Practical No. 1

1. **Aim:** To study cloud architecture and cloud computing model.

2. **Objectives:** From this experiment, the student will be able to
   - provide an overview of concepts of Cloud Computing.
   - To encourage students to indulge into research in Cloud Computing.

3. **Outcomes:** The learner will be able to
   - understand and appreciate cloud architecture.
   - analyze the local and global impact of computing on individuals, organizations, and society.
   - recognize the need for, and an ability to engage in life-long learning.

4. **Hardware / Software Required:** Ubuntu operating system, Internet

5. **Theory:**

Cloud computing enables companies to consume compute resources as a utility -- just like electricity -- rather than having to build and maintain computing infrastructures in-house. Cloud computing promises several attractive benefits for businesses and end users.

Three of the main benefits of cloud computing include:

• Self-service provisioning: End users can spin up computing resources for almost any type of workload on-demand.

• Elasticity: Companies can scale up as computing needs increase and then scale down again as demands decreases.

Pay per use: Computing resources are measured at a granular level, allowing users to pay only for the resources and workloads they use.

Cloud computing services can be Private, Public or Hybrid.

Private cloud services are delivered from a business' data center to internal users. This model offers versatility and convenience, while preserving management, control and security. Internal customers may or may not be billed for services through IT chargeback.

In the Public cloud model, a third-party provider delivers the cloud service over the Internet. Public cloud services are sold on-demand, typically by the minute or the hour. Customers only pay for the CPU cycles, storage or bandwidth they consume. Leading public cloud providers include Amazon Web Services (AWS), Microsoft Azure, IBM/SoftLayer and Google Compute Engine.

Hybrid cloud is a combination of public cloud services and on-premises private cloud – with orchestration and automation between the two.

Companies can run mission-critical workloads or sensitive applications on the private cloud while using the public cloud for workloads that must scale on-demand. The goal of hybrid cloud is to create a unified, automated, scalable environment which takes advantage of all that a public cloud infrastructure can provide, while still maintaining control over mission-critical data.

Types of cloud computing:

IT people talk about three different kinds of cloud computing, where different services are being provided for you. Note that there's a certain amount of vagueness about how these things are defined and some overlap between them.

- Infrastructure as a Service (IaaS) means you're buying access to raw computing hardware over the Net, such as servers or storage. Since you buy what you need and pay-as-you-go, this is often referred to as utility computing. Ordinary web hosting is a simple example of IaaS: you pay a monthly subscription or a per-megabyte/gigabyte fee to have a hosting company serve up files for your website from their servers.
- Software as a Service (SaaS) means you use a complete application running on someone else's system. Web-based email and Google Documents are perhaps the best-known examples. Zoho is another well-known SaaS provider offering a variety of office applications online.
- Platform as a Service (PaaS) means you develop applications using Web-based tools so they run on systems software and hardware provided by another company. So, for example, you might develop your own ecommerce website but have the whole thing, including the shopping cart, checkout, and payment mechanism running on a merchant's server. Force.com (from salesforce.com) and the Google App Engine are examples of PaaS.
- Advantages and disadvantages of cloud computing

Advantages: The pros of cloud computing are obvious and compelling. If your business is selling books or repairing shoes, why get involved in the nitty gritty of buying and maintaining a complex computer system? If you run an insurance office, do you really want your sales agents wasting time running anti-virus software, upgrading word-processors, or worrying about hard-drive crashes? Do you really want them cluttering your expensive computers with their personal emails, illegally shared MP3 files, and naughty YouTube videos—when you could leave that responsibility to someone else? Cloud computing allows you to buy in only the services you want, when you want them, cutting the upfront capital costs of computers and peripherals. You avoid equipment going out of date and other familiar IT problems like ensuring system security and reliability. You can add extra services (or take them away) at a moment's notice as your business needs change. It's really quick and easy to add new applications or services to your business without waiting weeks or months for the new computer (and its software)to arrive.

Disadvantages: Instant convenience comes at a price. Instead of purchasing computers and software, cloud computing means you buy services, so one-off, upfront capital costs become ongoing operating costs instead. That might work outmuch more expensive in the long-term.

If you're using software as a service (for example, writing a report using an online word processor or sending emails through webmail), you need a reliable, high- speed, broadband Internet connection functioning the whole time you're working. That's something we take for granted in countries such as the United States, butit's much more of an issue in developing countries or rural areas where broadband is unavailable.

If you're buying in services, you can buy only what people are providing, so you may be restricted to off-the-peg solutions rather than ones that precisely meet your needs. Not only that, but you're completely at the mercy of your suppliers if they suddenly decide to stop supporting a product you've come to depend on. (Google, for example, upset many users when it announced in September 2012 that its cloud-based Google Docs would drop support for old but de facto standard Microsoft Office file formats such as .DOC, .XLS, and .PPT, giving a mere one week's notice of the change—although, after public pressure, it later extended the deadline by three months.) Critics charge that cloud-computing is a return to the bad-old days of mainframes and proprietary systems, where businesses are locked into unsuitable, long-term arrangements with big, inflexible companies. Instead of using "generative" systems (ones that can be added to and extended in exciting ways the developers never envisaged), you're effectively using "dumb terminals" whose uses are severely limited by the supplier. Good for convenience and security, perhaps, but what will you lose in flexibility? And is such a restrained approach good for the future of the Internet as a whole? (To see why it may not be, take a look at Jonathan Zittrain's eloquent book The Future of the Internet— And How to Stop It.)

1. Conclusion:

Cloud computing enables a convenient and on-demand network access to a wide range of resources. The different services and also the deployment models allow flexible service provider interaction with minimal human intervention. It saves costs but also can lead to risk issues and suspension of resources when in huge quantity.

Practical No. 2

1. **Aim:** Installation and Configuration of virtualization using KVM

2. **Objectives:** From this experiment, the student will be able to,
   - Understand the concepts of virtualization.
   - Understand KVM architecture and its configuration.

3. **Outcomes:** The learner will be able**,**
   - To analyze user models and develop user centric interfaces
   - To analyze the local and global impact of computing on individuals, organizations, and society.
   - To engage in life-long learning development and higher studies.
   - To understand, identify, analyze and design the problem, implement and validate the solution including both hardware and software.

4. **Hardware / Software Required:** Ubuntu operating system, open- source software KVM, Internet.

5. **Theory:**

Virtualization is software that separates physical infrastructures to create various dedicated resources. It is the fundamental technology that powers cloud computing.

The technology behind virtualization is known as a virtual machine monitor (VMM) or virtual manager, which separates compute environments from the actual physical infrastructure.

Virtualization makes servers, workstations, storage and other systems independent of the physical hardware layer. This is done by installing a Hypervisor on top of the hardware layer, where the systems are then installed.

There are three areas of IT where virtualization is making headroads, network virtualization, storage virtualization and server virtualization:

- Network virtualization is a method of combining the available resources in a network by splitting up the available bandwidth into channels, each of which is independent from the others, and each of which can be assigned (or reassigned) to a particular server or device in real time. The idea is that virtualization disguises the true complexity of the network by separating it into manageable parts, much like your partitioned hard drive makes it easier to manage your files.
- Storage virtualization is the pooling of physical storage from multiple network storage devices into what appears to be a single storage device that is managed from a central console. Storage virtualization is commonly used in storage area networks (SANs).

- Server virtualization is the masking of server resources (including the number and identity of individual physical servers, processors, and operating systems) from server users. The intention is to spare the user from having to understand and manage complicated details of server resources while increasing resource sharing and utilization and maintaining the capacity to expand later.

Virtualization can be viewed as part of an overall trend in enterprise IT that includes autonomic computing, a scenario in which the IT environment will be able to manage itself based on perceived activity, and utility computing, in which computer processing power is seen as a utility that clients can pay for only as needed. The usual goal of virtualization is to centralize administrative tasks while improving scalability and workloads.

6. Procedure:

Installation Steps:

1. #sudo grep -c "svm\|vmx" /proc/cpuinfo
2. #sudo apt-get install qemu-kvm libvirt-bin bridge-utils virt-manager
3. #sudoadduserrait

#sudoadduserraitlibvirtd

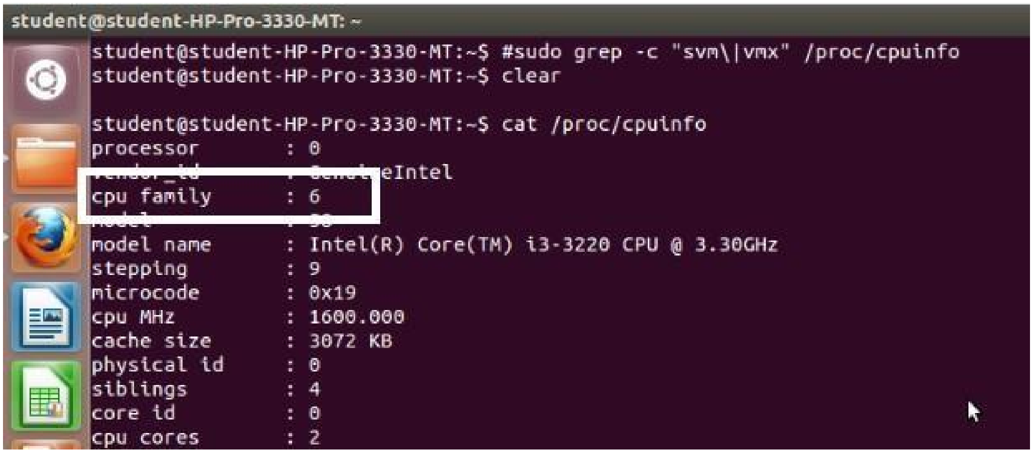
After running this command, log out and log back in as rait

4. Run following command after logging back in as rait and you should see an empty list of virtual machines. This indicates that everything is working correctly. #virsh -c qemu:///system list
5. Open Virtual Machine Manager application and Create Virtual Machine

#virt-manager

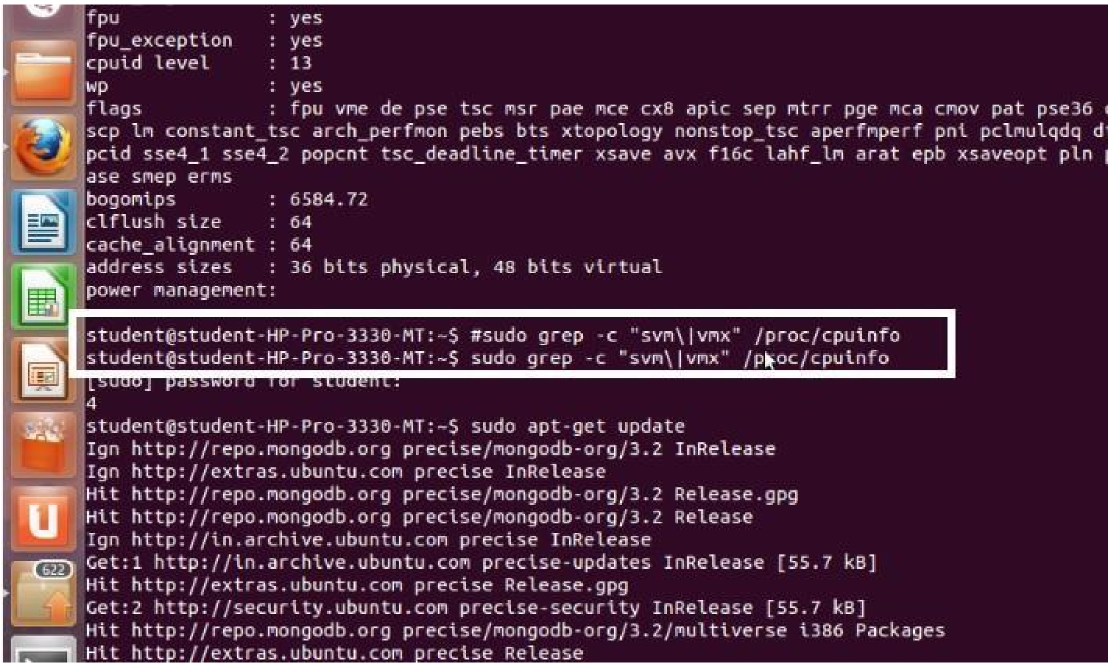
7. Result:

Step 1: #sudo grep -c "svm\|vmx" /proc/cpuinfo



```
student@student-HP-Pro-3330-MT: ~
student@student-HP-Pro-3330-MT:~$ #sudo grep -c "svm\|vmx" /proc/cpuinfo
student@student-HP-Pro-3330-MT:~$ clear

student@student-HP-Pro-3330-MT:~$ cat /proc/cpuinfo
processor       : 0
vendor_id       : GenuineIntel
cpu family      : 6
model           : 58
model name      : Intel(R) Core(TM) i3-3220 CPU @ 3.30GHz
stepping        : 9
microcode       : 0x19
cpu MHz         : 1600.000
cache size      : 3072 KB
physical id     : 0
siblings        : 4
core id         : 0
cpu cores       : 2
```

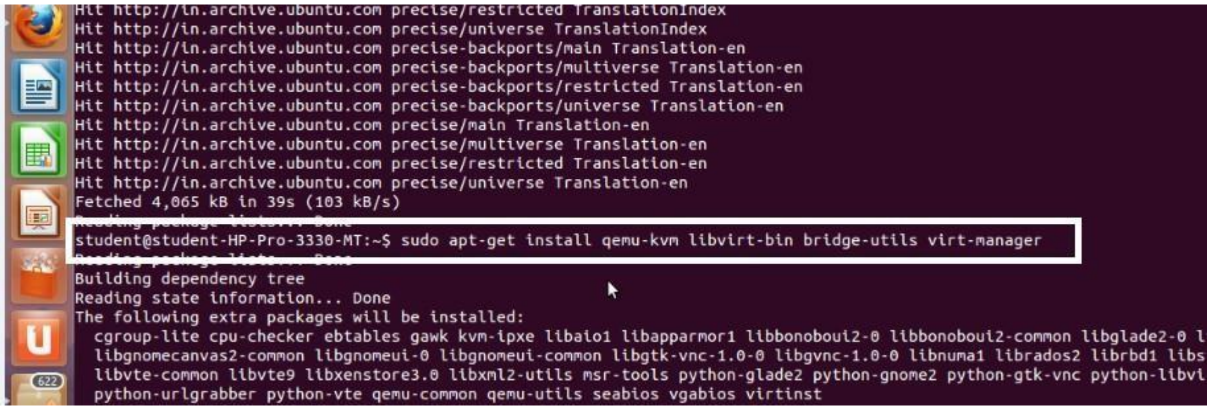
Step 2: #sudo apt-get install qemu-kvm libvirt-bin bridge-utils virt-manager



```
fpu             : yes
fpu_exception   : yes
cpuid level     : 13
wp              : yes
flags           : fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 
scp lm constant_tsc arch_perfmon pebs bts xtopology nonstop_tsc aperfmperf pni pclmulqdq d
pcid sse4_1 sse4_2 popcnt tsc_deadline_timer xsave avx f16c lahf_lm arat epb xsaveopt pln 
ase smep erms
bogomips        : 6584.72
clflush size    : 64
cache_alignment : 64
address sizes   : 36 bits physical, 48 bits virtual
power management:

student@student-HP-Pro-3330-MT:~$ #sudo grep -c "svm\|vmx" /proc/cpuinfo
student@student-HP-Pro-3330-MT:~$ sudo grep -c "svm\|vmx" /proc/cpuinfo
[sudo] password for student:
4
student@student-HP-Pro-3330-MT:~$ sudo apt-get update
Ign http://repo.mongodb.org precise/mongodb-org/3.2 InRelease
Ign http://extras.ubuntu.com precise InRelease
Hit http://repo.mongodb.org precise/mongodb-org/3.2 Release.gpg
Hit http://repo.mongodb.org precise/mongodb-org/3.2 Release
Ign http://in.archive.ubuntu.com precise InRelease
Get:1 http://in.archive.ubuntu.com precise-updates InRelease [55.7 kB]
Hit http://extras.ubuntu.com precise Release.gpg
Get:2 http://security.ubuntu.com precise-security InRelease [55.7 kB]
Hit http://repo.mongodb.org precise/mongodb-org/3.2/multiverse i386 Packages
Hit http://extras.ubuntu.com precise Release
```

Step 3: #sudo adduser rait

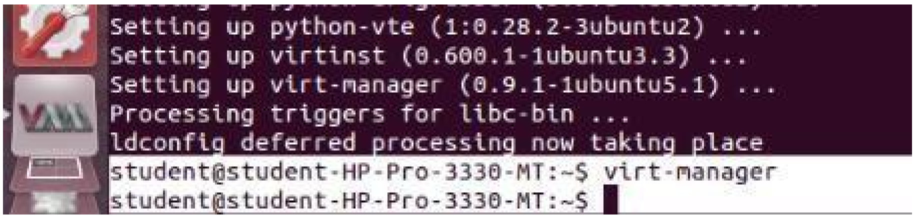
After running this command, log out and log back in as rait



```
Hit http://in.archive.ubuntu.com precise/restricted TranslationIndex
Hit http://in.archive.ubuntu.com precise/universe TranslationIndex
Hit http://in.archive.ubuntu.com precise-backports/main Translation-en
Hit http://in.archive.ubuntu.com precise-backports/multiverse Translation-en
Hit http://in.archive.ubuntu.com precise-backports/restricted Translation-en
Hit http://in.archive.ubuntu.com precise-backports/universe Translation-en
Hit http://in.archive.ubuntu.com precise/main Translation-en
Hit http://in.archive.ubuntu.com precise/multiverse Translation-en
Hit http://in.archive.ubuntu.com precise/restricted Translation-en
Hit http://in.archive.ubuntu.com precise/universe Translation-en
Fetched 4,065 kB in 39s (103 kB/s)
Reading package lists... Done
student@student-HP-Pro-3330-MT:~$ sudo apt-get install qemu-kvm libvirt-bin bridge-utils virt-manager
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following extra packages will be installed:
  cgroup-lite cpu-checker ebtables gawk kvm-ipxe libaio1 libapparmor1 libbonoboui2-0 libbonoboui2-common libglade2-0 l
  libgnomecanvas2-common libgnomeui-0 libgnomeui-common libgtk-vnc-1.0-0 libgvnc-1.0-0 libnuma1 librados2 librbd1 libs
  libvte-common libvte9 libxenstore3.0 libxml2-utils msr-tools python-glade2 python-gnome2 python-gtk-vnc python-libvi
  python-urlgrabber python-vte qemu-common qemu-utils seabios vgabios virtinst
```

Step 4: #sudoadduserraitlibvirtd

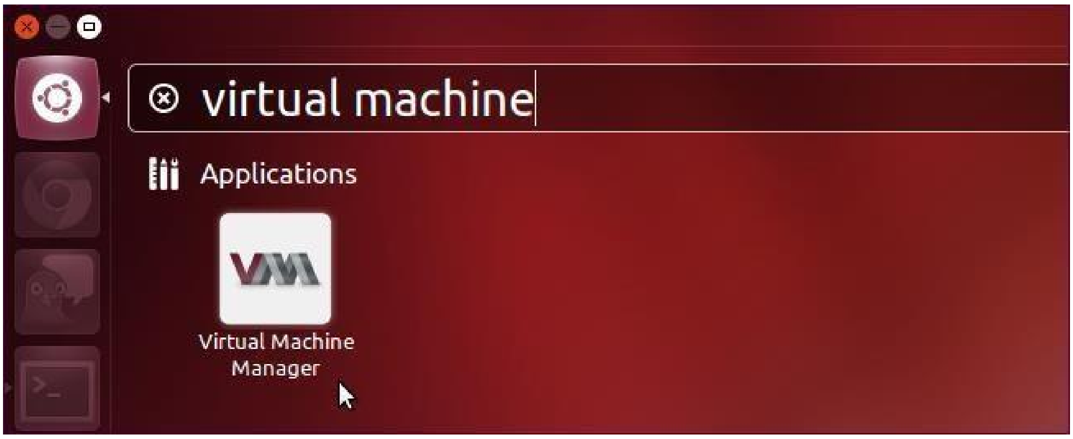
After running this command, log out and log back in as rait



```
Setting up python-vte (1:0.28.2-3ubuntu2) ...
Setting up virtinst (0.600.1-1ubuntu3.3) ...
Setting up virt-manager (0.9.1-1ubuntu5.1) ...
Processing triggers for libc-bin ...
ldconfig deferred processing now taking place
student@student-HP-Pro-3330-MT:~$ virt-manager
student@student-HP-Pro-3330-MT:~$
```

Step 5 : Open Virtual Machine Manager application and Create Virtual Machine

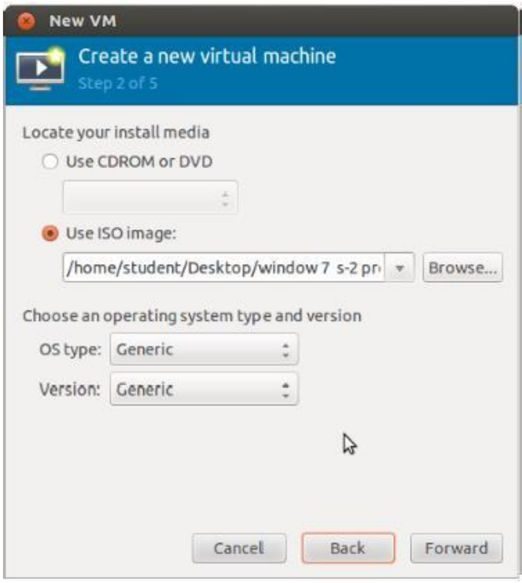
#virt-manager as shown below


virtual machine

Applications

Virtual Machine Manager

Step 6: Create a new virtual machine as shown below


New VM

Create a new virtual machine

Step 2 of 5

Locate your install media

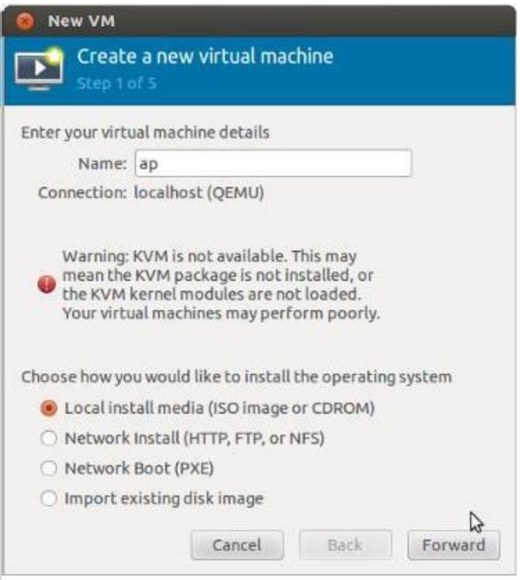
○ Use CDROM or DVD

● Use ISO image: /home/student/Desktop/window 7 s-2 pr Browse...

Choose an operating system type and version

OS type: Generic

Version: Generic


New VM

Create a new virtual machine

Step 1 of 5

Enter your virtual machine details

Name: ap

Connection: localhost (QEMU)

Warning: KVM is not available. This may mean the KVM package is not installed, or the KVM kernel modules are not loaded. Your virtual machines may perform poorly.

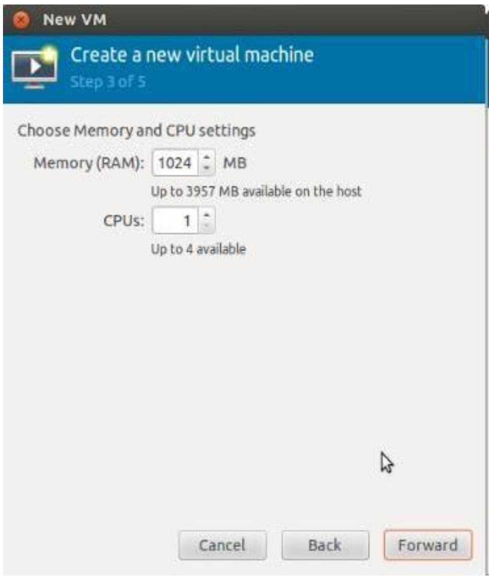
Choose how you would like to install the operating system

● Local install media (ISO image or CDROM)

○ Network Install (HTTP, FTP, or NFS)

○ Network Boot (PXE)

○ Import existing disk image


New VM

Create a new virtual machine

Step 3 of 5

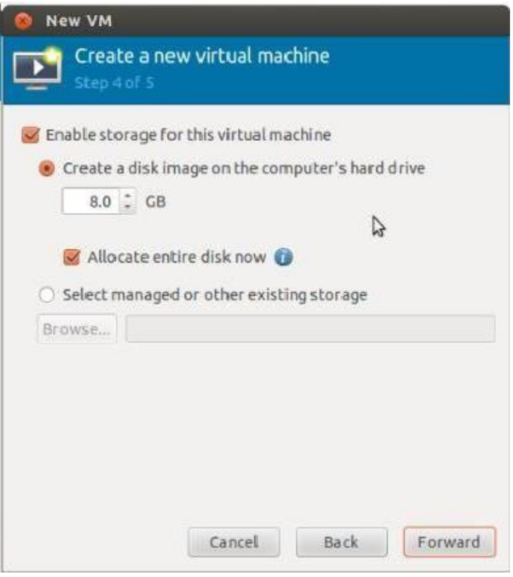
Choose Memory and CPU settings

Memory (RAM): 1024 MB

Up to 3957 MB available on the host

CPUs: 1

Up to 4 available


New VM

Create a new virtual machine

Step 4 of 5

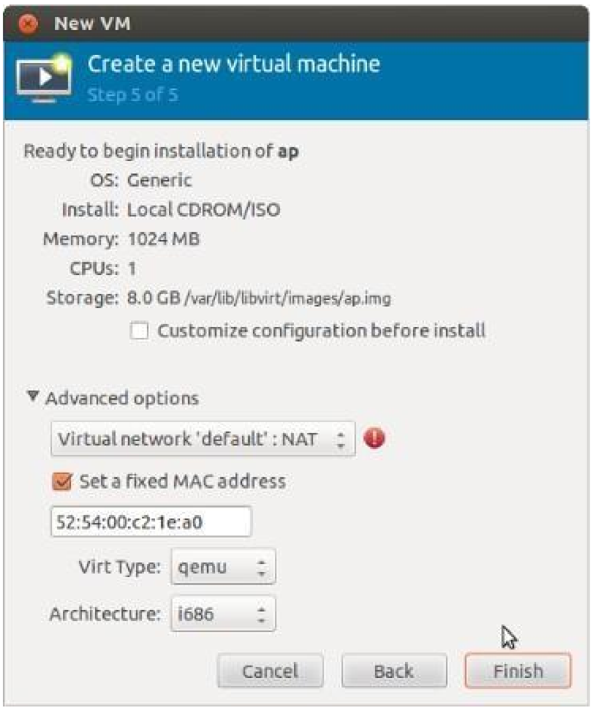
☑ Enable storage for this virtual machine

● Create a disk image on the computer's hard drive

8.0 GB

☑ Allocate entire disk now

○ Select managed or other existing storage



Create a new virtual machine

Step 5 of 5

Ready to begin installation of **ap**

OS: Generic

Install: Local CDROM/ISO

Memory: 1024 MB

CPUs: 1

Storage: 8.0 GB /var/lib/libvirt/images/ap.img

□ Customize configuration before install

▼ Advanced options

Virtual network 'default' : NAT

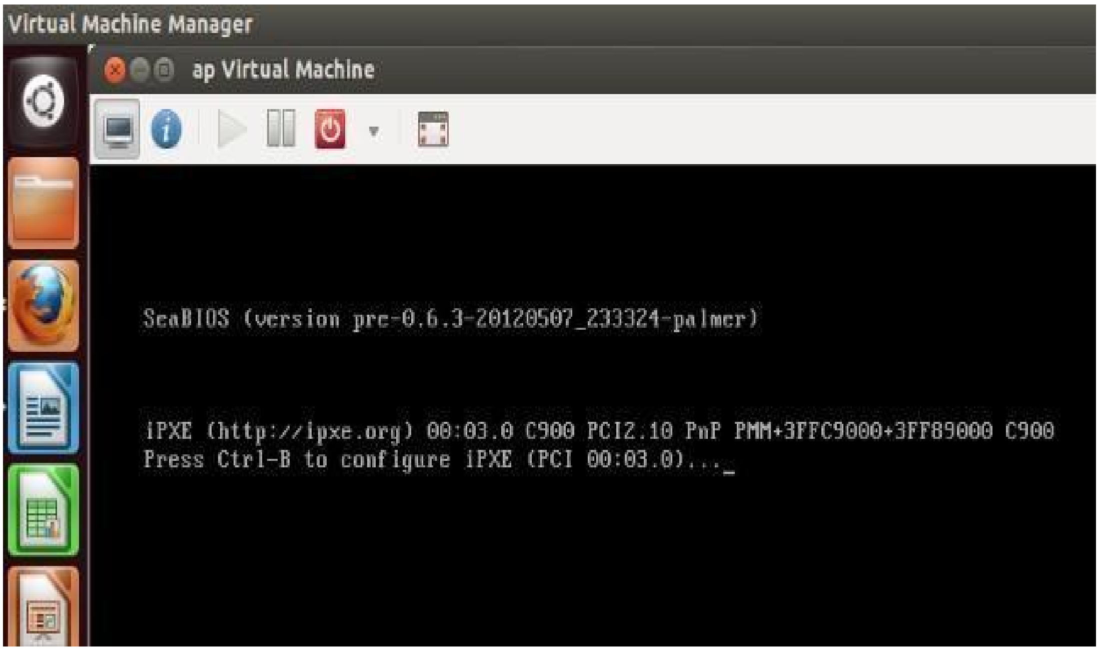
☑ Set a fixed MAC address

52:54:00:c2:1e:a0

Virt Type: qemu

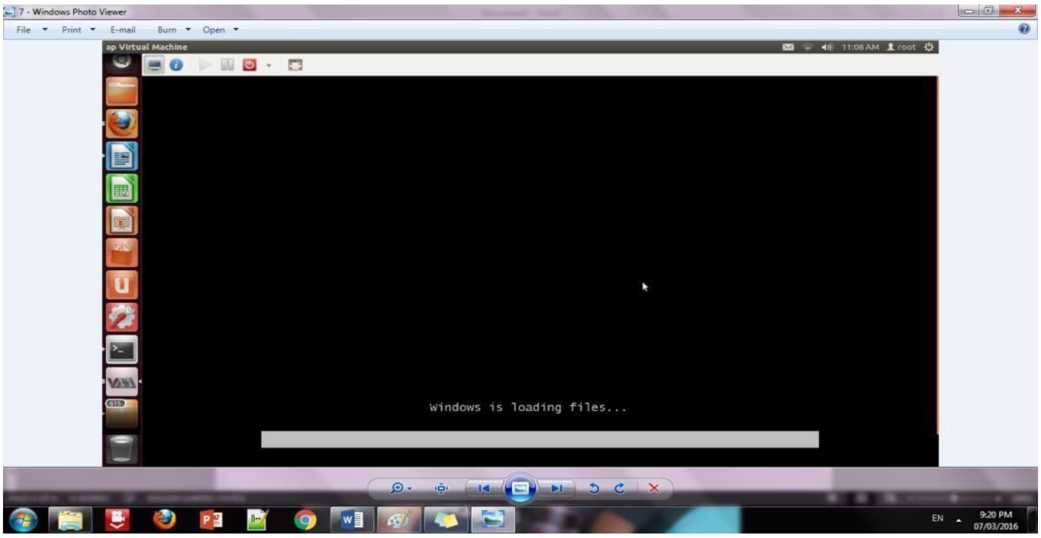
Architecture: i686

Step 7: Install windows operating system on virtual machine



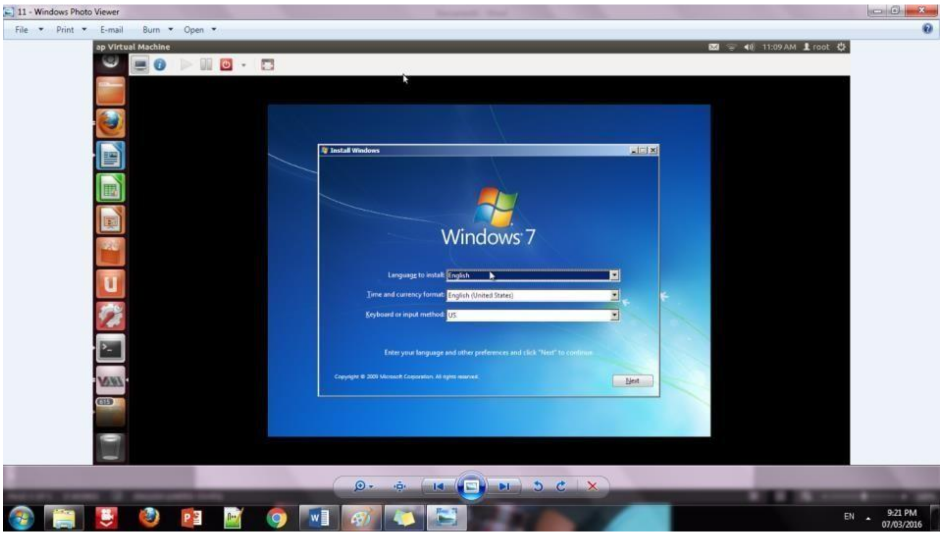
```
SeaBIOS (version pre-0.6.3-20120507_233324-palmer)


iPXE (http://ipxe.org) 00:03.0 C900 PCI2.10 PnP PMM+3FFC9000+3FF89000 C900
Press Ctrl-B to configure iPXE (PCI 00:03.0)..._
```

Step 8: Installation of windows on virtual machine



```
Windows is loading files...
```

Step 9: Installation of windows 7 on virtual machine



Language to install: English

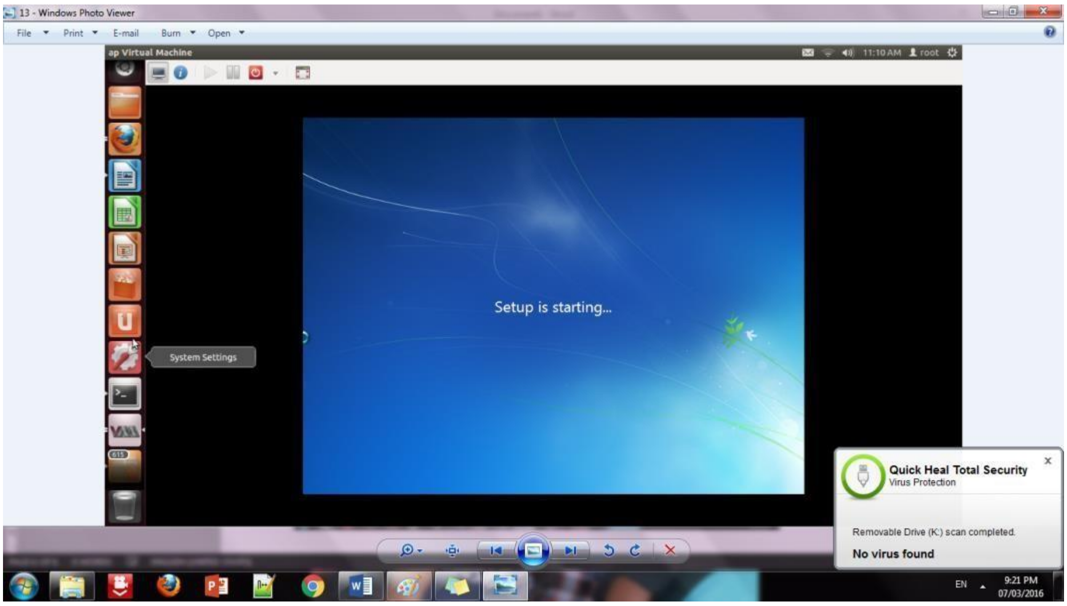
Time and currency format: English (United States)

Keyboard or input method: US

Enter your language and other preferences and click "Next" to continue.

Copyright © 2009 Microsoft Corporation. All rights reserved.

Step 10: Initialization of windows on virtual machine



Setup is starting...

Quick Heal Total Security
Virus Protection

Removable Drive (K:) scan completed.

No virus found

8. Conclusion:

Installation and configuration of KVM have been done successfully onto Ubuntu and users added. Like this we can create as many virtual machines as possible on OS and can install any windows onto it.

Practical No. 3

1. **Aim:** To study and implementation of Infrastructure as a Service

2. **Objectives:** From this experiment, the student will be able to,
   - Understand concepts of virtualization and to use cloud as Infrastructure as a service.
   - Learn the technique and its complexity
   - Understand the importance of this technique from application point of view

3. **Outcomes:** The learner will be able,

   - To match the industry requirements in the domains of Database management, Programming and Networking with limited infrastructure.
   - To analyze the local and global impact of computing on individuals, organizations, and society.
   - To use current techniques, skills, and tools necessary for computing practice.

4. **Hardware / Software Required:** Ubuntu operating system, Virtual machine, WAMP/ZAMP server, Any tool or technology can be used for implementation of web application e.g., JAVA, PHP, etc.

5. **Procedure:**

   Add user

   ```
   useradd -s /bin/bash -d /opt/stack -m stack

   apt-get install sudo -y

   echo "stack ALL=(ALL) NOPASSWD: ALL" >> /etc/sudoers
   ```

   login as stack user

   Download DevStack

   ```
   sudo apt-get install git -y || sudo yum install -y git

   git clone https://git.openstack.org/openstack-dev/devstack

   cd devstack
   ```

   Run DevStack

Now to configure **stack.sh**. DevStack includes a sample in **devstack/samples/local.conf**. Create **local.conf** as shown below to do the following:

- Set **FLOATING_RANGE** to a range not used on the local network, i.e. 192.168.1.224/27. This configures IP addresses ending in 225-254 to be used as floating IPs.
- Set **FIXED_RANGE** and **FIXED_NETWORK_SIZE** to configure the internal address space used by the instances.
- Set **FLAT_INTERFACE** to the Ethernet interface that connects the host to your local network. This is the interface that should be configured with the static IP address mentioned above.
- Set the administrative password. This password is used for the **admin** and **demo** accounts set up as OpenStack users.
- Set the MySQL administrative password. The default here is a random hex string which is inconvenient if you need to look at the database directly for anything.
- Set the RabbitMQ password.
- Set the service password. This is used by the OpenStack services (Nova, Glance, etc) to authenticate with Keystone.

local.conf should look something like this:

```
[[local|localrc]]

FLOATING_RANGE=192.168.1.224/27

FIXED_RANGE=10.11.12.0/24

FIXED_NETWORK_SIZE=256

FLAT_INTERFACE=eth0

ADMIN_PASSWORD=supersecret

DATABASE_PASSWORD=iheartdatabases

RABBIT_PASSWORD=flopsymopsy

SERVICE_PASSWORD=iheartksl
```

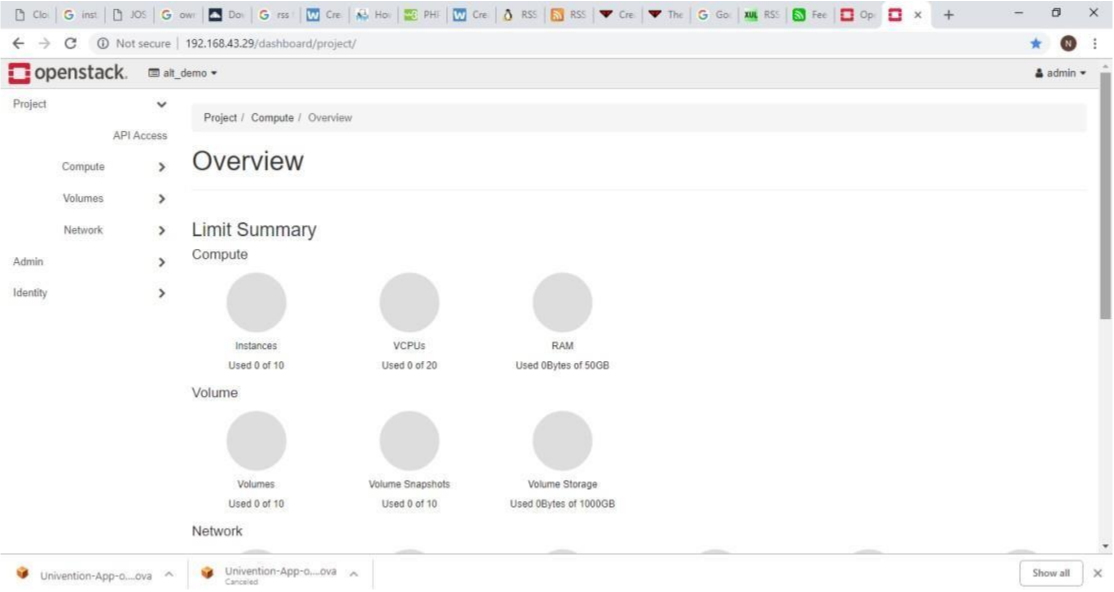
Run DevStack:

```
./stack.sh
```

A seemingly endless stream of activity ensues. When complete you will see a summary of **stack.sh**'s work, including the relevant URLs, accounts and passwords to poke at your shiny new OpenStack.

Using OpenStack

At this point you should be able to access the dashboard from other computers on the local network. In this example that would be http://192.168.43.29/ for the dashboard (aka Horizon). Launch VMs and if you give them floating IPs and security group access those VMs will be accessible from other machines on your network.



Overview

Limit Summary

Compute

Instances
Used 0 of 10

VCPUs
Used 0 of 20

RAM
Used 0Bytes of 50GB

Volume

Volumes
Used 0 of 10

Volume Snapshots
Used 0 of 10

Volume Storage
Used 0Bytes of 1000GB

Network

6. Conclusion:

We have installed Ubuntu/Xen as bare metal hypervisor and implemented it. It provides access to computing resources in a virtual environment. With the help of Infrastructure as a service we can build our own IT platform. We can install Windows Operating System on Ubuntu and vice versa.

Practical No. 4

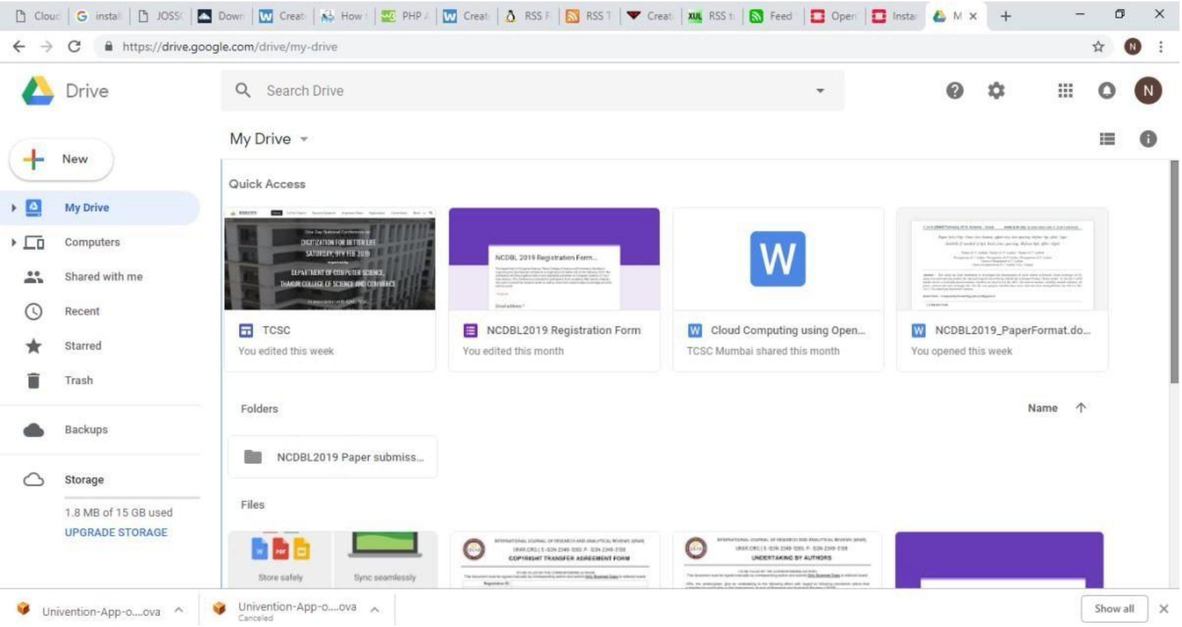
1. **Aim:** To study and implementation of Storage as a Service

2. **Objectives:** From this experiment, the student will be able to

   - To make the students understand use of cloud as Platform, Storage as a service.
   - To learn the efficient tools to implement the technique

3. **Outcomes:** The learner will be able to

4. **Result:**



https://drive.google.com/drive/my-drive

1.8 MB of 15 GB used

TCSC
You edited this week

NCDBL2019 Registration Form
You edited this month

Cloud Computing using Open...
TCSC Mumbai shared this month

NCDBL2019_PaperFormat.do...
You opened this week

NCDBL2019 Paper submiss...

Univention-App-o....ova

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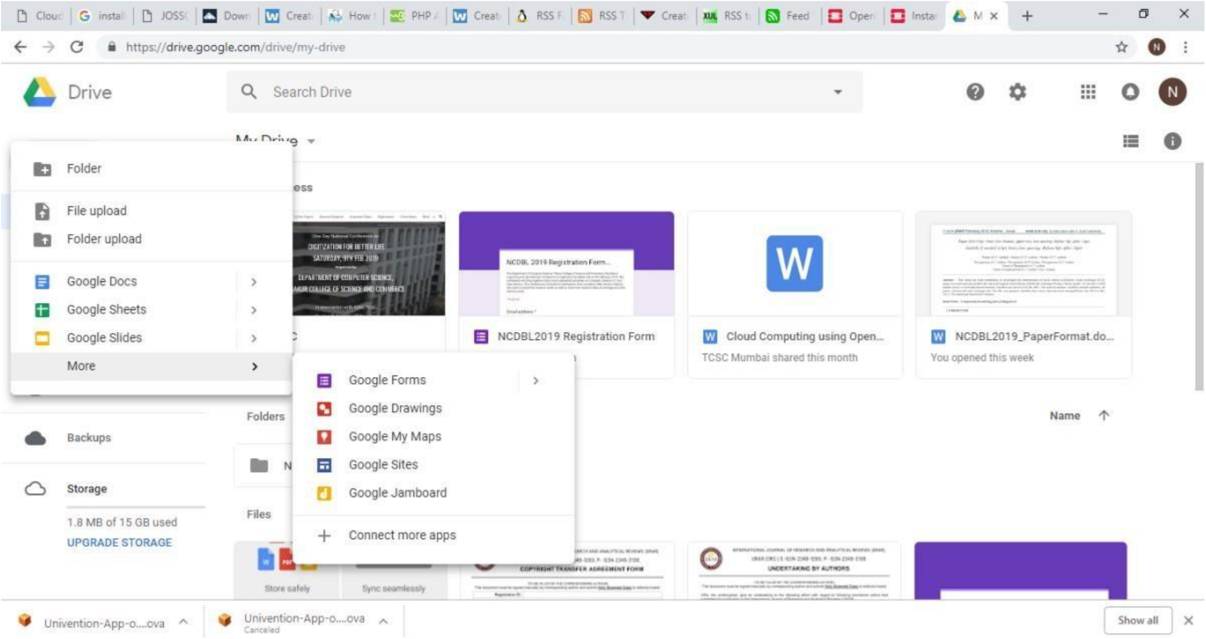
Canceled



5. Conclusion:

Google Docs provide an efficient way for storage of data. It fits well in Storage as a service (SaaS). It has varied options to create documents, presentations and also spreadsheets. It saves documents automatically after a few seconds and can be shared anywhere on the Internet at the click of a button.

Practical No. 5

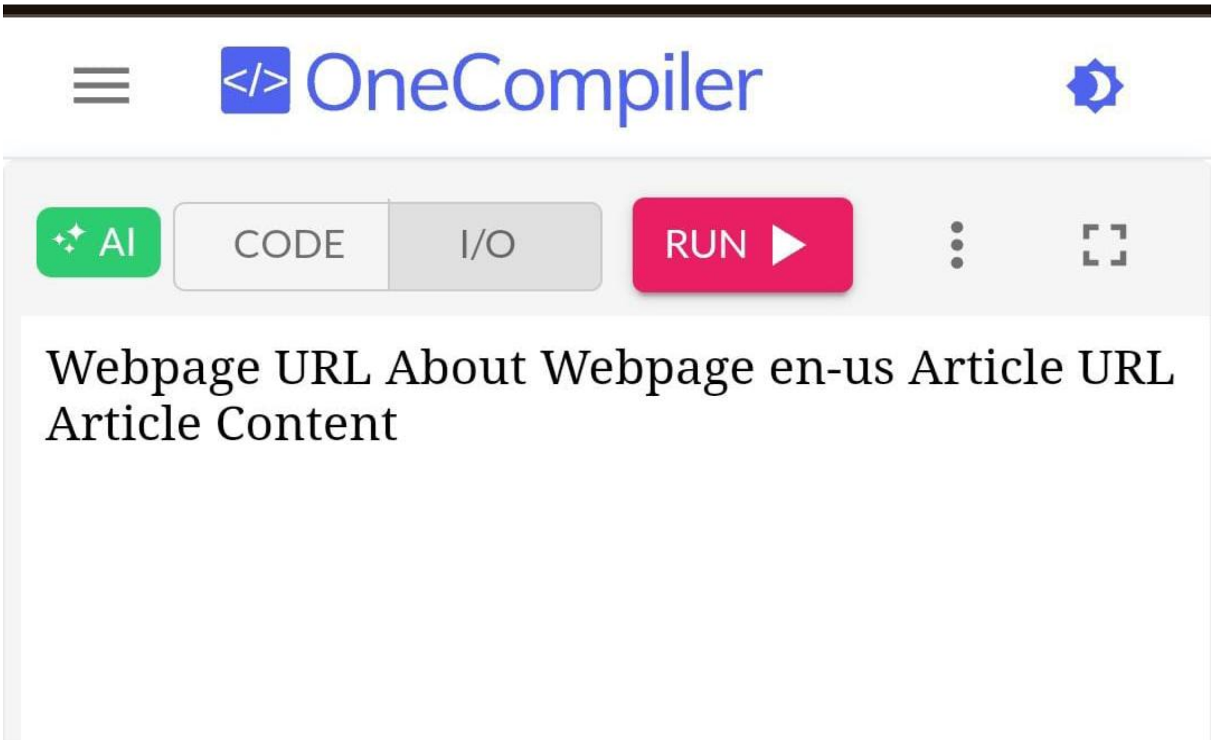
Aim: Write a program for web feed.

```
<?xml version='1.0' encoding='UTF-8'?>
<rss version='2.0'>
<channel>

<title>Title of Webpage</title>
<link>Webpage URL</link>
<description>About Webpage</description>
<language>en-us</language>

<item>
  <title>Article Title</title>
  <link>Article URL</link>
  <description>Article Content</description>
</item>

</channel>
</rss>
```



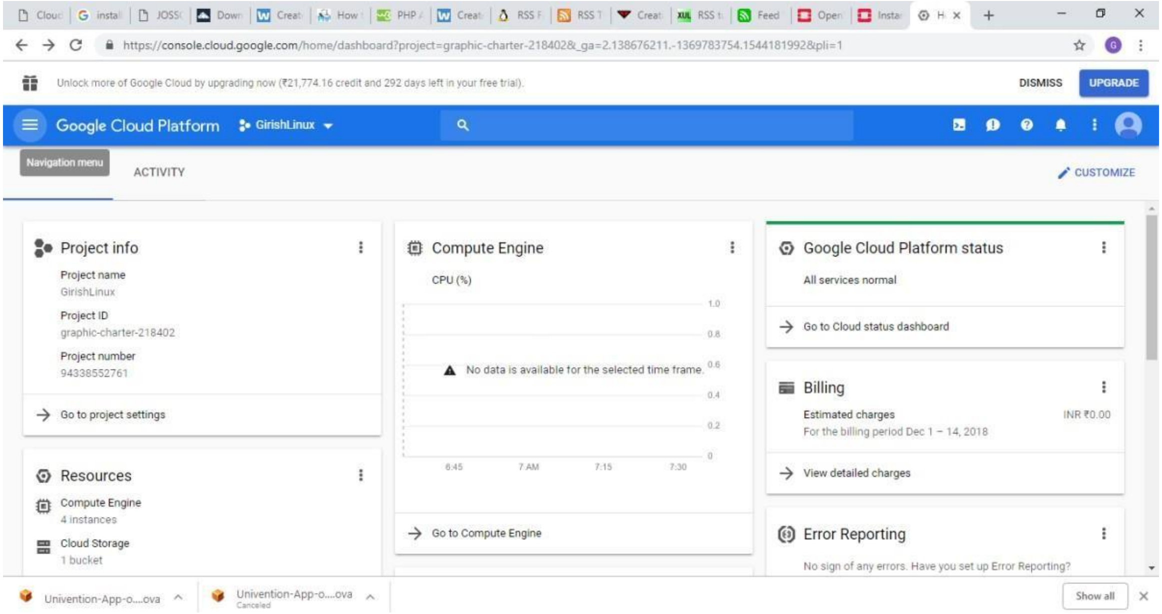
```
Webpage URL About Webpage en-us Article URL
Article Content
```

Practical No. 6

Aim: Case study on Amazon EC2/Microsoft Azure/Google Cloud Platform

GCP:

1) Main dashboard



https://console.cloud.google.com/home/dashboard?project=graphic-charter-218402&_ga=2.138676211.-1369783754.1544181992&pli=1

Unlock more of Google Cloud by upgrading now (₹21,774.16 credit and 292 days left in your free trial).

Project info

Project name
GirishLinux

Project ID
graphic-charter-218402

Project number
94338552761

Compute Engine

CPU (%)

No data is available for the selected time frame.

Google Cloud Platform status

All services normal

Resources

Compute Engine
4 instances

Cloud Storage
1 bucket

Billing

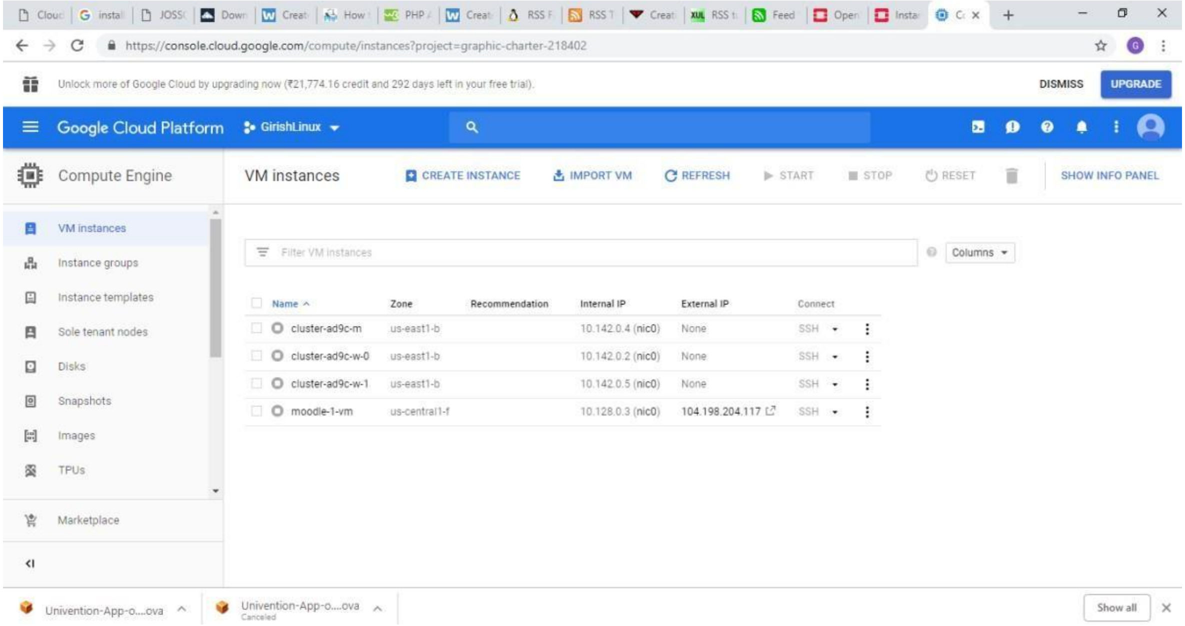
Estimated charges INR ₹0.00

For the billing period Dec 1 – 14, 2018

Error Reporting

No sign of any errors. Have you set up Error Reporting?

2) Compute engine



https://console.cloud.google.com/compute/instances?project=graphic-charter-218402

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VM instances

Name	Zone	Recommendation	Internal IP	External IP	Connect
cluster-ad9c-m	us-east1-b		10.142.0.4 (nic0)	None	SSH
cluster-ad9c-w-0	us-east1-b		10.142.0.2 (nic0)	None	SSH
cluster-ad9c-w-1	us-east1-b		10.142.0.5 (nic0)	None	SSH
moodle-1-vm	us-central1-f		10.128.0.3 (nic0)	104.198.204.117	SSH