navigation bar and user information are identical to the previous screen. The main interface has three steps: '1. Select a Profile', '2. Parameterize', and '3. Finalize' (which is active). A message at the top states: 'New standard image now available: UBUNTU16-64-STD (Ubuntu 16.04 64-bit); also UBUNTU16-64-ARM (aarch64) [View Details]'. The 'Finalize' section displays the selected profile ('Profile: OpenStack Version: 49'), the name ('CloudLab'), and the cluster ('Cloudlab Utah'). It also includes an 'Advanced Options' link and a 'Check Cluster Status' button. To the right is a network diagram showing a connection between a controller node ('ctl') and a compute node ('cp-1'). At the bottom are 'Previous' and 'Finish' buttons. The taskbar at the bottom shows various application icons and the system status.

Finalizing the experiment gives the output as shown below.

It goes through provisioning and booting phase to get the nodes ready for the experiment.



Viewing the Experiment

The experiment can be viewed in different ways.

- Topology View
- List View
- Manifest View
- Graphs

Topology View

The screenshot shows the CloudLab Experiment interface in a web browser. At the top, there are tabs for 'Topology View', 'List View', 'Manifest', and 'Graphs'. The 'Topology View' tab is selected. Below the tabs, there is a summary bar with the following information:

- Expires: Dec 6, 2017 9:55 AM (in 16 hours)
- Silver
- Create Disk Image
- Copy
- Extend
- Terminate

A large central area displays a network topology diagram. Two green rectangular nodes are shown: 'ctl' on the left and 'cp-1' on the right. They are connected by a single horizontal line. A tooltip above the connection line says 'Click on a node for more options. Click and drag to move things around.' At the bottom of the main area are three buttons: 'Reload Topo', 'Run Linktest', and 'Refresh Status'. The footer of the page includes links for 'Powered by emulab', 'Question or comment? Join the Help Forum', and 'Supported by NSF © 2017 The University of Utah'. It also shows a search bar and system status indicators like 'ENG 18:12 IN 05-12-2017'.

List View

The screenshot shows the CloudLab Experiment interface in a web browser, similar to the previous topology view. The 'List View' tab is selected at the top. A message 'Your experiment is ready!' is displayed in a green box. Below it, detailed experiment information is shown in a blue box:

Name:	CloudLab
State:	ready
Profile:	OpenStack
Created:	Dec 5, 2017 5:55 PM
Expires:	Dec 6, 2017 9:55 AM (in 16 hours)

Below this are buttons for 'Create Disk Image', 'Copy', 'Extend', and 'Terminate'. A 'Profile Instructions' link is also present. The main content area shows a table of nodes:

ID	Node	Type	SSH command (if you provided your own key)	Actions
ctl	ms1001	m510	ssh -p 22 sgr430@ms1001.utah.cloudlab.us	
cp-1	ms1029	m510	ssh -p 22 sgr430@ms1029.utah.cloudlab.us	

The footer of the page includes links for 'Powered by emulab', 'Question or comment? Join the Help Forum', and 'Supported by NSF © 2017 The University of Utah'. It also shows a search bar and system status indicators like 'ENG 18:22 IN 05-12-2017'.

Manifest View

The screenshot shows a web browser window titled "CloudLab - Experiment S". The URL is <https://www.cloudlab.us/status.php?uuid=bd21ca9a-da17-11e7-b179-90e2ba22fee4>. The page displays a manifest with the following details:

Created:	Dec 5, 2017 5:55 PM
Expires:	Dec 6, 2017 9:55 AM (in 16 hours)
Sliver:	Silver

Buttons for "Create Disk Image", "Copy", "Extend", and "Terminate" are present. Below this, a "Profile Instructions" section is shown. The main content area contains tabs for "Topology View", "List View", "Manifest" (selected), and "Graphs". The "Manifest" tab displays the following XML code:

```
<rspec xmlns="http://www.geni.net/resources/rspec/3" xmlns:emulab="http://www.protogeni.net/resources/rspec/ext/emulab/1" xmlns:tc="http://www.geni.net/resources/rspec/ext/tc/1" xmlns:jacks="http://www.protogeni.net/resources/rspec/ext/jacks/1" xmlns:emulab="http://www.protogeni.net/resources/rspec/ext/emulab/1">
<node xmlns:jacks="http://www.protogeni.net/resources/rspec/ext/jacks/1" xmlns:emulab="http://www.protogeni.net/resources/rspec/ext/emulab/1">
<sliver_type name="raw-pc">
<disk_image name="urn:publicid:IDN+utah.cloudlab.us+image+emulab-ops//UBUNTU16-64-OSCN"/>
</sliver_type>
<interface client_id="ctl:if0" component_id="urn:publicid:IDN+utah.cloudlab.us+interface+ms1001:eth1" sliver_id="urn:publicid:IDN+utah.cloudlab.us+interface+ms1001:eth1">
<ip address="10.11.10.1" netmask="255.255.0.0" type="ipv4"/>
</interface>
<services>
<login authentication="ssh-keys" hostname="ms1001.utah.cloudlab.us" port="22" username="sgr430"/>
<emulab:console server="boss.utah.cloudlab.us"/>
<execute shell="sh" command="sudo mkdir -p /root/setup && (if [ -d /local/repository ]; then sudo -H /local/repository/install url='http://www.emulab.net/downloads/openstack-setup-v33.tar.gz' install_path='/tmp'/); fi"/>
</services>
<emulab:root>
<private="false" public="false"/>
</emulab:root>
</node>
</rspec>
```

At the bottom of the page, there are links for "Powered by emulab", "Question or comment? Join the Help Forum", and "Supported by NSF © 2017 The University of Utah". The system status bar at the bottom shows "Type here to search", icons for file operations, and "ENG IN 18:23 05-12-2017".

Graphs

Shown below are the graphs for Load Average, Control Traffic and Experiment Traffic





Since the topology is ready for the experiment, we can create a shell or console for the node. We can also reboot or rebuild the system if necessary. Shown below is the screenshot of a running shell of the node.

```

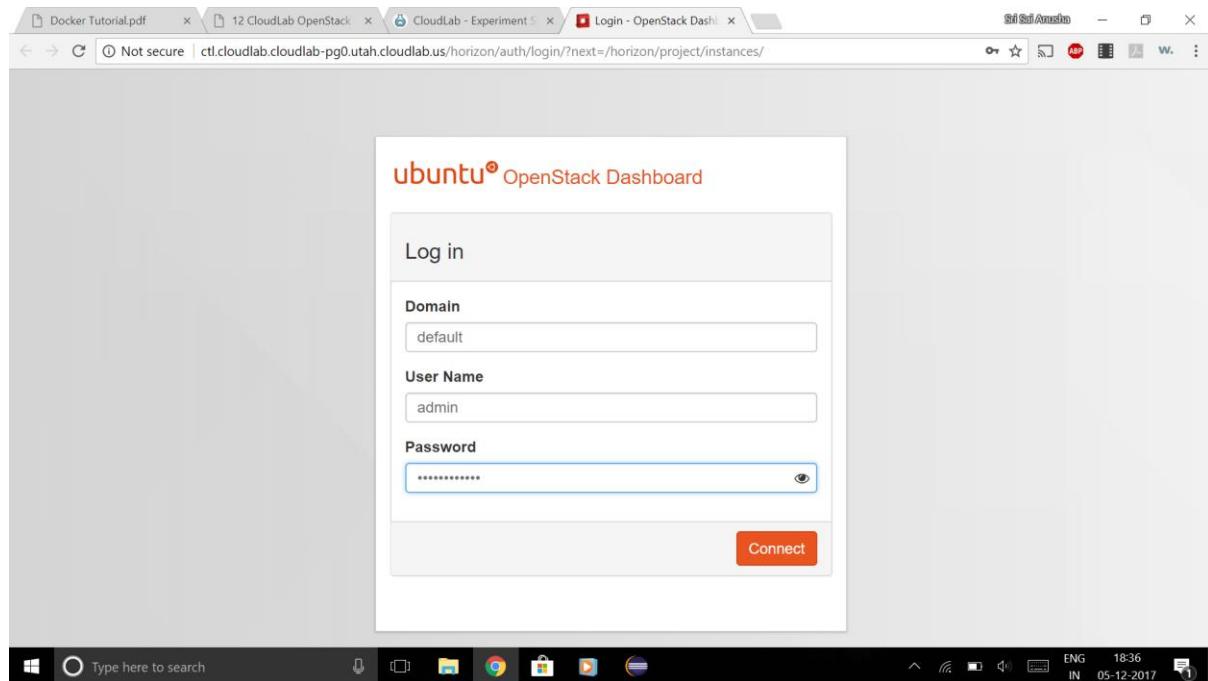
sgr430@cp-1:~$ ifconfig
br-ex      Link encap:Ethernet HWaddr 14:58:d0:58:ff:02
           inet addr:128.110.153.182 Bcast:128.110.155.255 Mask:255.255.252.0
             inet6 addr: fe80::1658:d0ff:fe58:ff02/64 Scope:Link
               UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
               RX packets:12790 errors:0 dropped:10 overruns:0 frame:0
               TX packets:2511 errors:0 dropped:0 overruns:0 carrier:0
               collisions:0 txqueuelen:1
               RX bytes:646426 (646.4 KB) TX bytes:365071 (365.0 KB)

br-flat-lan-1 Link encap:Ethernet HWaddr 14:58:d0:58:ff:03
           inet addr:10.11.10.2 Bcast:10.11.255.255 Mask:255.255.0.0
             inet6 addr: fe80::1658:d0ff:fe58:ff03/64 Scope:Link
               UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
               RX packets:2960 errors:0 dropped:0 overruns:0 frame:0
               TX packets:3684 errors:0 dropped:0 overruns:0 carrier:0
               collisions:0 txqueuelen:1
               RX bytes:1000031 (1.0 MB) TX bytes:1411229 (1.4 MB)

eno1       Link encap:Ethernet HWaddr 14:58:d0:58:ff:02
           inet6 addr: fe80::1658:d0ff:fe58:ff02/64 Scope:Link

```

There is a provision to use OpenStack from the CloudLab Dashboard under the Profile Instructions. The password that is used to log on to OpenStack changes frequently and can be obtained from the CloudLab Dashboard.



This leads us to the dashboard of OpenStack as shown below.

The screenshot shows the CloudLab OpenStack Instances page. On the left, there's a sidebar with various compute-related options like Overview, Instances, Volumes, Images, etc. The main area is titled 'Instances' and contains a table with columns: Instance Name, Image Name, IP Address, Size, Key Pair, Status, Availability Zone, Task, Power State, Time since created, and Actions. A message at the bottom says 'No items to display.' At the top right of the main area, there's a 'Launch Instance' button with a red circle around it. The browser address bar shows the URL: `ctl.cloudlab.cloudlab-pg0.utah.cloudlab.us/horizon/project/instances/`.

Here, we need to launch a new instance with the required details, source, flavour and network.

The screenshot shows the 'Launch Instance' dialog box. It has a 'Details' tab where users can provide initial hostname, availability zone, and instance count. The 'Source' field is set to 'CloudLab'. The 'Flavor' field is set to 'nova'. The 'Instance Name' field is set to 'CloudLab'. The 'Availability Zone' dropdown is set to 'nova'. The 'Count' input field is set to '1'. At the bottom of the dialog, there are 'Cancel', 'Next >', and a large blue 'Launch Instance' button. The background shows the same CloudLab OpenStack Instances page as the previous screenshot.

Docker Tutorial.pdf 12 CloudLab OpenStack CloudLab - Experiment Instances - OpenStack

ubuntu®

Project Compute

Instances

Source

Flavor Networks Network Ports Security Groups Key Pair Configuration Metadata

Select Boot Source Create New Volume

Allocated Name Updated Size Type Visibility

trust-server	12/6/17 1 2:09 AM	252.13 MB	QCOW2	Private
--------------	----------------------	-----------	-------	---------

Available Name Updated Size Type Visibility

manila-service-image	12/6/17 1 2:09 AM	372.69 MB	QCOW2	Private
----------------------	----------------------	-----------	-------	---------

Type here to search

18:38 ENG IN 05-12-2017

Docker Tutorial.pdf 12 CloudLab OpenStack CloudLab - Experiment Instances - OpenStack

ubuntu® default admin

Project Compute

Instances

Source

Flavor Networks Network Ports Security Groups Key Pair Configuration Metadata

Launch Instance

Flavors manage the sizing for the compute, memory and storage capacity of the instance.

Allocated Name VCPUS RAM Total Disk Root Disk Ephemeral Disk Public

m1.sma	1	2 GB	20 GB	20 GB	0 GB	Yes
--------	---	------	-------	-------	------	-----

Available Name VCPUS RAM Total Disk Root Disk Ephemeral Disk Public

manila-service-flavor	1	256 M B	0 GB	0 GB	0 GB	Yes
m1.tiny	1	512 M B	1 GB	1 GB	0 GB	Yes

Type here to search

18:39 ENG IN 05-12-2017

Docker Tutorial.pdf 12 CloudLab OpenStack CloudLab - Experiment Instances - OpenStack

ubuntu® default admin

Project Compute

Instances

Source

Flavor Networks Network Ports Security Groups Key Pair Configuration Metadata

Launch Instance

Networks provide the communication channels for instances in the cloud.

Allocated Network Subnets Associated Shared Admin State Status

tun0-net	tun0-subnet	Yes	Up	Active
----------	-------------	-----	----	--------

Available Network Subnets Associated Shared Admin State Status

ext-net	ext-subnet	Yes	Up	Active
flat-lan-1-net	flat-lan-1-subnet	Yes	Up	Active

Cancel Back Next Launch Instance

Type here to search

18:40 ENG IN 05-12-2017

This creates a new instance with the given details and we are supposed to create a floating IP address for the instance. This can be done as shown.

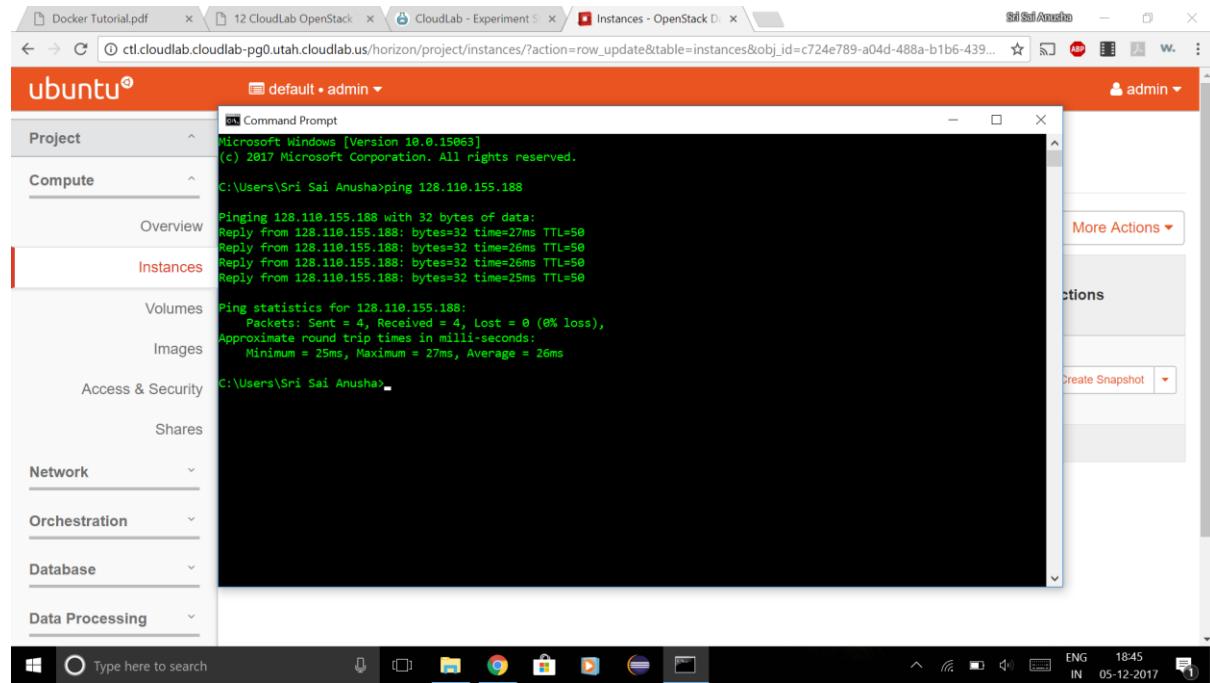
The screenshot shows the 'Instances' page in the CloudLab OpenStack interface. The sidebar on the left has 'Compute' selected under 'Instances'. The main table displays one instance:

Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
CloudLab	trustyserver	10.254.0.3	m1.small	CloudLab	Active	nova	None	Running	0 minutes	Create Snapshot

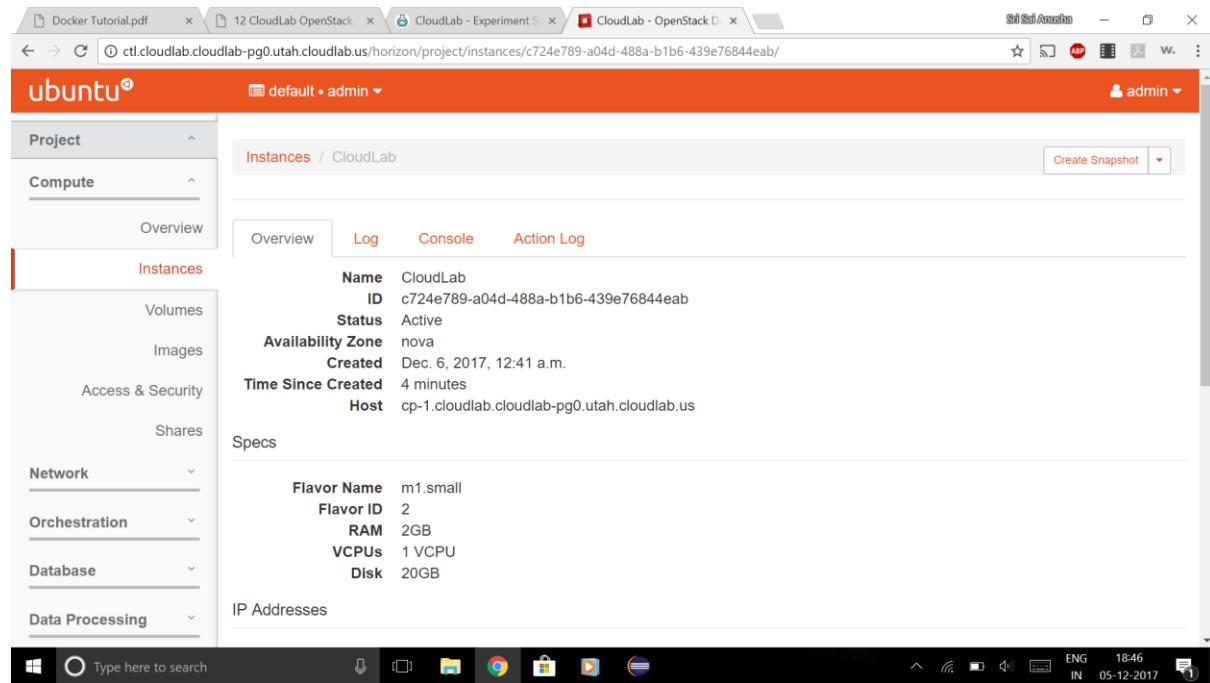
A modal dialog titled 'Manage Floating IP Associations' is open. It contains fields for 'IP Address' (set to 128.110.155.188) and 'Port to be associated' (set to CloudLab: 10.254.0.3). A note says: 'Select the IP address you wish to associate with the selected instance or port.' At the bottom are 'Cancel' and 'Associate' buttons.

The 'Instances' page now shows the floating IP address assigned to the instance. The row for 'CloudLab' now includes the IP address 128.110.155.188 in the 'IP Address' column, circled in red.

This floating IP address can be ping from any other system and the output will be as follows.



The details of the instance can be obtained from the OpenStack Dashboard.



From the control node in the topology, we can run many commands and obtain the results as shown below.

Docker Tutorial.pdf 12 CloudLab OpenStack CloudLab - Experiment CloudLab - OpenStack

[Secure | https://www.cloudlab.us/status.php?uid=bd21ca9a-da17-11e7-b179-90e2ba22fee](https://www.cloudlab.us/status.php?uid=bd21ca9a-da17-11e7-b179-90e2ba22fee)

Profile Instructions >

Topology View List View Manifest Graphs ctrl X

```

root 406 1 0 16:59 ? 00:00:00 /sbin/lvmetad -f
root 407 2 0 16:59 ? 00:00:06 [kworker/1:2]
root 419 1 0 16:59 ? 00:00:00 /lib/systemd/systemd-udevd
root 530 2 0 16:59 ? 00:00:00 [edac-poller]
root 613 2 0 16:59 ? 00:00:00 [kvm-irqfd-clean]
root 636 2 0 16:59 ? 00:00:00 [kipm1]
root 638 2 0 16:59 ? 00:00:00 [kworker/15:2]
root 737 2 0 16:59 ? 00:00:01 [kworker/2:2]
root 772 2 0 16:59 ? 00:00:06 [kworker/13:2]
root 799 2 0 16:59 ? 00:00:07 [kworker/9:2]
root 800 1 0 16:59 ? 00:00:00 /usr/lib/accountsservice/accounts-daemon
daemon 803 1 0 16:59 ? 00:00:00 /usr/sbin/atd -f
root 823 1 0 16:59 ? 00:00:00 /usr/sbin/cron -f
message+ 826 1 0 16:59 ? 00:00:05 /usr/bin/dhus-daemon --system --address=systemd: --nofork --
root 832 1 0 16:59 ? 00:00:01 /lib/systemd/systemd-logind
root 1109 1 0 16:59 ? 00:00:00 /usr/sbin/sshd -D
root 1153 1 0 16:59 ? 00:00:00 /sbin/lscsicd
root 1154 1 0 16:59 ? 00:00:00 /sbin/lscsicd
root 1210 2 0 16:59 ? 00:00:20 [kworker/0:3]
root 1287 1 0 16:59 ? 00:00:00 /usr/sbin/irqbalance --pid=/var/run/irqbalance.pid
root 1288 1 0 16:59 ? 00:00:00 /usr/bin/orel -w /usr/local/etc/emuwatchdog start

```

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Docker Tutorial.pdf 12 CloudLab OpenStack CloudLab - Experiment CloudLab - OpenStack

[Secure | https://www.cloudlab.us/status.php?uid=bd21ca9a-da17-11e7-b179-90e2ba22fee](https://www.cloudlab.us/status.php?uid=bd21ca9a-da17-11e7-b179-90e2ba22fee)

Profile Instructions >

Topology View List View Manifest Graphs ctrl X

```

neutron 19003 1 0 17:09 ? 00:00:00 /usr/bin/python /usr/bin/neutron-ns-metadata-proxy --pid_file=
neutron 19960 1 0 17:09 ? 00:00:00 /usr/bin/python /usr/bin/neutron-ns-metadata-proxy --pid_file=
nobody 20281 1 0 17:09 ? 00:00:00 dnsmesg -no-hosts --no-resolv --strict-order --except-inter-
root 20776 1 0 17:10 ? 00:00:04 python /root/setup/openstack-slothd.py
root 21587 2 0 17:14 ? 00:00:15 [kworker/1:1]
root 24882 2 0 17:30 ? 00:00:00 [kworker/u32:2]
root 27182 2 0 17:41 ? 00:00:00 [kworker/u32:3]
nova 28438 7789 0 17:46 ? 00:00:00 /usr/bin/python /usr/bin/nova-novncproxy --config-file=/etc/
nova 28439 7789 0 17:46 ? 00:00:00 /usr/bin/python /usr/bin/nova-novncproxy --config-file=/etc/
nova 28440 7789 0 17:46 ? 00:00:00 /usr/bin/python /usr/bin/nova-novncproxy --config-file=/etc/
nova 28441 7789 0 17:46 ? 00:00:00 /usr/bin/python /usr/bin/nova-novncproxy --config-file=/etc/
nova 28442 7789 0 17:46 ? 00:00:00 /usr/bin/python /usr/bin/nova-novncproxy --config-file=/etc/
nova 28443 7789 0 17:46 ? 00:00:00 /usr/bin/python /usr/bin/nova-novncproxy --config-file=/etc/
nova 28444 7789 2 17:46 ? 00:00:02 /usr/bin/python /usr/bin/nova-novncproxy --config-file=/etc/
root 28634 2 0 17:47 ? 00:00:00 [kworker/u32:1]
root 28823 1109 0 17:48 ? 00:00:00 sshd: sgr430 [priv]
sgr430 28825 28823 0 17:48 ? 00:00:00 sshd: sgr430@pts/0
sgr430 28826 28825 0 17:48 pts/0 00:00:00 -bash
sgr430 28878 28826 0 17:48 pts/0 00:00:00 ps -ef
sgr430@ctrl:~$ 

```

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Docker Tutorial.pdf 12 CloudLab OpenStack CloudLab - Experiment CloudLab - OpenStack

[Secure | https://www.cloudlab.us/status.php?uid=bd21ca9a-da17-11e7-b179-90e2ba22fee](https://www.cloudlab.us/status.php?uid=bd21ca9a-da17-11e7-b179-90e2ba22fee)

Profile Instructions >

Topology View List View Manifest Graphs ctrl X

```

TX packets:11484 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1
RX bytes:2852658 (2.8 MB) TX bytes:266856259 (266.8 MB)

eno1 Link encap:Ethernet HWaddr ec:b1:d7:85:7a:a2
inet6 addr: fe80::eb1:d7ff:fe85:7aa2/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:495441 errors:0 dropped:0 overruns:0 frame:0
TX packets:171915 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:712941623 (712.9 MB) TX bytes:12778742 (12.7 MB)

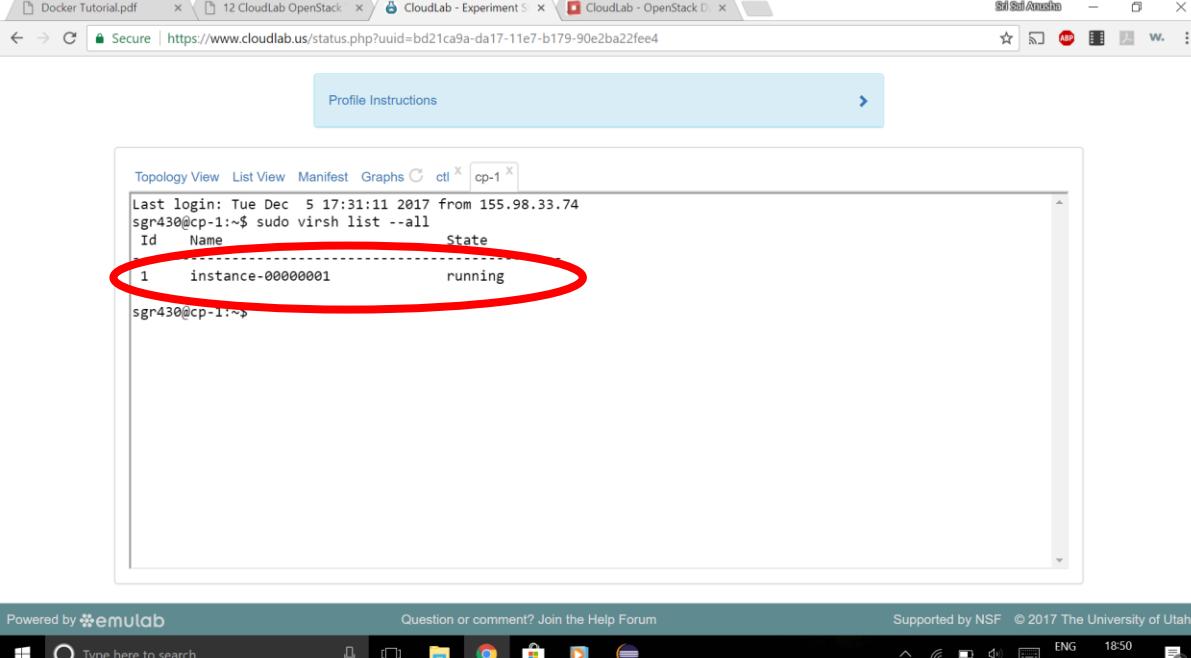
eno1d1 Link encap:Ethernet HWaddr ec:b1:d7:85:7a:a3
inet6 addr: fe80::eb1:d7ff:fe85:7aa3/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:11329 errors:0 dropped:0 overruns:0 frame:0
TX packets:189865 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:3096954 (3.0 MB) TX bytes:278629725 (278.6 MB)

lora_evc link encap:Ethernet HWaddr ff:7e:7d:33:6c:1a

```

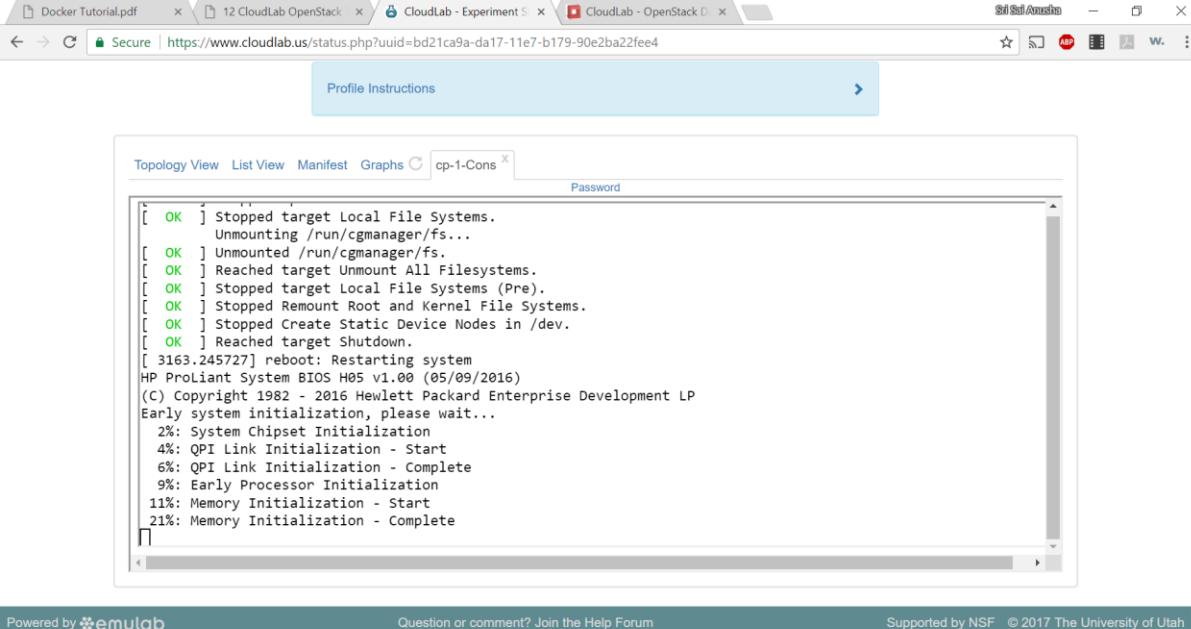
Powered by Emulab Question or comment? Join the Help Forum Supported by NSF © 2017 The University of Utah ENG 18:49 IN 05-12-2017

When a command “`sudo virsh list --all`” is run on the other node in the topology, it displays all the instances that are present in the experiment.



```
Last login: Tue Dec  5 17:31:11 2017 from 155.98.33.74
sgr430@cp-1:~$ sudo virsh list --all
 Id  Name      State
 1  instance-00000001  running
sgr430@cp-1:~$
```

The node when reboot is done shows the following in the console window of the node.



```
[ OK ] Stopped target Local File Systems.
[ OK ] Unmounting /run/cgmanager/fs...
[ OK ] Unmounted /run/cgmanager/fs.
[ OK ] Reached target Unmount All Filesystems.
[ OK ] Stopped target Local File Systems (Pre).
[ OK ] Stopped Remount Root and Kernel File Systems.
[ OK ] Stopped Create Static Device Nodes in /dev.
[ OK ] Reached target Shutdown.
[ 3163.24527] reboot: Restarting system
HP Proliant System BIOS H05 v1.00 (05/09/2016)
(C) Copyright 1982 - 2016 Hewlett Packard Enterprise Development LP
Early system initialization, please wait...
 2%: System Chipset Initialization
 4%: QPI Link Initialization - Start
 6%: QPI Link Initialization - Complete
 9%: Early Processor Initialization
11%: Memory Initialization - Start
21%: Memory Initialization - Complete
```

At the same time, when the Hypervisor tab is opened in the OpenStack Dashboard, due to the rebooting of the system, the state of the system goes down.

All Hypervisors

Hypervisor Summary

Host	Zone	Status	State	Updated At	Actions
cp-1.cloudlab.cloudlab-pg0.utah.cloudlab.us	nova	Enabled	Down	1 minute	<button>Evacuate Host</button>

Once the system is done with rebooting function, the state instantly transitions to up.

Profile Instructions

Topology View List View Manifest Graphs cp-1-Cons

System Memory: 64 GB
1 Processor(s) detected, 8 total cores enabled, Hyperthreading is enabled
Proc 1: Intel(R) Xeon(R) CPU D-1548 @ 2.00GHz

HPE Power Profile Mode: Balanced Power and Performance
Power Regulator Mode: Dynamic Power Savings
Advanced Memory Protection Mode: Advanced ECC Support
Boot Mode: UEFI

HPE SmartMemory authenticated in all populated DIMM slots.

For access via BIOS Serial Console:
Press 'ESC+9' for System Utilities
Press 'ESC+1' for One-Time Boot Menu
Press 'ESC+8' for Network Boot

Starting drivers. Please wait, this may take a few moments....

All Hypervisors

Hypervisor Summary

Host	Zone	Status	State	Updated At	Actions
cp-1.cloudlab.cloudlab-pg0.utah.cloudlab.us	nova	Enabled	Up	minutes	<button>Disable Service</button>

When we are done with the experiment, it is a good practice to always terminate it.

The screenshot shows a web browser window with multiple tabs. The active tab is titled "CloudLab - Experiment Status". It displays a topology view with two nodes: "ctl" and "cp-1". A connection line links them. Below the topology, there is a message: "Are you sure you want to terminate this experiment? Click on the button below if you are really sure." A blue "Terminate" button is centered in a modal dialog. At the bottom of the main content area, there are buttons for "Reload Topo", "Run Linktest", and "Refresh Status". The status bar at the bottom indicates "Powered by emulab" and "Supported by NSF © 2017 The University of Utah".

The screenshot shows a web browser window with multiple tabs. The active tab is titled "CloudLab - User Dashboard". The interface includes a navigation bar with "Experiments" and "Storage" buttons, and a search bar. A message at the top says "New standard image now available: UBUNTU16-64-STD (Ubuntu 16.04 64-bit); also UBUNTU16-64-ARM (aarch64) [View Details]". Below this, a message shows "Current Usage: 2.00 Node Hours, Prev Week: 2, Prev Month: 2 (30 day rank: 336 of 351 users)". The main content is a table of experiments:

Name	Profile	Project	Status	Cluster	PCs	PHours[1]	VMs	Created	Expires
CloudLab	OpenStack	CloudLab	terminating	Utah	2	2.00	0	Dec 5, 2017	Dec 6, 2017

[1] PHours: Number of nodes times number of hours in a week.

Below the table, there is a section titled "Experiments in my Projects" with another table:

Name	Profile	Creator	Project	Status	Cluster	PCs	PHours[1]	VMs	Created	Expires
ZMQ2	ZMQ2	nikhil0	CloudLab	ready	Emulab	0	0.00	3	Dec 1, 2017	Dec 16, 2017
CloudLab	OpenStack	sgr430	CloudLab	terminating	Utah	2	2.00	0	Dec 5, 2017	Dec 6, 2017
testallservrs2	testallservrs2	nikhil0	CloudLab	ready	APT	0	0.00	5	Oct 21, 2017	Dec 10, 2017
just-one	just-one	bsures0	CloudLab	ready	Wisc	1	148.09	0	Nov 29, 2017	Dec 7, 2017
clickComm	clickCommissioning	monica0	CloudLab	ready	AL2S,Clem,Emulab,USTitch	2	99.23	0	Dec 3, 2017	Dec 11, 2017
smgfb0-QV31302	OpenStack	smgfb0	CloudLab	ready	Utah	2	16.22	0	Dec 5, 2017	Dec 6, 2017
DNSMASQ4	DNSMASQ4	nikhil0	CloudLab	ready	Emulab	0	0.00	5	Nov 9, 2017	Dec 8, 2017
harmadik	OpenStack	simon0	CloudLab	ready	Clem	7	1356.83	0	Nov 27, 2017	Dec 9, 2017

The status bar at the bottom indicates "Powered by emulab" and "Supported by NSF © 2017 The University of Utah".