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Laboratory.

Teacher In-Charge

Head of Department

Date : _____

Examiner

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PRACTICAL 1

AIM: Study and implementation of Infrastructure as a Service A. Using FOSS Demo B. FOSS Server. C. USING Ubuntu and KVM D. GCP/AWS/IBM/Azure/...

THEORY:

What is IaaS?

IaaS (infrastructure as a service) is a cloud service model that offers on-demand infrastructure resources, such as compute, storage, networking, and virtualization, to businesses and individuals via the cloud.

IaaS is attractive because acquiring computing resources to run applications or store data the traditional way requires time and capital. Organizations must purchase equipment through procurement processes that can take months. They must invest in physical spaces, typically specialized rooms with power and cooling. And after deploying the systems, they need IT professionals to manage and maintain them.

For IaaS models, the service provider hosts, maintains, and updates the backend infrastructure, such as compute, storage, networking, and virtualization. You manage everything else including the operating system, middleware, data, and applications.

IaaS examples: Compute Engine, Cloud Storage.

Advantages of IaaS

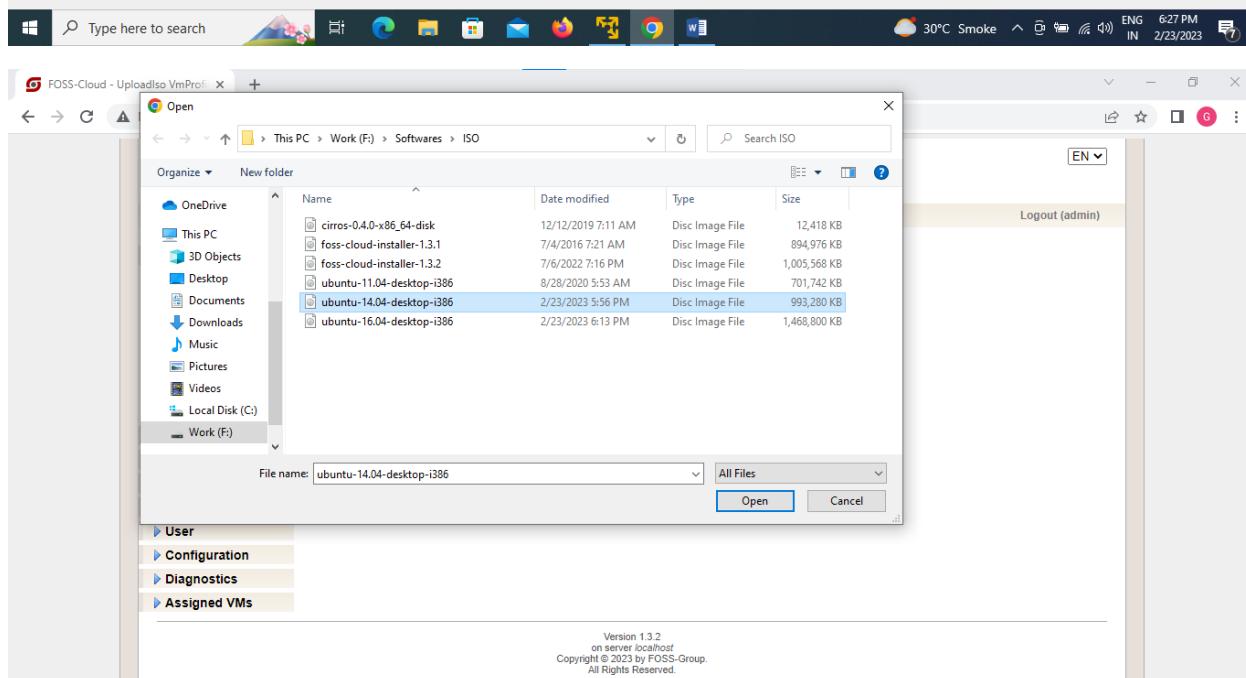
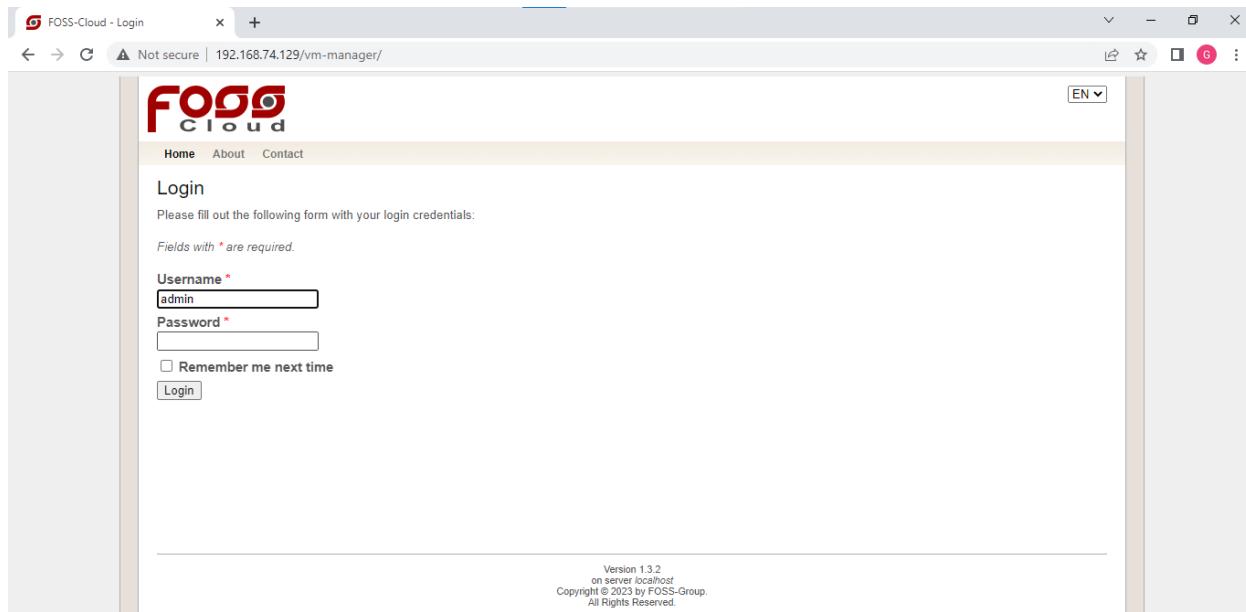
- Cost savings
- Increased efficiency
- More innovation
- Reliability
- High scalability
- Lower latency

IMPLEMENTATION & OUTPUT:

A. Using FOSS Demo & B. FOSS Server

Steps:

Loginto to FOSS cloud through the IP address



The screenshot shows the FOSS-Cloud web interface. On the left, a sidebar menu includes options like 'Virtual Machine', 'VM Pool', 'Storage Pool', 'Node', 'Network', 'User', 'Configuration', 'Diagnostics', and 'Assigned VMs'. The main area is titled 'Upload ISO File' with a note: 'Fields with * are required.' It features an 'Iso File' section with a 'Choose File' button and a progress bar showing 'ubuntu-14.04_1386.iso' being uploaded at 970 MB. A modal window in the center says 'Finished' and 'Upload finished!'. Below the main area, there's a note: 'Version 1.3.2 on server localhost Copyright © 2023 by FOSS-Group. All Rights Reserved.'

The screenshot shows the 'Create VmProfile' page. The sidebar menu is identical to the previous screen. The main form has two steps: Step I (selecting a profile) and Step II (overriding default values). In Step I, 'linux' is selected as the base profile, with 'multi' chosen. In Step II, the 'Isofile' dropdown lists 'U14.iso', 'ubuntu16.iso', 'U16_32.iso', and 'phas.iso'. The 'Name' field is set to 'pbas' and the 'Description' is 'this is our first foss'. Configuration fields include 'Memory' (3.5 GB), 'Volume Capacity' (10 GB), 'CPU' (1), and 'Clock Offset' (utc). A 'Create' button is at the bottom.

Manage VMProfiles

No.	Name	Architecture	Language	Description	Action
1	Ubuntu11	linux / x86_64	multi	Ubuntu11	
2	U14	linux / x86_64	multi	U14	
3	Ub16	linux / x86_64	multi	Ub16	
4	pbas	linux / x86_64	multi	this is our first foss	

Version 1.3.2
on server localhost
Copyright © 2023 by FOSS-Group.
All Rights Reserved.

Please select a profile first!

Vmpool *
Profile
vm-template-virtual-machine-pool-01

Name *
pbas

Description *
this is our first foss

Memory *
3.5 GB

Volume Capacity *
10 GB

CPU * 1 **Clock Offset *** utc

Number of displays
1

Create

The screenshot shows the FOSS Cloud interface with the title "Manage VM Templates". The left sidebar has a "Virtual Machine" section with "VM Templates" selected. The main area displays a table of VM templates:

No.	DisplayName	Status	Run Action	Memory	Node	Action
1	Ubuntu11	stopped	↓ X ↻	---	foss-cloud-01.foss-cloud.org	
2	U14	stopped	↓ X ↻	---	foss-cloud-01.foss-cloud.org	
3	Ub16	stopped	↓ X ↻	---	foss-cloud-01.foss-cloud.org	
4	pbas	stopped	↓ X ↻	---	foss-cloud-01.foss-cloud.org	

At the bottom of the table, it says "Page 1 of 1" and "Refresh 10". The status bar at the bottom shows "Version 1.3.2 on Server localhost".

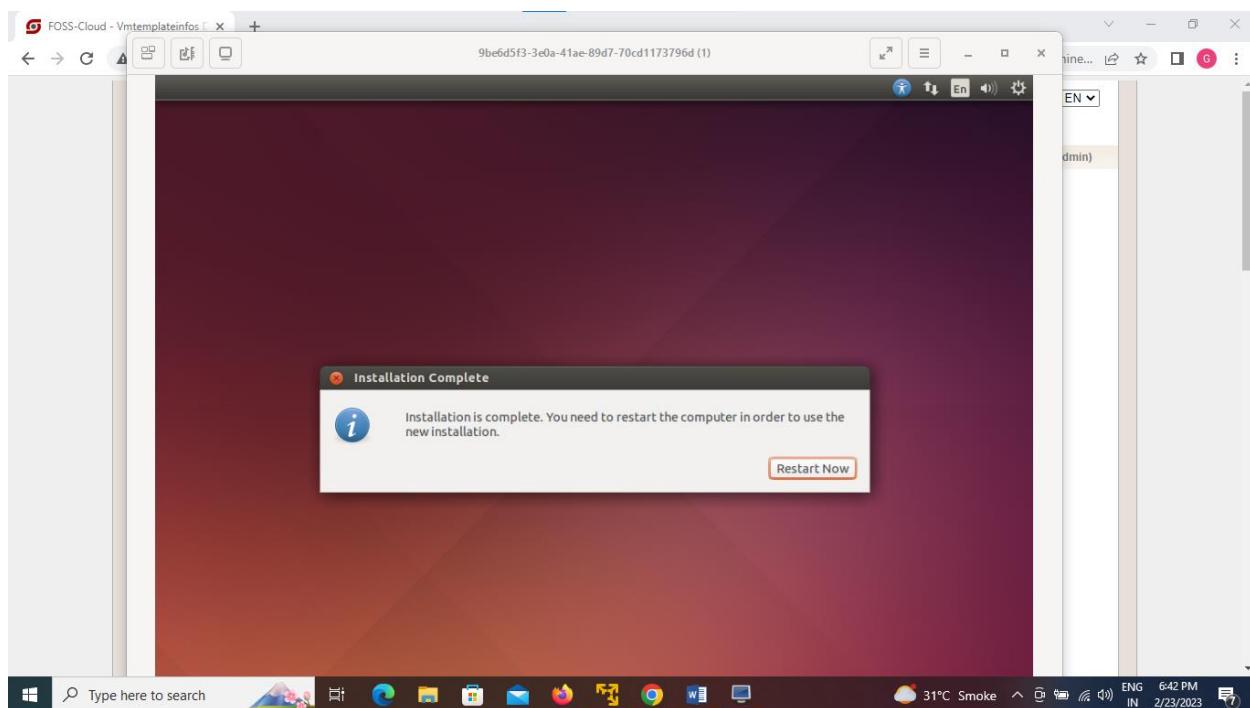
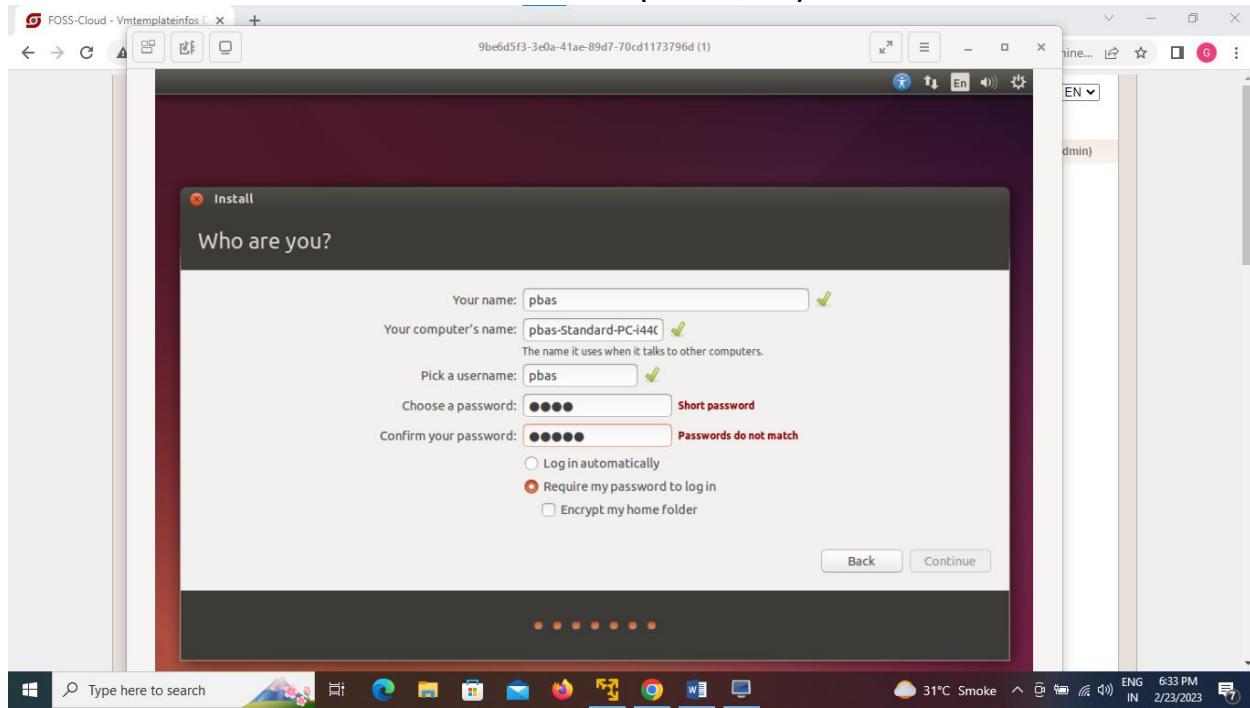
This screenshot is identical to the one above, except the fourth row (pbas) now shows "running" in the Status column and "3.5 GB / 3.5 GB" in the Memory column. The status bar at the bottom shows "Version 1.3.2 on Server localhost" and "Sunset".

The screenshot shows the FOSS Cloud interface. The left sidebar has a 'Diagnostics' section with 'VM Template Infos' selected. The main content area displays 'VM Template Infos' with several items listed:

- [Ubuntu11](#)
- [U14](#)
- [Ub16](#)
- [>> phas](#)
- Libvirt URI: `qemu+tcp://127.0.0.1/system`
- SPICE URI: `spice://192.168.74.129?port=5903&password=B82NT5Z6vKab`
- Start XML (xml code shown)

A modal window titled 'Connection details' is open, showing the 'Connection Address' field filled with `03&password=B82NT5Z6vKab`. The 'Recent connections' list also shows `03&password=B82NT5Z6vKab`.

This screenshot is identical to the one above, showing the same interface and modal window for 'Connection details'. The modal window still displays the connection address as `03&password=B82NT5Z6vKab`.



C. USING Ubuntu and KVM

Step 01 : Creating a user ‘Scientilla’ in Ubuntu and adding ‘scientilla’ to the sudoers.

```
Activities Terminal Jan 10 03:41
scientilla@tcsc:/home/dcstcsc/Desktop

dcstcsc@tcsc:~/Desktop$ sudo adduser scientilla
[sudo] password for dcstcsc:
Adding user 'scientilla' ...
Adding new group 'scientilla' (1041) ...
Adding new user 'scientilla' (1041) with group 'scientilla' ...
Creating home directory '/home/scientilla' ...
Copying files from '/etc/skel' ...
New password:
BAD PASSWORD: The password is shorter than 8 characters
Retype new password:
passwd: password updated successfully
Changing the user information for scientilla
Enter the new value, or press ENTER for the default
  Full Name []: scientilla nadar
  Room Number []:
  Work Phone []:
  Home Phone []:
  Other []:
Is the information correct? [y/n] y
dcstcsc@tcsc:~/Desktop$ sudo usermod -aG sudo scientilla
dcstcsc@tcsc:~/Desktop$ su scientilla
Password:
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
```

Step 02 : Check Virtualization Support on Ubuntu 20.04

```
scientilla@tcsc:/home/dcstcsc/Desktop$ egrep -c '(vmx|svm)' /proc/cpuinfo
12
scientilla@tcsc:/home/dcstcsc/Desktop$
```

Step 03 : To install cpu-checker, run the following command

```
12
scientilla@tcsc:/home/dcstcsc/Desktop$ sudo kvm-ok
[sudo] password for scientilla:
INFO: /dev/kvm exists
KVM acceleration can be used
scientilla@tcsc:/home/dcstcsc/Desktop$ sudo apt install cpu-checker
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
cpu-checker is already the newest version (0.7-1.3build1).
0 upgraded, 0 newly installed, 0 to remove and 4 not upgraded.
scientilla@tcsc:/home/dcstcsc/Desktop$
```

Step 04 : Install KVM on Ubuntu 20.04

```
Activities Terminal Jan 10 03:45
scientilla@tcsc: /home/dcstcsc/Desktop

Reading state information... Done
cpu-checker is already the newest version (0.7-1.3build1).
0 upgraded, 0 newly installed, 0 to remove and 4 not upgraded.
scientilla@tcsc: /home/dcstcsc/Desktop$ sudo apt update
Ign:1 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Ign:2 http://security.ubuntu.com/ubuntu jammy-security InRelease
Ign:3 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease
Ign:4 https://ppa.launchpadcontent.net/ondrej/php/ubuntu jammy InRelease
Ign:5 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease
Ign:1 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Ign:2 http://security.ubuntu.com/ubuntu jammy-security InRelease
Ign:3 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease
Ign:4 https://ppa.launchpadcontent.net/ondrej/php/ubuntu jammy InRelease
Ign:5 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease
Ign:4 https://ppa.launchpadcontent.net/ondrej/php/ubuntu jammy InRelease
Ign:1 http://in.archive.ubuntu.com/ubuntu jammy InRelease
Ign:2 http://security.ubuntu.com/ubuntu jammy-security InRelease
Ign:4 https://ppa.launchpadcontent.net/ondrej/php/ubuntu jammy InRelease
Ign:3 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease
Ign:5 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease
Err:1 http://in.archive.ubuntu.com/ubuntu jammy InRelease
  Something wicked happened resolving 'in.archive.ubuntu.com:http' (-5 - No address associated with hostname)
Err:4 https://ppa.launchpadcontent.net/ondrej/php/ubuntu jammy InRelease
  Something wicked happened resolving 'ppa.launchpadcontent.net:https' (-5 - No address associated with hostname)
Err:2 http://security.ubuntu.com/ubuntu jammy-security InRelease
  Something wicked happened resolving 'security.ubuntu.com:http' (-5 - No address associated with hostname)
Err:3 http://in.archive.ubuntu.com/ubuntu jammy-updates InRelease
  Something wicked happened resolving 'in.archive.ubuntu.com:http' (-5 - No address associated with hostname)
Err:5 http://in.archive.ubuntu.com/ubuntu jammy-backports InRelease
  Something wicked happened resolving 'in.archive.ubuntu.com:http' (-5 - No address associated with hostname)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
4 packages can be upgraded. Run 'apt list --upgradable' to see them.
W: Failed to fetch http://in.archive.ubuntu.com/ubuntu/dists/jammy/InRelease  Something wicked happened resolving 'in.archive.ubuntu.com:http' with hostname)
W: Failed to fetch http://in.archive.ubuntu.com/ubuntu/dists/jammy-updates/InRelease  Something wicked happened resolving 'in.archive.ubuntu.com:https' with hostname)
W: Failed to fetch http://in.archive.ubuntu.com/ubuntu/dists/jammy-backports/InRelease  Something wicked happened resolving 'in.archive.ubuntu.com:https' with hostname)
W: Failed to fetch https://ppa.launchpadcontent.net/ondrej/php/ubuntu/dists/jammy/InRelease  Something wicked happened resolving 'ppa.launchpadcontent.net:https' with hostname)
W: Some index files failed to download. They have been ignored, or old ones used instead.
scientilla@tcsc: /home/dcstcsc/Desktop$
```

Step 05 : Authorize Users

```
scientilla@tcsc: /home/dcstcsc/Desktop$ sudo adduser scientilla libvirt
Adding user `scientilla' to group `libvirt' ...
Adding user scientilla to group libvirt
Done.
scientilla@tcsc: /home/dcstcsc/Desktop$ sudo adduser scientilla kvm
Adding user `scientilla' to group `kvm' ...
Adding user scientilla to group kvm
Done.
scientilla@tcsc: /home/dcstcsc/Desktop$
```

Step 06 : Verify the Installation

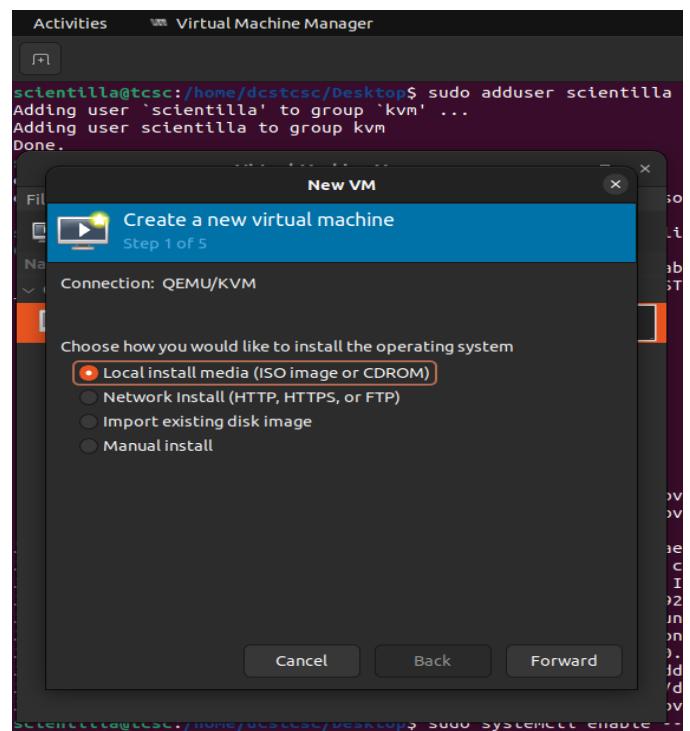
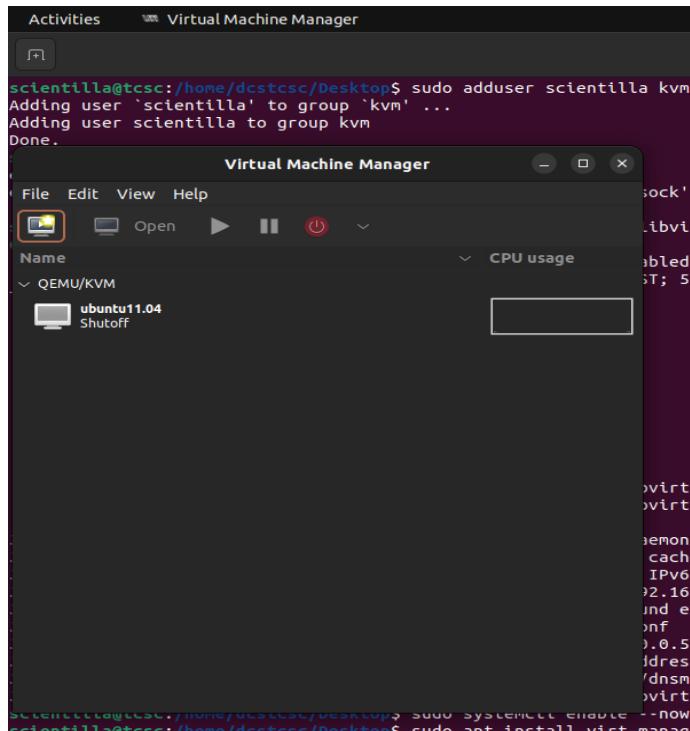
```
scientilla@tcsc:/home/dcstcsc/Desktop$ sudo systemctl status libvirdt
● libvirdt.service - Virtualization daemon
  Loaded: loaded (/lib/systemd/system/libvirdt.service; enabled; vendor preset: enabled)
  Active: active (running) since Tue 2023-01-10 02:57:23 IST; 55min ago
TriggeredBy: ● libvirdt-ro.socket
    ● libvirdt-admin.socket
    ● libvirdt.socket
  Docs: man:libvirdt(8)
        https://libvirt.org
 Main PID: 1172 (libvirdt)
   Tasks: 21 (limit: 32768)
  Memory: 39.5M
     CPU: 386ms
    CGroup: /system.slice/libvirdt.service
            └─1172 /usr/sbin/libvirdt
              ├─1512 /usr/sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf --leasefile-ro --dhcp-script=/usr/lib/libvirt/libvirt_leaseshell
              ├─1513 /usr/sbin/dnsmasq --conf-file=/var/lib/libvirt/dnsmasq/default.conf --leasefile-ro --dhcp-script=/usr/lib/libvirt/libvirt_leaseshell

Jan 10 02:57:23 tcsc.org systemd[1]: Started Virtualization daemon.
Jan 10 02:57:26 tcsc.org dnsmasq[1512]: started, version 2.86 cachesize 150
Jan 10 02:57:26 tcsc.org dnsmasq[1512]: compile time options: IPv6 GNU-getopt DBus no-UBus i18n IDN2 DHCP DHCPv6 no-Lua TFTP conntrack ipset auth crypt
Jan 10 02:57:26 tcsc.org dnsmasq-dhcp[1512]: DHCP, IP range 192.168.122.2 -- 192.168.122.254, lease time 1h
Jan 10 02:57:26 tcsc.org dnsmasq-dhcp[1512]: DHCP, sockets bound exclusively to interface virbr0
Jan 10 02:57:26 tcsc.org dnsmasq[1512]: reading /etc/resolv.conf
Jan 10 02:57:26 tcsc.org dnsmasq[1512]: using nameserver 127.0.0.53#53
Jan 10 02:57:26 tcsc.org dnsmasq[1512]: read /etc/hosts - 7 addresses
Jan 10 02:57:26 tcsc.org dnsmasq[1512]: read /var/lib/libvirt/dnsmasq/default.addnhosts - 0 addresses
Jan 10 02:57:26 tcsc.org dnsmasq-dhcp[1512]: read /var/lib/libvirt/dnsmasq/default.hostsfile
lines 1-27/27 (END)
```

Step 07 : Creating a Virtual Machine on Ubuntu 20.04

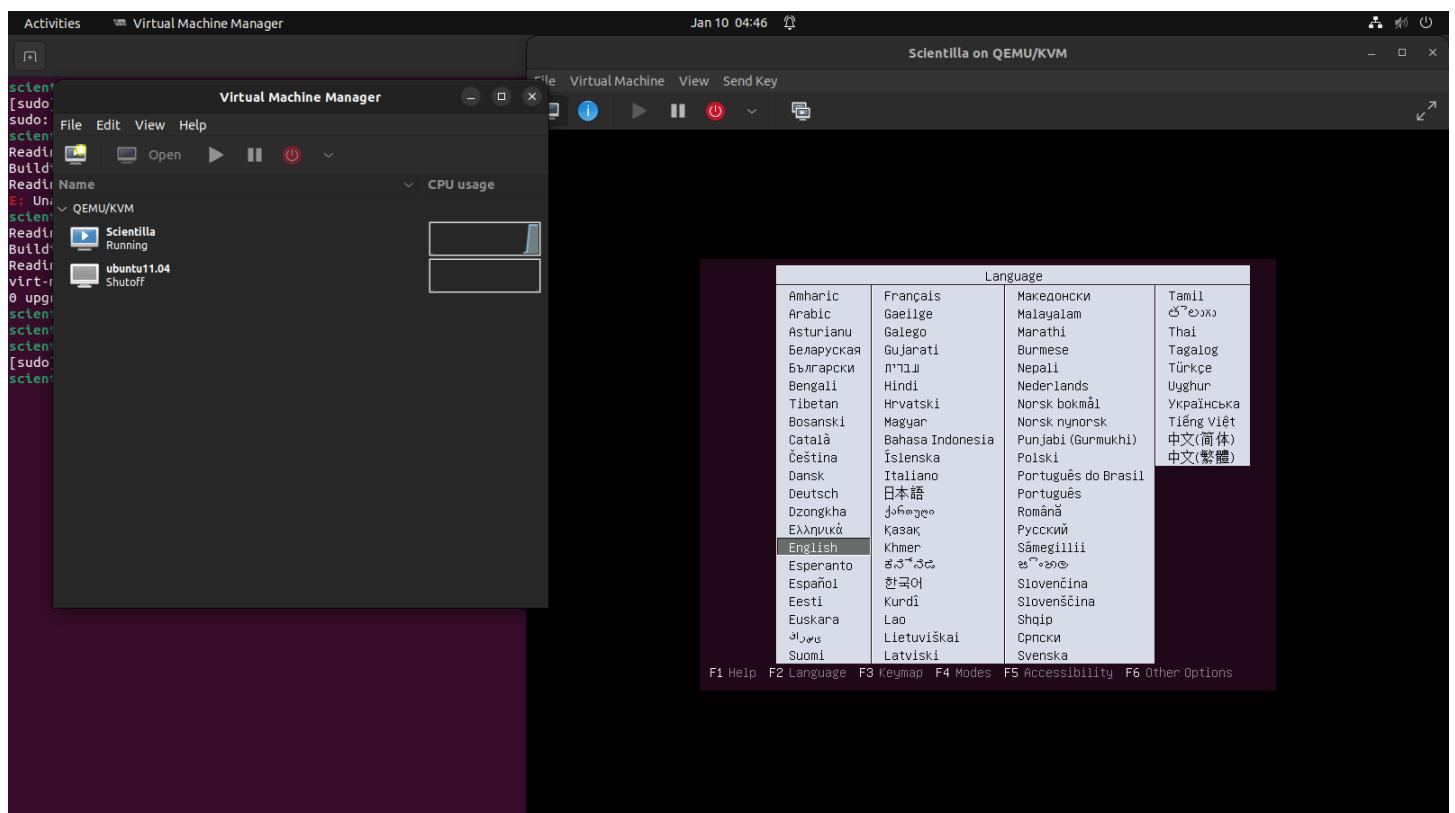
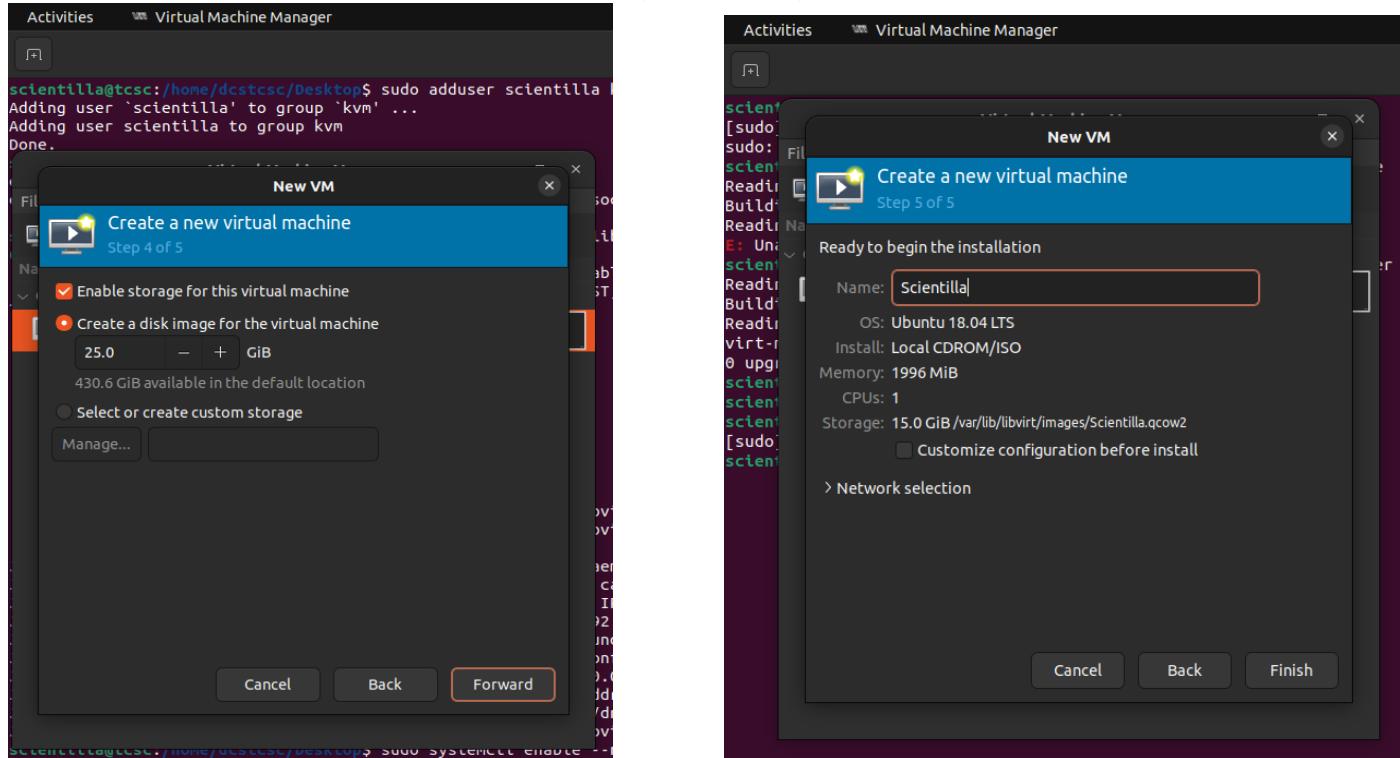
```
scientilla@tcsc:/home/dcstcsc/Desktop$ sudo systemctl enable --now libvirdt
scientilla@tcsc:/home/dcstcsc/Desktop$ sudo apt install virt-manager
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
virt-manager is already the newest version (1:4.0.0-1).
0 upgraded, 0 newly installed, 0 to remove and 4 not upgraded.
scientilla@tcsc:/home/dcstcsc/Desktop$
```

Step 08 : Virt-Manager GUI Method



The screenshot shows a Linux desktop environment with three main windows:

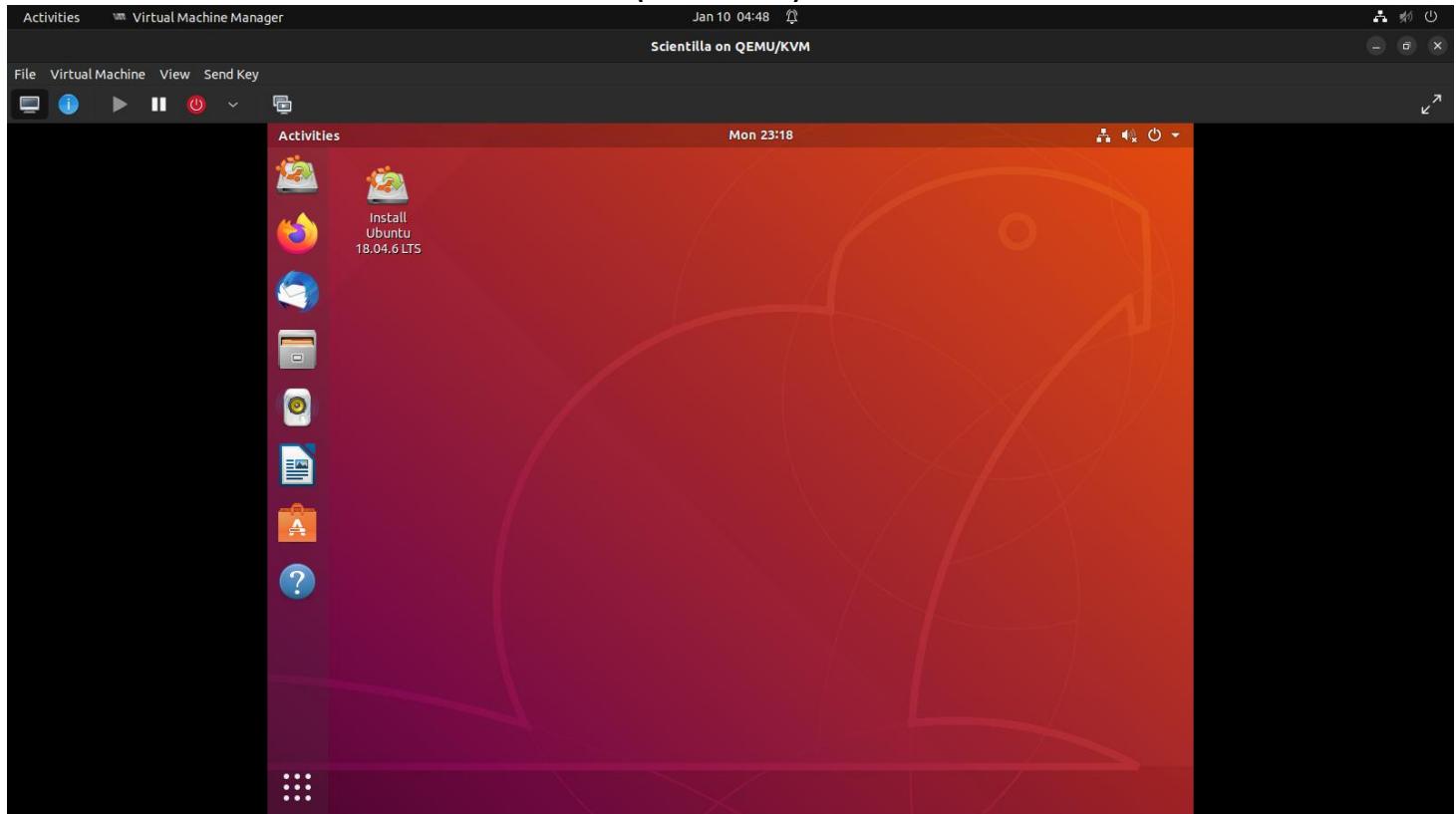
- File Browser:** Located at the top right, titled "Virtual Machine Manager". It displays a list of files in the "/home/dcstcsc/Desktop" directory. A file named "ubuntu-18.04.6-desktop-amd64.iso" is highlighted with an orange border.
- Terminal:** Located at the bottom right, showing a command-line session. The user runs "sudo adduser scientilla kvm" and "Adding user 'scientilla' to group 'kvm' ... Done." followed by "lspci | grep -i virt" which lists several virt-related devices.
- New VM Dialog:** Located in the center, titled "Create a new virtual machine Step 2 of 5". It asks for the ISO file path: "/Downloads/ubuntu-18.04.6-desktop-amd64.iso". Below it, it asks to choose the operating system, with "Ubuntu 18.04 LTS" selected. A checkbox for "Automatically detect from the installation media / source" is checked. Buttons for "Cancel", "Back", and "Forward" are visible.



ROLL NO: 457
TYCS

CLOUD COMPUTING
(TCSCCSP601)

NADAR SCENTILLA STEPHEN
DIV:B



D. GCP/AWS/IBM/Azure/...

Step 01 : Log onto your GCP account

Free trial status: ₹24,497.44 credit and 44 days remaining - with a full account, you'll get unlimited access to all of Google Cloud Platform.

DISMISS ACTIVATE

Google Cloud creatingInstance Search () for resources, docs, products, and more Search ADD CONTACT DISMISS

Welcome

You're working in **creatingInstance**

Project number: 999895102408 Project ID: creatinginstance

Dashboard Recommendations

Create a VM Run a query in BigQuery Create a GKE cluster Create a storage bucket

Quick access

- creatingInstance Manage Resources
- creatingInstance Compute Engine Instances
- creatingInstance My Billing Account - Overview
- creatingInstance Getting started

Privacy Policy Terms of Service

Step 02 : Creating an Linux VM Instance in GCP Compute Engine

Free trial status: ₹24,497.44 credit and 44 days remaining - with a full account, you'll get unlimited access to all of Google Cloud Platform.

DISMISS ACTIVATE

Google Cloud creatingInstance Search () for resources, docs, products, and more Search EQUIVALENT CODE HELP ASSISTANT

Create an instance

To create a VM instance, select one of the options:

- New VM instance Create a single VM instance from scratch
- New VM instance from template Create a single VM instance from an existing template
- New VM instance from machine image Create a single VM instance from an existing machine image
- Marketplace Deploy a ready-to-go solution onto a VM instance

Name * instance-1

Labels + ADD LABELS

Region * us-west4 (Las Vegas) Zone * us-west4-b

Machine configuration

Machine family

Item	Monthly estimate
2 vCPU + 4 GB memory	\$27.55
10 GB balanced persistent disk	\$1.10
Use discount	-\$0.00
Total	\$28.65

Compute Engine pricing

Instance deleted

Page 16 | 69

Step 03 : Configuring and loading Ubuntu OS in VM instance

Boot disk

Select an image or snapshot to create a boot disk; or attach an existing disk. Can't find what you're looking for? Explore hundreds of VM solutions in [Marketplace](#)

PUBLIC IMAGES **CUSTOM IMAGES** **SNAPSHOTS** **ARCHIVE SNAPSHOTS** **EXISTING DISKS**

Operating system: Ubuntu

Version: Ubuntu 20.04 LTS

Container: Confidential VM service

Boot disk type: Balanced persistent disk

Size (GB): 10

Identity and API access

Service accounts: Compute Engine default service account

SELECT **CANCEL**

Identity and API access

Service accounts: Compute Engine default service account

Access scopes: Allow default access

Firewall: Allow HTTP traffic

Advanced options

Monthly estimate: \$28.65

Compute Engine pricing

Item	Monthly estimate
2 vCPU + 4 GB memory	\$27.55
10 GB balanced persistent disk	\$1.10
Use discount	-\$0.00
Total	\$28.65

CREATE **CANCEL** **EQUIVALENT CODE**

Step 04 : Once the instance is created connect to OS using ssh protocol

The screenshot shows the Google Cloud Platform interface for Compute Engine. On the left, there's a sidebar with 'Compute Engine' selected under 'Virtual machines'. The main area shows a table of VM instances with one entry: 'linuxinstance' (Status: Up, Zone: us-west4-b). Below the table are several related actions: 'Explore Backup and DR', 'View billing report', 'Monitor VMs', 'Explore VM logs', 'Set up firewall rules', 'Patch management', and 'Load balance between VMs'. At the top right, there are buttons for 'DISMISS' and 'ACTIVATE'.

The screenshot shows an SSH session in a browser window titled 'SSH-in-browser'. The terminal output is as follows:

```
Welcome to Ubuntu 20.04.5 LTS (GNU/Linux 5.15.0-1027-gcp x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/advantage

 System information as of Sat Feb 11 06:14:24 UTC 2023
 System load: 0.33      Processes:          109
 Usage of /: 19.5% of 9.51GB   Users logged in: 0
 Memory usage: 5%          IPv4 address for ens4: 10.182.0.2
 Swap usage: 0%          

 0 updates can be applied immediately.

 The list of available updates is more than a week old.
 To check for new updates run: sudo apt update

 The programs included with the Ubuntu system are free software;
 the exact distribution terms for each program are described in the
 individual files in /usr/share/doc/*/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

scientilla5524@linuxinstance:~$
```

CONCLUSION: Successfully implemented Infrastructure as a service (IAAS)

PRACTICAL 2

AIM: Study and implementation of Platform as a Service A. Using FOSS Server B. Using KVM. C. GCP/AWS/IBM/Azure/...

THEORY:

What is Platform as a Service (PaaS)?

Platform as a Service, also known as PaaS, is a type of cloud computing service model that offers a flexible, scalable cloud platform to develop, deploy, run, and manage apps. PaaS provides everything developers need for application development without the headaches of updating the operating system and development tools or maintaining hardware. Instead, the entire PaaS environment—or platform—is delivered by a third-party service provider via the cloud.

Unlike IaaS or SaaS service models, PaaS solutions are specific to application and software development and typically include:

- **Cloud infrastructure:** Data centers, storage, network equipment, and servers
- **Middleware software:** Operating systems, frameworks, development kits (SDK), libraries, and more
- **User interface:** A graphical user interface (GUI), a command line interface (CLI), an API interface, and in some cases, all three

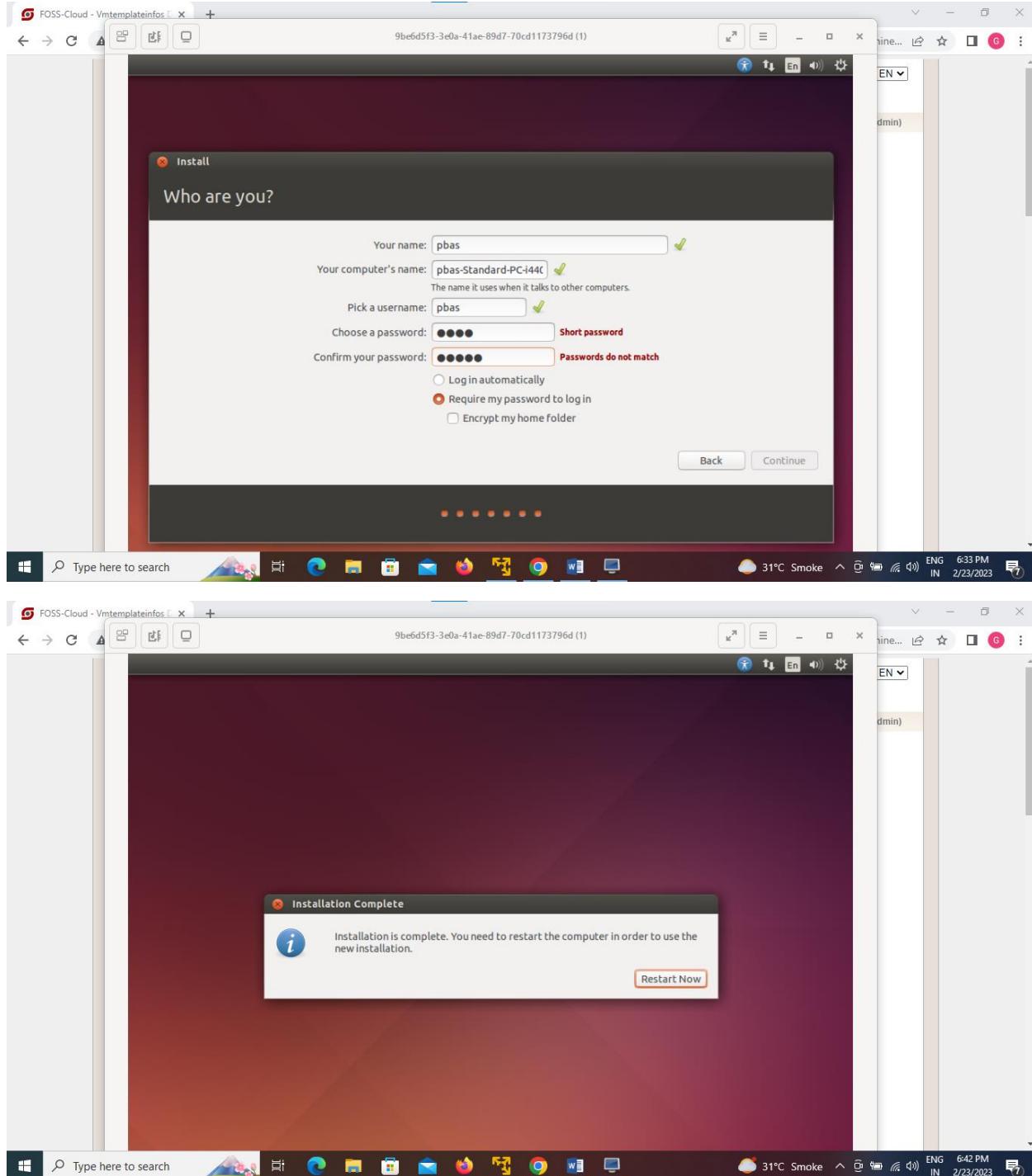
Benefits of PaaS

- Cost-effective pricing
- Low maintenance
- Flexible access

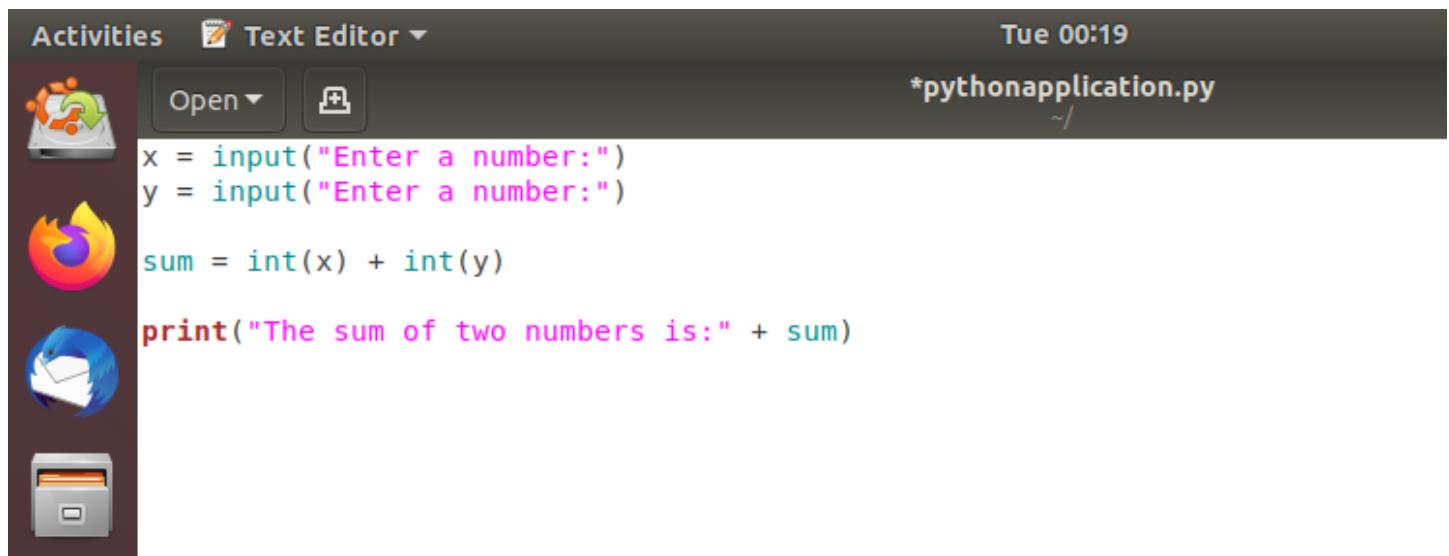
IMPLEMENTATION & OUTPUT:

A) Using FOSS Demo & B) FOSS Server

Step 1: Once the Infrastructure is set up using FOSS Server using terminal to access python platform i.e PaaS



Step 2: Use commands touch app.py and sudo gedit app.py to enter the editor and create applications



A screenshot of a Linux desktop environment. At the top, there's a dock with icons for Dash, Text Editor, Open, and a plus sign. The main window is titled "Text Editor" and shows the following Python code:

```
x = input("Enter a number:")
y = input("Enter a number:")

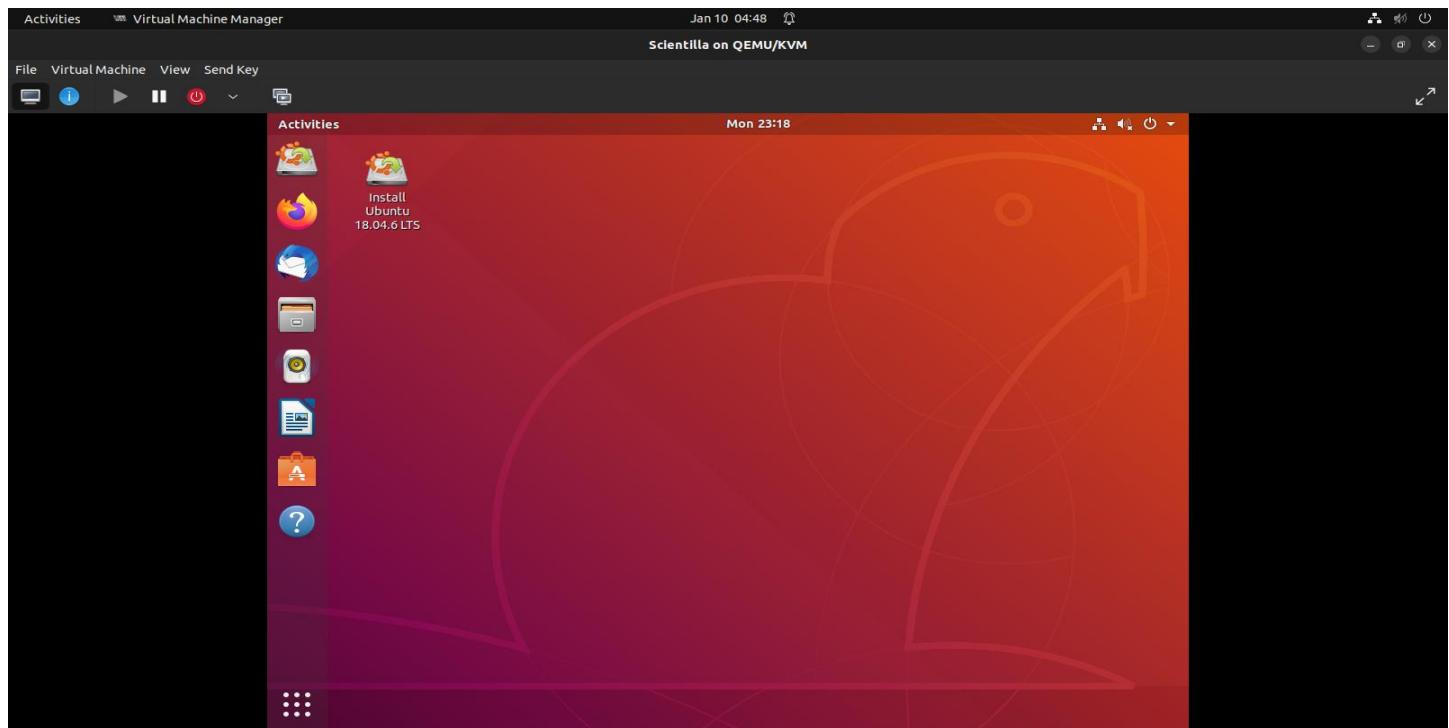
sum = int(x) + int(y)

print("The sum of two numbers is:" + sum)
```

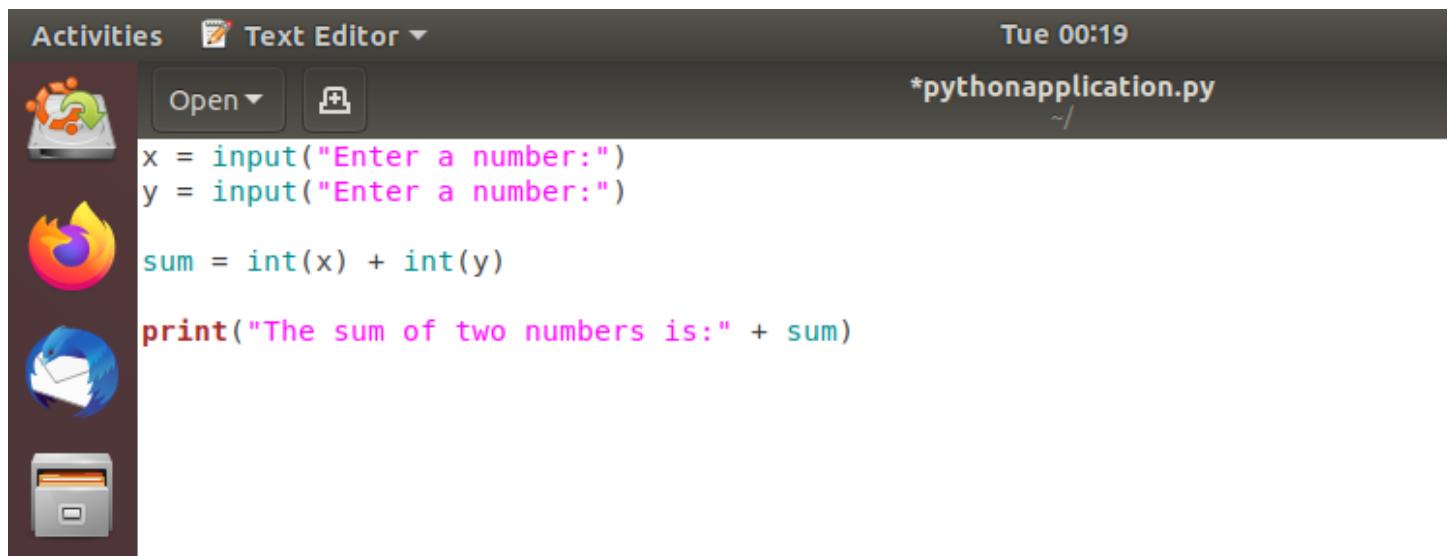
C. USING Ubuntu and KVM

Steps: Refer to IAAS implementation and once the Infrastructure is set up open terminal and type command
touch pythonapplication.py

sudo gedit pythonapplication.py



Step 02: Gedit opens an interface where you can create applications.



The screenshot shows a Linux desktop environment with a dark theme. The Gedit text editor is open, displaying the following Python script:

```
x = input("Enter a number:")
y = input("Enter a number:")

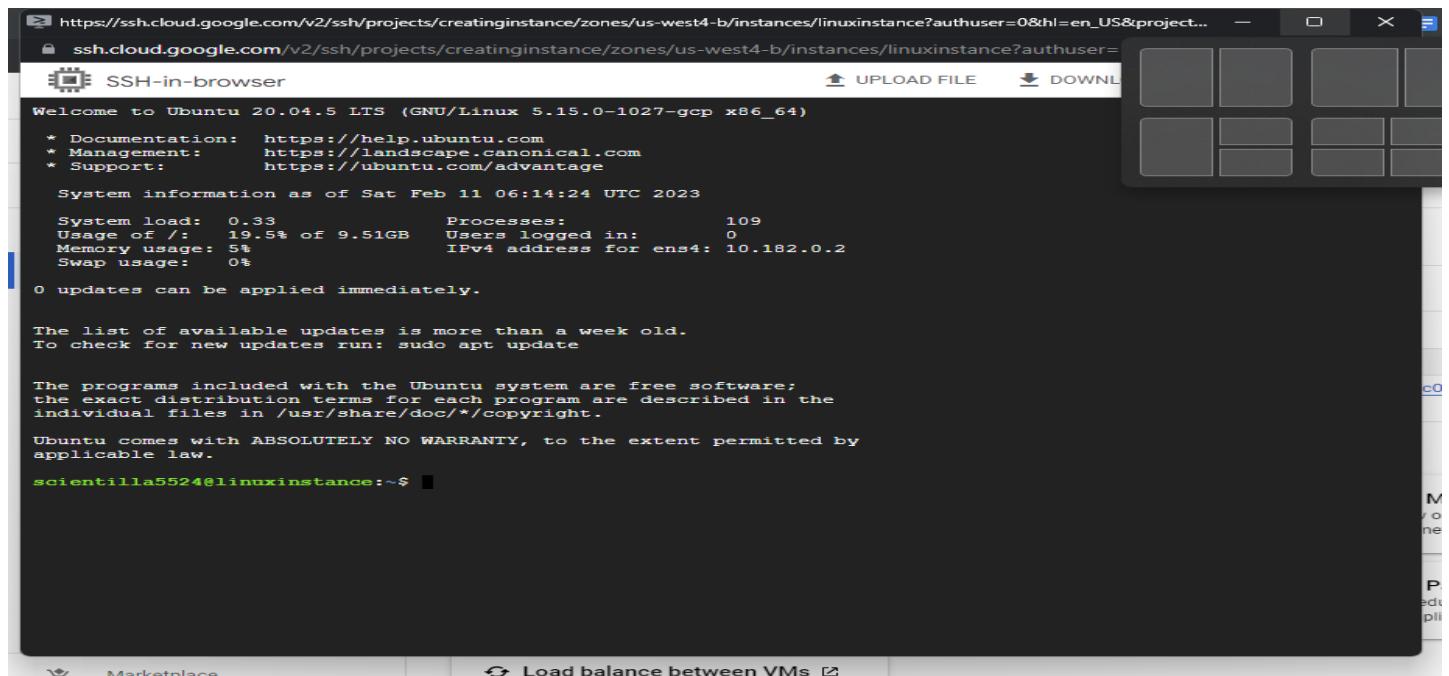
sum = int(x) + int(y)

print("The sum of two numbers is:" + sum)
```

D. GCP/AWS/IBM/Azure/...

Step 01: Refer to IAAS implementation and once the Infrastructure is set up open terminal and type command
touch app.py

sudo vi app.py



The screenshot shows an SSH session in a browser window titled "SSH-in-browser". The terminal output shows the contents of the "app.py" file:

```
Welcome to Ubuntu 20.04.5 LTS (GNU/Linux 5.15.0-1027-gcp x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/advantage

 System information as of Sat Feb 11 06:14:24 UTC 2023

 System load: 0.33           Processes:          109
 Usage of /: 19.5% of 9.51GB   Users logged in: 0
 Memory usage: 5%            IPv4 address for ens4: 10.182.0.2
 Swap usage: 0%

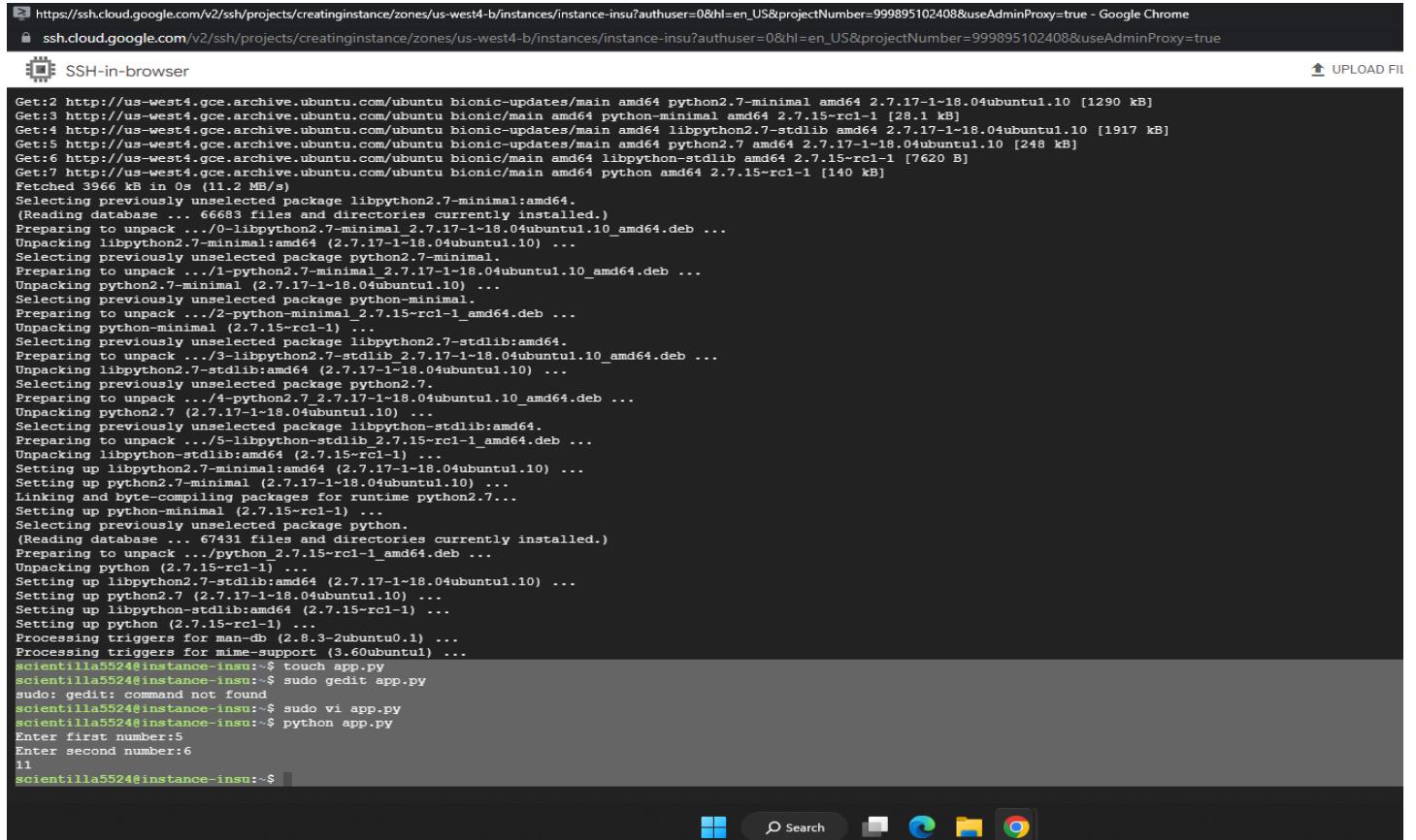
 0 updates can be applied immediately.

 The list of available updates is more than a week old.
 To check for new updates run: sudo apt update

 The programs included with the Ubuntu system are free software;
 the exact distribution terms for each program are described in the
 individual files in /usr/share/doc/*/*copyright.

 Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
 applicable law.

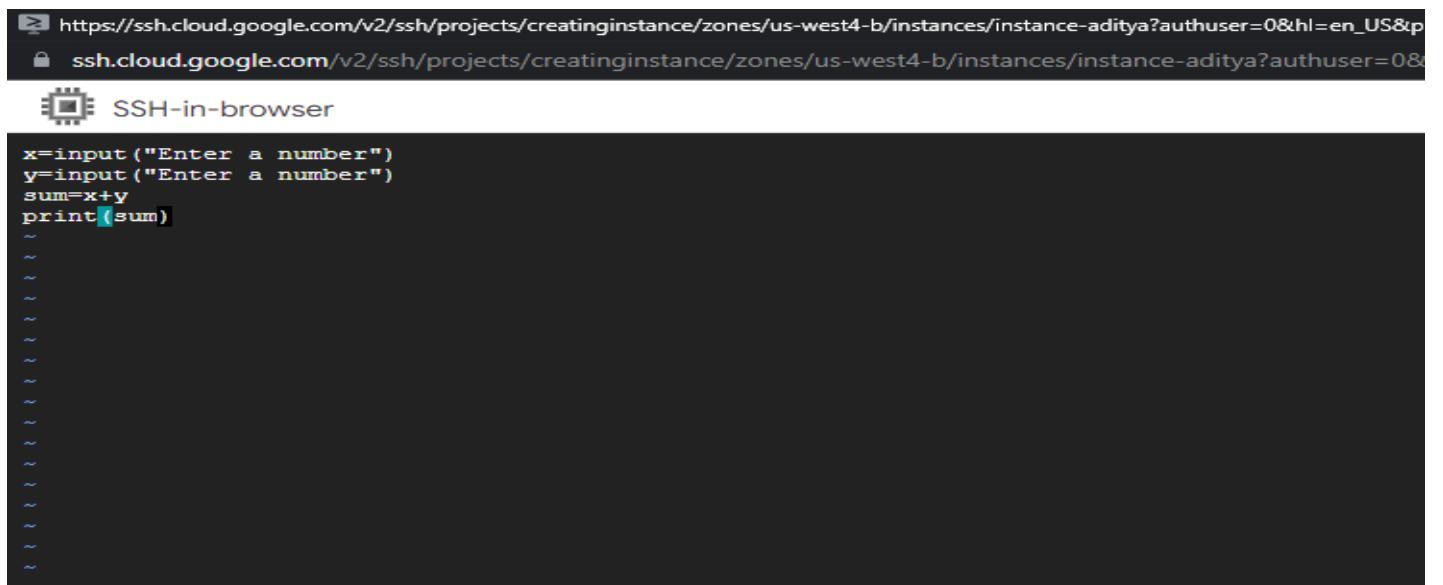
scientilla5524@linuxinstance:~$
```



```

Get:2 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic-updates/main amd64 python2.7-minimal amd64 2.7.17-1-18.04ubuntul.10 [1290 kB]
Get:3 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic/main amd64 python-minimal amd64 2.7.15-rc1-1 [28.1 kB]
Get:4 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libpython2.7-stdlib amd64 2.7.17-1-18.04ubuntul.10 [1917 kB]
Get:5 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic-updates/main amd64 python2.7 amd64 2.7.17-1-18.04ubuntul.10 [248 kB]
Get:6 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic/main amd64 libpython2.7-stdlib amd64 2.7.15-rc1-1 [7620 B]
Get:7 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic/main amd64 python amd64 2.7.15-rc1-1 [140 kB]
Fetched 3966 kB in 0s (11.2 MB/s)
Selecting previously unselected package libpython2.7-minimal:amd64.
(Reading database ... 66683 files and directories currently installed.)
Preparing to unpack .../0-libpython2.7-minimal_2.7.17-1-18.04ubuntul.10_amd64.deb ...
Unpacking libpython2.7-minimal:amd64 (2.7.17-1-18.04ubuntul.10) ...
Selecting previously unselected package python2.7-minimal.
Preparing to unpack .../1-python2.7-minimal_2.7.17-1-18.04ubuntul.10_amd64.deb ...
Unpacking python2.7-minimal (2.7.17-1-18.04ubuntul.10) ...
Selecting previously unselected package python-minimal.
Preparing to unpack .../2-python-minimal_2.7.15-rc1-1_amd64.deb ...
Unpacking python-minimal (2.7.15-rc1-1) ...
Selecting previously unselected package libpython2.7-stdlib:amd64.
Preparing to unpack .../3-libpython2.7-stdlib_2.7.17-1-18.04ubuntul.10_amd64.deb ...
Unpacking libpython2.7-stdlib:amd64 (2.7.17-1-18.04ubuntul.10) ...
Selecting previously unselected package python2.7.
Preparing to unpack .../4-python2.7_2.7.17-1-18.04ubuntul.10_amd64.deb ...
Unpacking python2.7 (2.7.17-1-18.04ubuntul.10) ...
Selecting previously unselected package libpython-stdlib:amd64.
Preparing to unpack .../5-libpython-stdlib_2.7.15-rc1-1_amd64.deb ...
Unpacking libpython-stdlib:amd64 (2.7.15-rc1-1) ...
Setting up libpython2.7-minimal:amd64 (2.7.17-1-18.04ubuntul.10) ...
Setting up python2.7-minimal (2.7.17-1-18.04ubuntul.10) ...
Linking and byte-compiling packages for runtime python2.7...
Setting up python-minimal (2.7.15-rc1-1) ...
Selecting previously unselected package python.
(Reading database ... 67431 files and directories currently installed.)
Preparing to unpack .../python_2.7.15-rc1-1_amd64.deb ...
Unpacking python (2.7.15-rc1-1) ...
Setting up libpython2.7-stdlib:amd64 (2.7.17-1-18.04ubuntul.10) ...
Setting up python2.7 (2.7.17-1-18.04ubuntul.10) ...
Setting up libpython-stdlib:amd64 (2.7.15-rc1-1) ...
Setting up python (2.7.15-rc1-1) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for mime-support (3.60ubuntu1) ...
scientilla5524@instance-insu:~$ touch app.py
scientilla5524@instance-insu:~$ sudo gedit app.py
sudo: gedit: command not found
scientilla5524@instance-insu:~$ sudo vi app.py
scientilla5524@instance-insu:~$ python app.py
Enter first number:5
Enter second number:6
11
scientilla5524@instance-insu:~$
```

Step 02: Vi editor opens an interface where you can create applications.



```

x=input("Enter a number")
y=input("Enter a number")
sum=x+y
print(sum)

~
```

CONCLUSION: Successfully implemented Platform as a service (PaaS)

PRACTICAL 3

AIM: Study and implementation of Software as a Service A. Using FOSS Server B. Using KVM. C. GCP/AWS/IBM/Azure/...

THEORY:

What is software as a service?

Software as a service (SaaS) is a software distribution model in which a cloud provider hosts applications and makes them available to end users over the internet. In this model, an independent software vendor (ISV) may contract a third-party cloud provider to host the application. Or, with larger companies, such as Microsoft, the cloud provider might also be the software vendor.

The service provider delivers and manages the entire application stack—from the hardware infrastructure all the way to the application itself—through the internet. All updates, bug fixes, and other general maintenance to all components are handled by the provider. All you have to do is connect to the app.

In the software-on-demand SaaS model, the provider gives customers network-based access to a single copy of an application that the provider created specifically for SaaS distribution. The application's source code is the same for all customers, and when new features or functionalities are released, they are rolled out to all customers. Depending on the service-level agreement (SLA), the customer's data for each model may be stored locally, in the cloud or both locally and in the cloud.

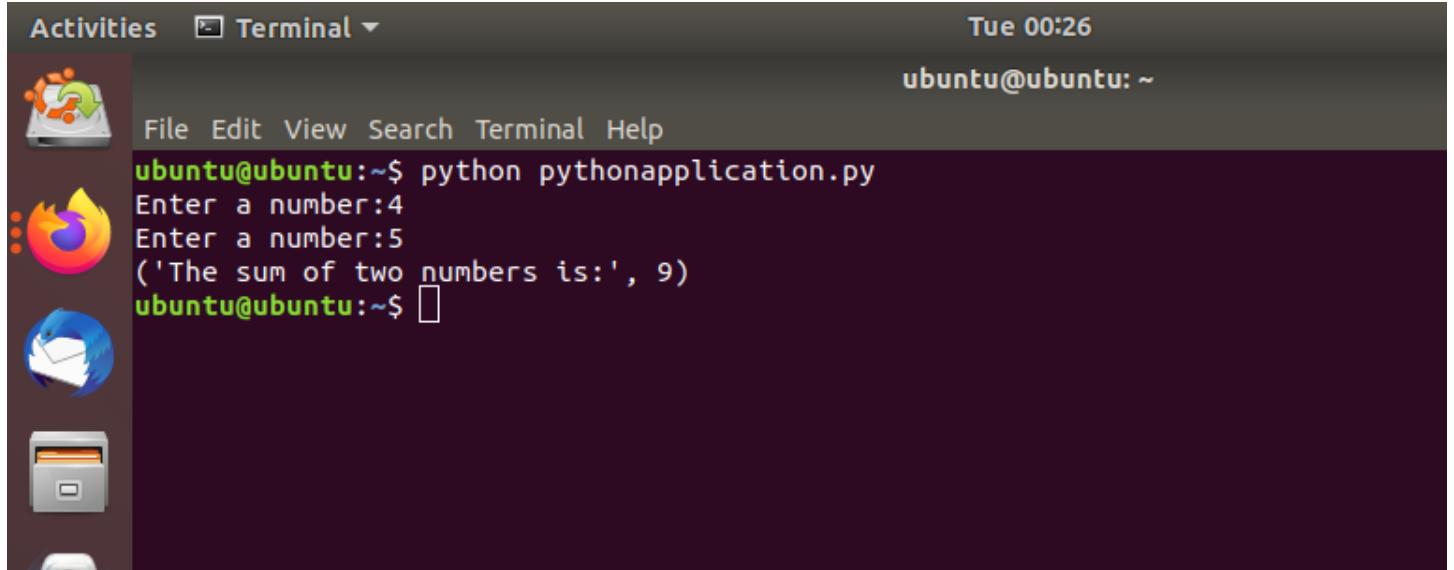
Advantages of SaaS

- Flexible payments.
- Scalable usage.
- Automatic updates
- Customization

IMPLEMENTATION & OUTPUT:

A. Using FOSS Demo & B)FOSS Server

Steps: Now your application is ready(refer above) you can access the app using command python app.py



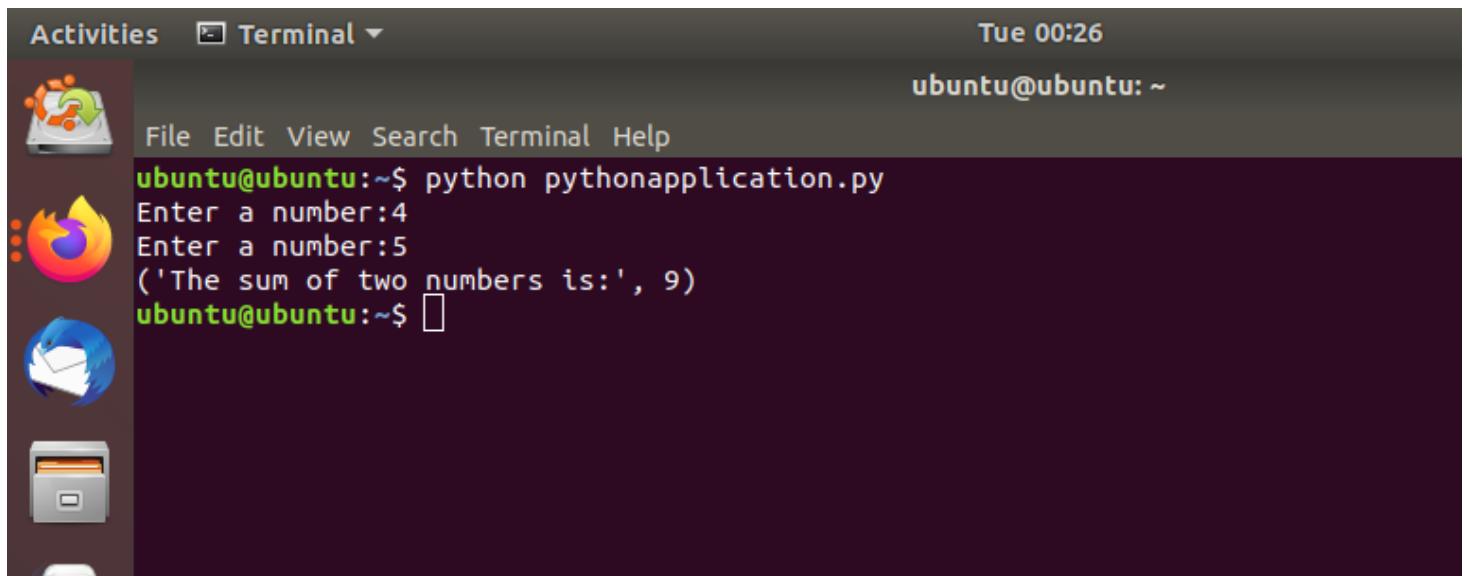
A screenshot of an Ubuntu desktop environment. On the left is a dock with icons for Dash, Home, Applications, and Files. A terminal window titled "Terminal" is open in the center. The terminal shows the command "python pythonapplication.py" being run, followed by user input "Enter a number:4" and "Enter a number:5", and the output "('The sum of two numbers is:', 9)". The terminal window has a dark background with light-colored text. The status bar at the top right shows "Tue 00:26" and "ubuntu@ubuntu: ~".

C. USING Ubuntu and KVM

Step 01: Refer to IAAS & PAAS implementation mentioned above and once the application is ready to execute open terminal and type command

python pythonapplication.py

Step 02: Take user inputs and displays output



A screenshot of an Ubuntu desktop environment, similar to the one above. It shows a terminal window with the same command and output as the previous screenshot. The terminal window is titled "Terminal" and is located on the desktop. The status bar at the top right shows "Tue 00:26" and "ubuntu@ubuntu: ~".

D. GCP/AWS/IBM/Azure/...

Step 01: Refer to IAAS & PAAS implementation mentioned above and once the application is ready to execute open terminal and type command

python app.py

Step 02: Take user inputs and displays output

```
Unpacking python (2.7.15~rc1-1) ...
Setting up libpython2.7-stdlib:amd64 (2.7.17-1~18.04ubuntu1.10) ...
Setting up python2.7 (2.7.17-1~18.04ubuntu1.10) ...
Setting up libpython-stdlib:amd64 (2.7.15~rc1-1) ...
Setting up python (2.7.15~rc1-1) ...
Processing triggers for man-db (2.8.3-2ubuntu0.1) ...
Processing triggers for mime-support (3.60ubuntu1) ...
scientilla5524@instance-insu:~$ touch app.py
scientilla5524@instance-insu:~$ sudo gedit app.py
sudo: gedit: command not found
scientilla5524@instance-insu:~$ sudo vi app.py
scientilla5524@instance-insu:~$ python app.py
Enter first number:5
Enter second number:6
11
scientilla5524@instance-insu:~$
```



CONCLUSION: Successfully implemented Software as a service (SAAS)

PRACTICAL 4

AIM: Study and implementation of Storage as a Service A. Google Drive B. OwnCloud (online) C. Owncloud (local)

THEORY:

What Is Storage as a Service?

Storage as a Service or STaaS is cloud storage that you rent from a Cloud Service Provider (CSP) and that provides basic ways to access that storage. Enterprises, small and medium businesses, home offices, and individuals can use the cloud for multimedia storage, data repositories, data backup and recovery, and disaster recovery. There are also higher-tier managed services that build on top of STaaS, such as Database as a Service, in which you can write data into tables that are hosted through CSP resources.

The key benefit to STaaS is that you are offloading the cost and effort to manage data storage infrastructure and technology to a third-party CSP. This makes it much more effective to scale up storage resources without investing in new hardware or taking on configuration costs. You can also respond to changing market conditions faster. With just a few clicks you can rent terabytes or more of storage, and you don't have to spin up new storage appliances on your own.

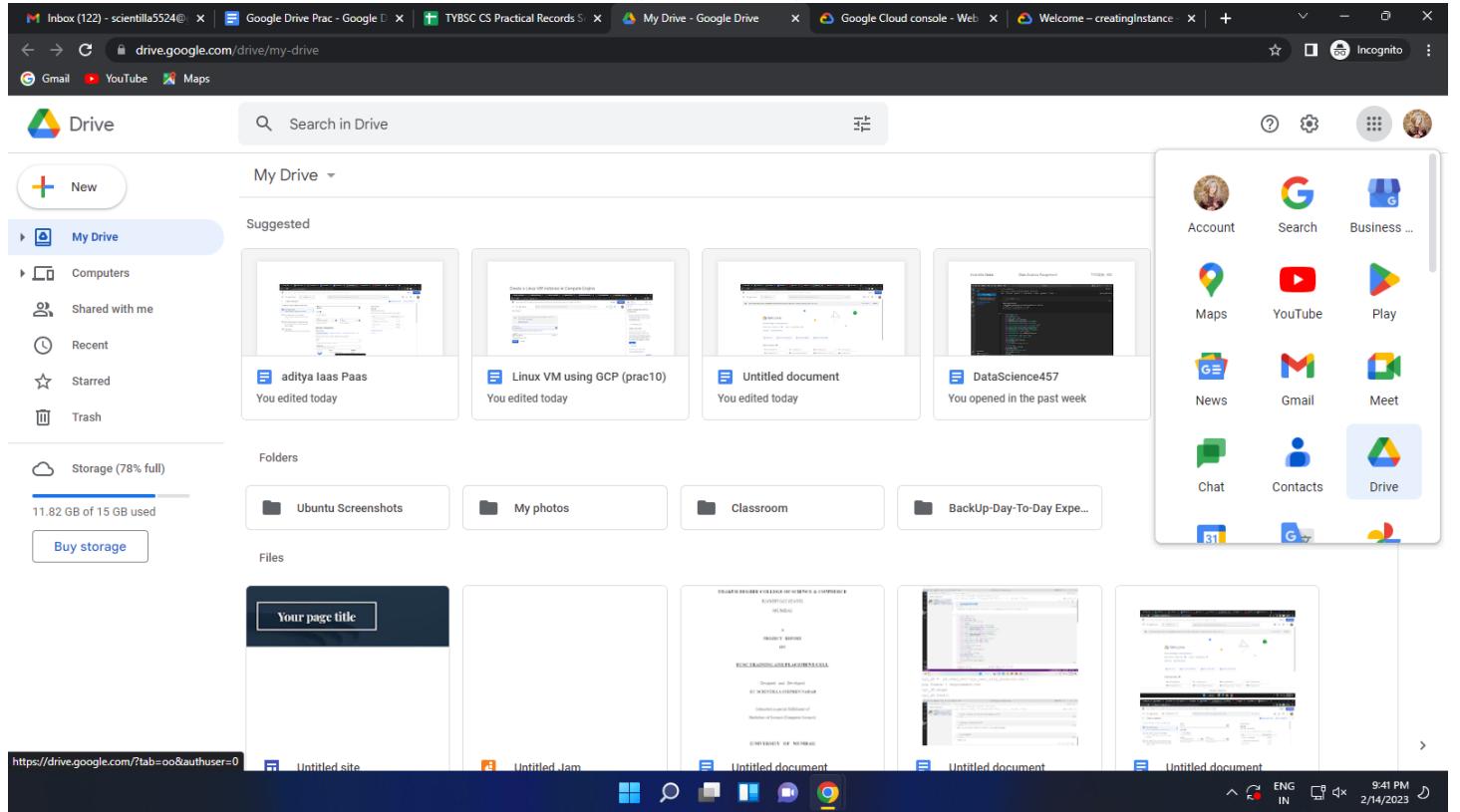
Understanding Data Types

- Block storage
- File storage
- Object-based storage

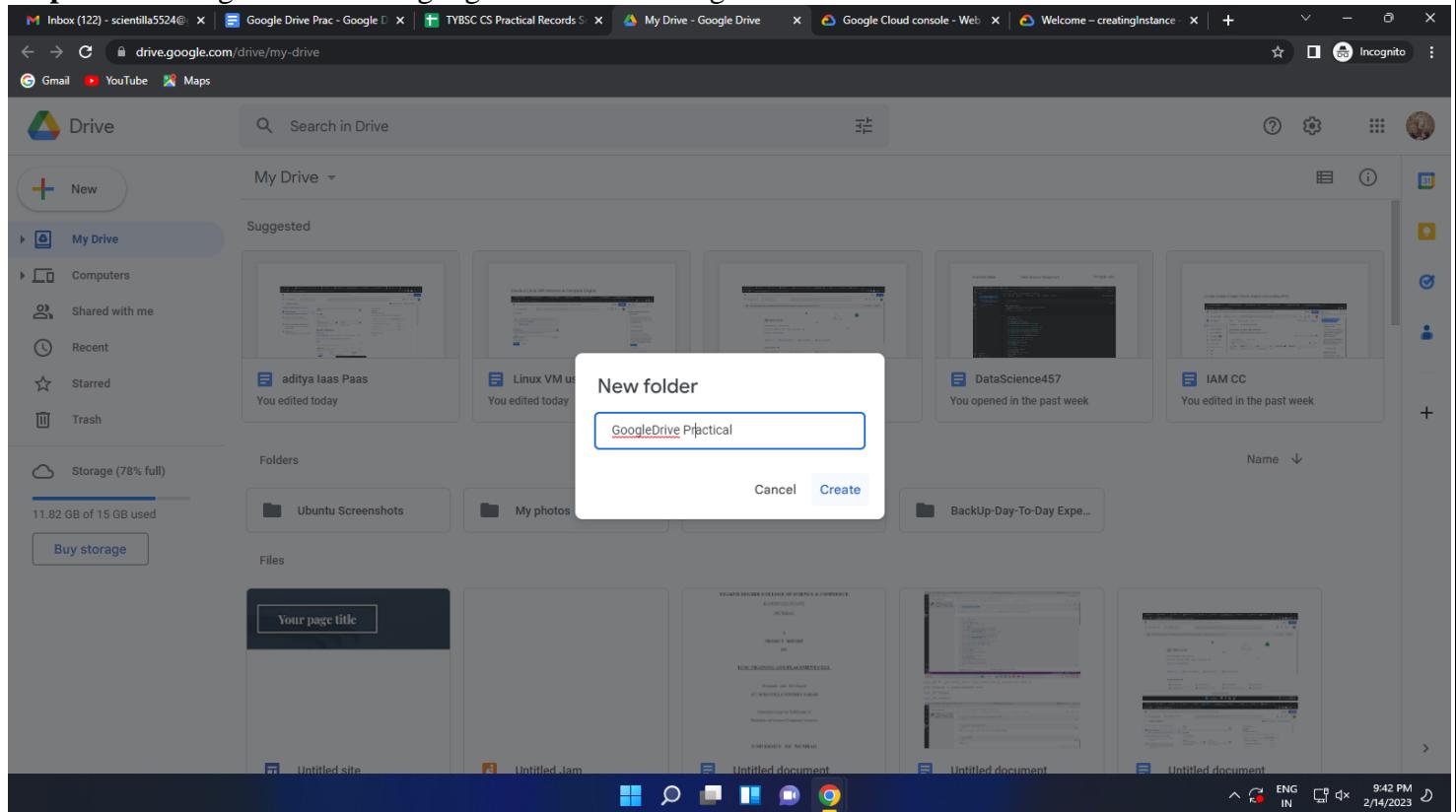
IMPLEMENTATION:

A. Google Drive

Step 01: Sign into your Google account and access the Google Drive



Step 02: Creating new folder in google drive and storing files in it.



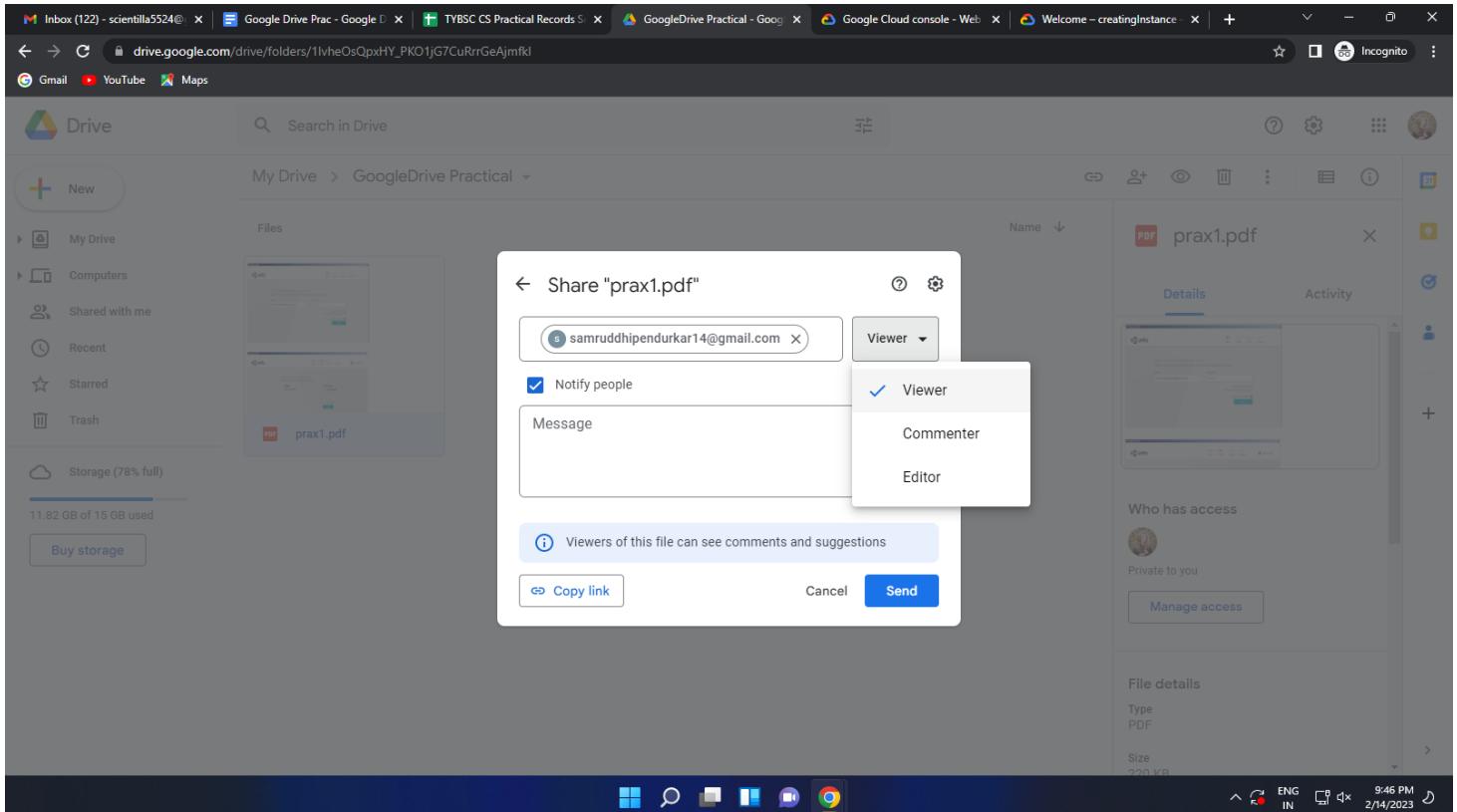
The screenshot shows a Google Drive interface. On the left, there's a sidebar with navigation links like 'My Drive', 'Computers', 'Shared with me', 'Recent', 'Starred', and 'Trash'. Below that is a storage status bar showing 'Storage (78% full)' and '11.82 GB of 15 GB used'. A 'Buy storage' button is also present. The main area displays a single file, 'prax1.pdf', which has a red 'PDF' icon. The file is located in the 'GoogleDrive Practical' folder, indicated by the breadcrumb trail 'My Drive > GoogleDrive Practical'. The top navigation bar includes tabs for 'Inbox', 'Google Drive Prac', 'Google Cloud console', and 'Welcome'.

1 upload complete

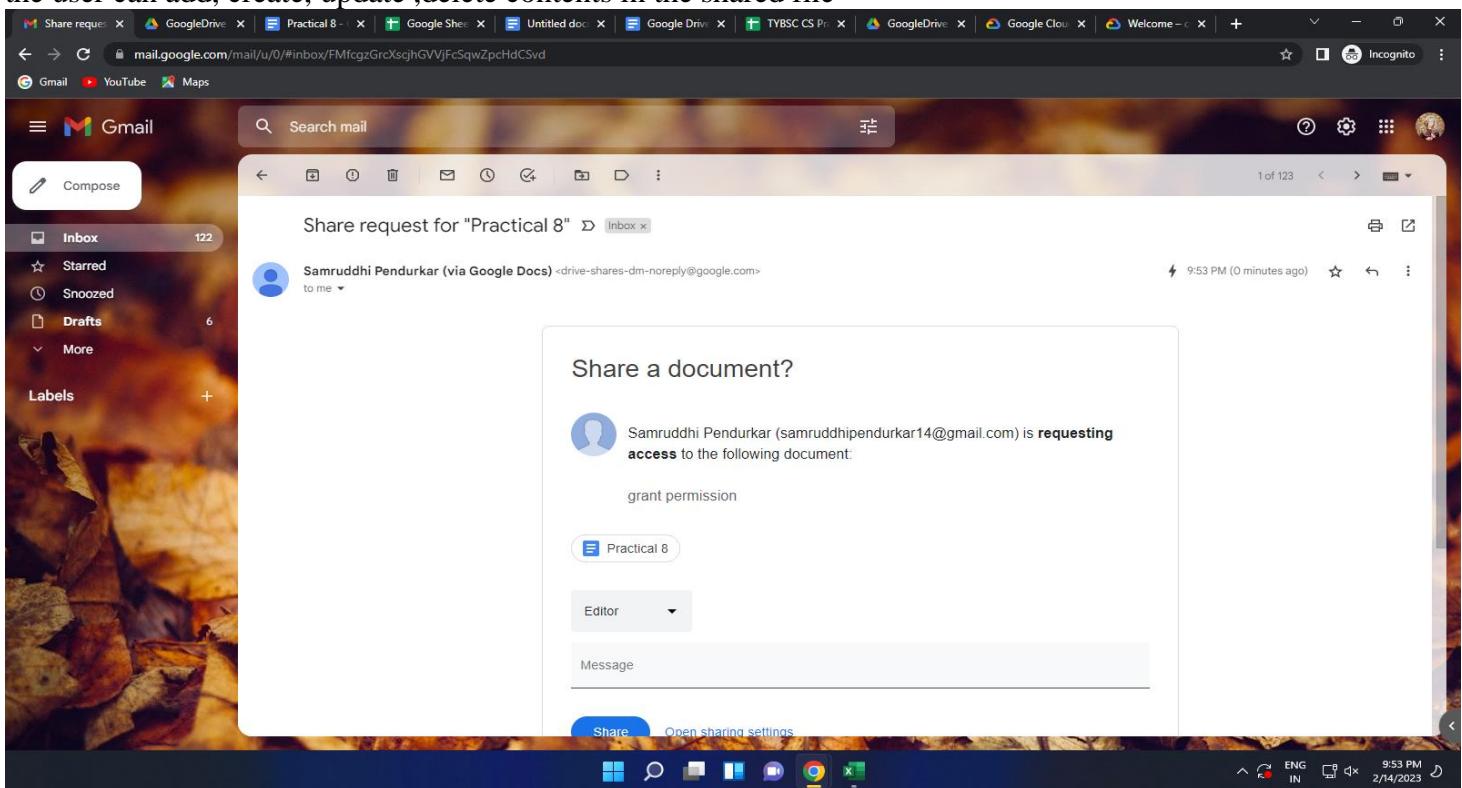
prax1.pdf

Step 03: Sharing and Managing permissions and access to shared users

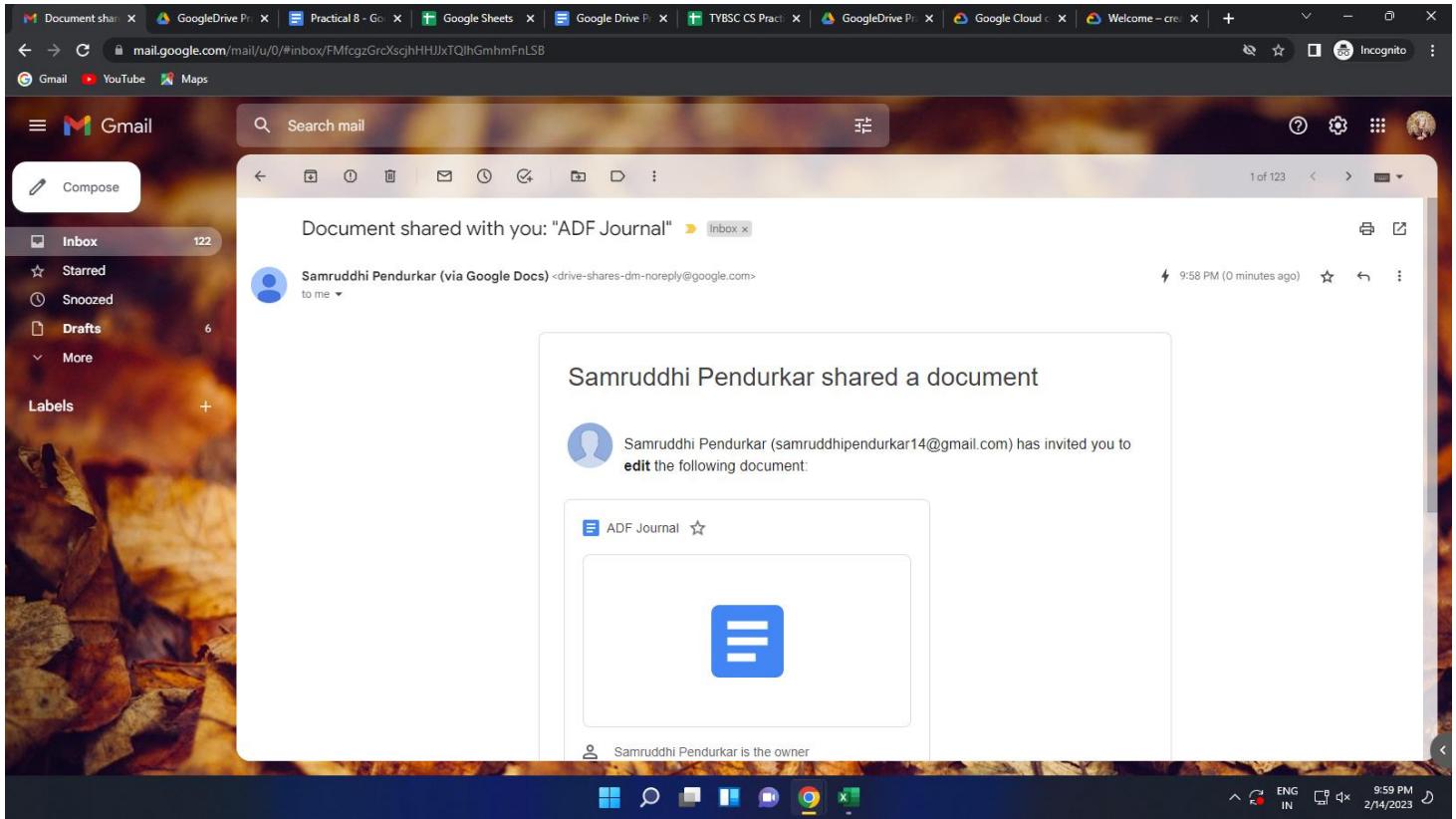
This screenshot shows the same Google Drive interface as above, but with a file info card open for 'prax1.pdf'. The card displays the file's name, type (PDF), and size (220 KB). It also shows the 'Details' tab, which includes a preview of the document and a 'Who has access' section. This section indicates that the file is 'Private to you' and provides a 'Manage access' button. The bottom of the card shows the 'File details' section again. The desktop taskbar at the bottom shows various application icons.



Step 04: Accepting or updating access permission upon request since the user requested editor permission now the user can add, create ,update ,delete contents in the shared file



Step 05: Accessing files and folders shared by others to you. Since I have editor access to this file I can update or delete contents of the file or folder.



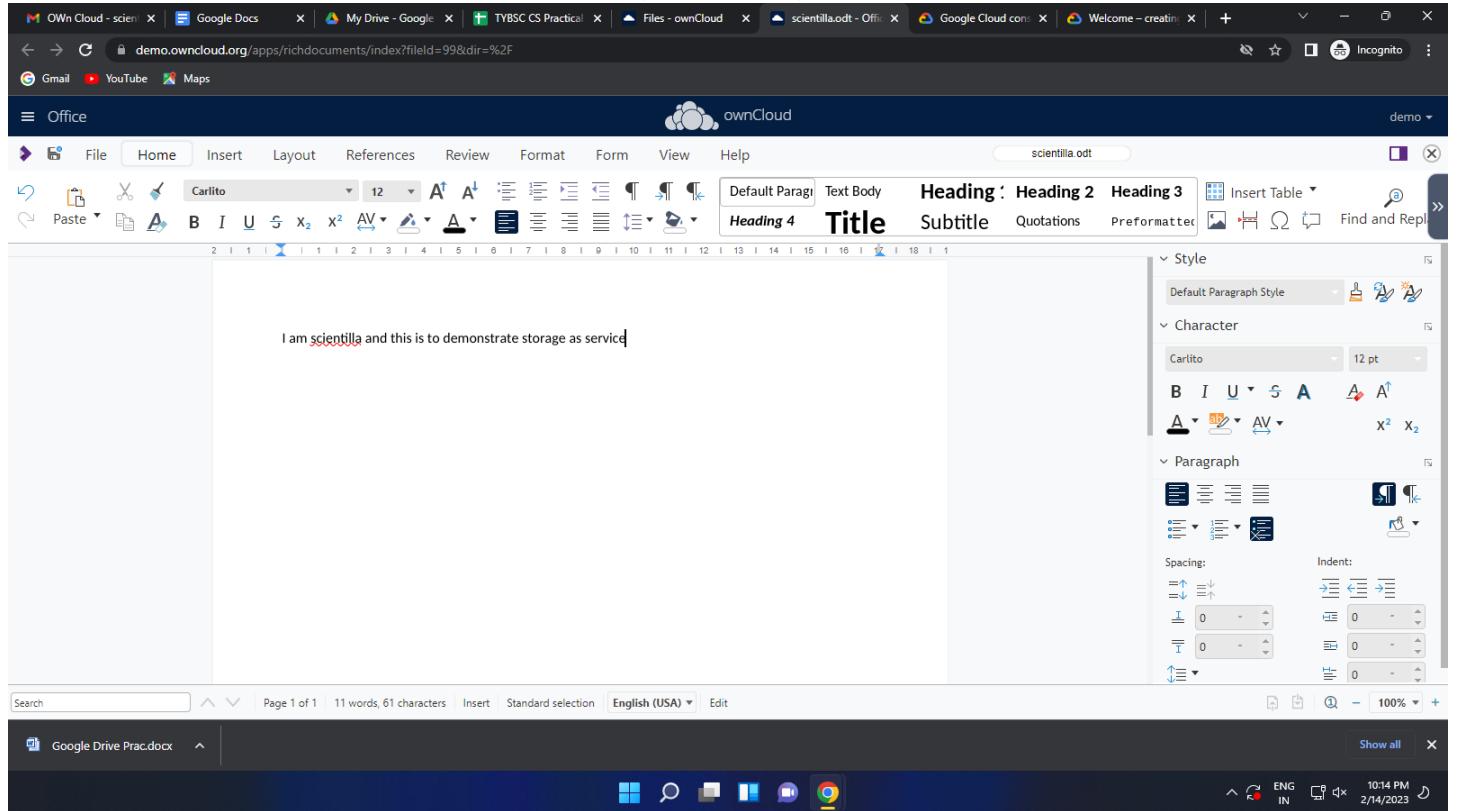
A screenshot of a Google Docs editor window. The title bar shows 'ADF Journal'. The document content includes two simple arithmetic equations: $8 + 6 = 14$ and $4 * 5 = 20$. A blue box at the bottom left contains the text 'I have edited this file'. The right side of the screen features a sidebar with sharing and collaboration options. The bottom status bar shows system icons and date/time (9:59 PM, 2/14/2023).

B. OwnCloud (online)

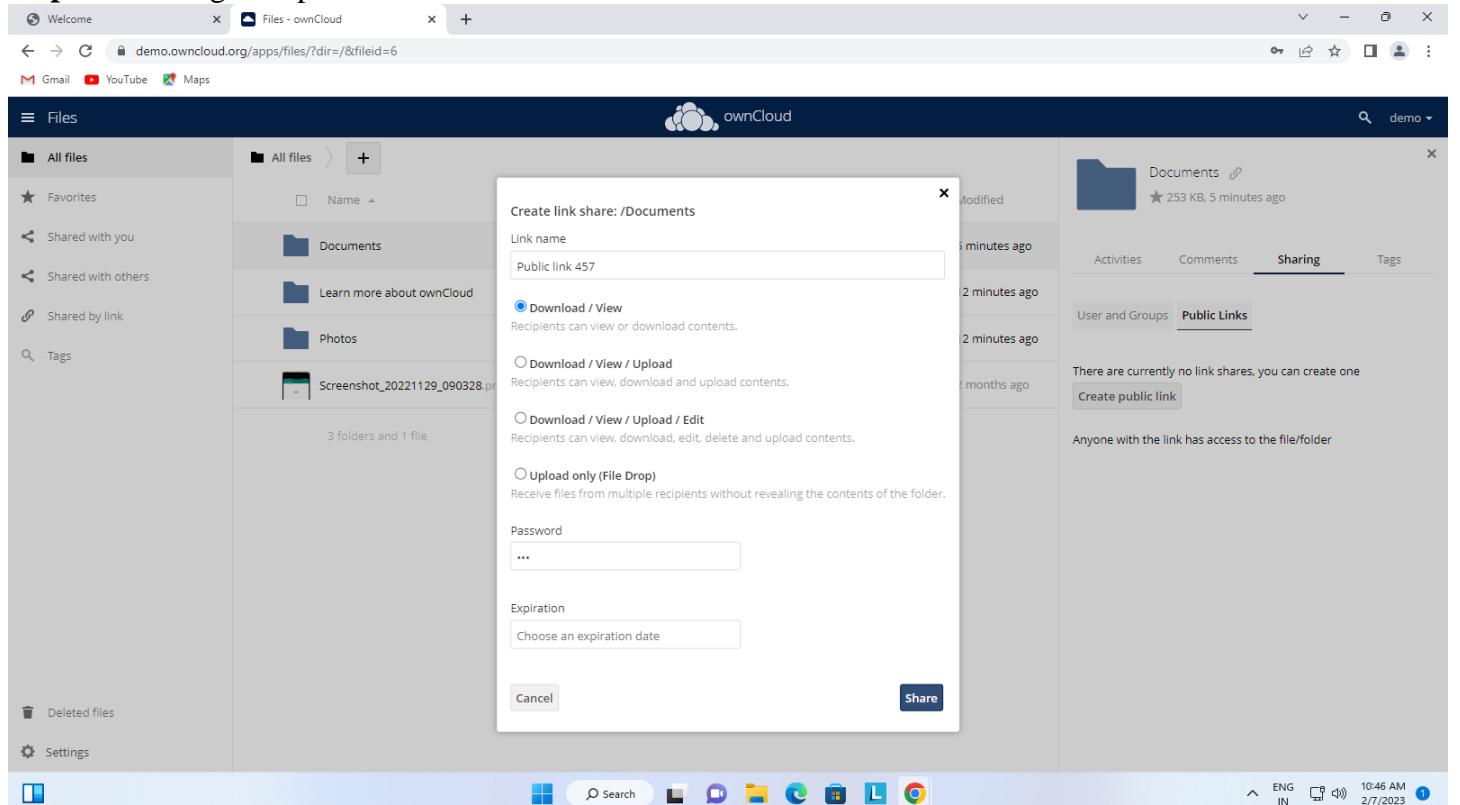
Step 01: Access the owncloud.org website and login as demo user create a file to be shared.

The screenshot shows the ownCloud web interface. A context menu is open over a file named "Example.odt". The menu options include Upload, Folder, Text file, Document, Spreadsheet, Presentation, Form template, Form template from existing text file, Document, Spreadsheet, Presentation, and Drawing. The "Document" option is highlighted. The main file list shows "Example.odt" with a size of 35 KB and modified 8 minutes ago. Below the file list, there are sections for Deleted files and Settings. The browser's address bar shows the URL: <https://demo.owncloud.org/apps/files/?dir=/&fileid=7>. The status bar at the bottom right indicates ENG IN, 10:43 AM, and 2/7/2023.

The screenshot shows the ownCloud web interface. A context menu is open over a file named "scientilla.odt". The menu options include Upload, Folder, Text file, Document, Spreadsheet, Presentation, Form template, Form template from existing text file, Document, Spreadsheet, Presentation, and Drawing. The "Document" option is highlighted. The main file list shows "scientilla.odt" with a size of 0 KB and modified 4 minutes ago. Below the file list, there are sections for Deleted files and Settings. The browser's address bar shows the URL: <https://demo.owncloud.org/apps/files/?dir=/&fileid=6>. The status bar at the bottom right indicates ENG IN, 10:12 PM, and 2/14/2023.

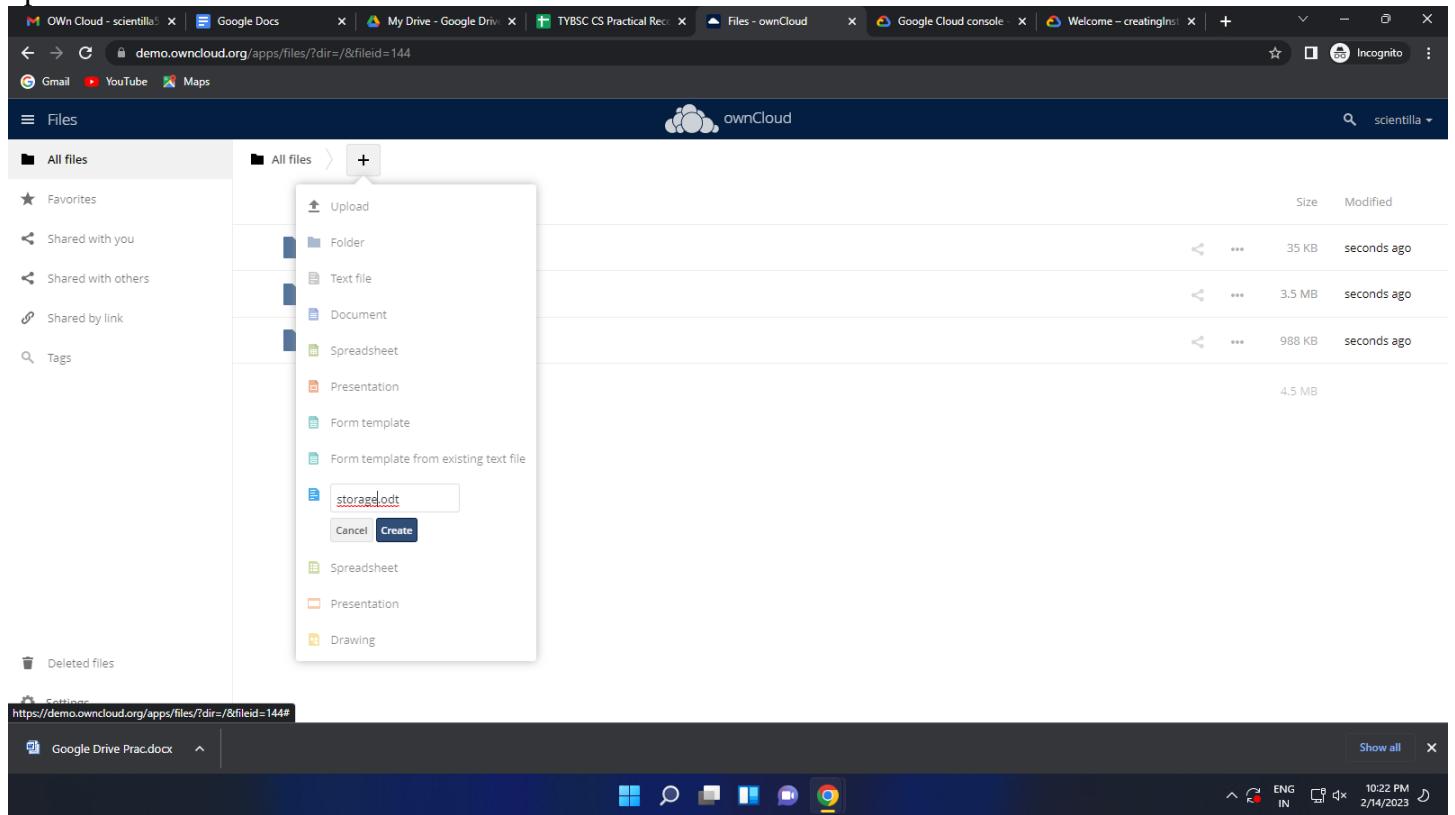


Step 02: Sharing the uploaded or created document

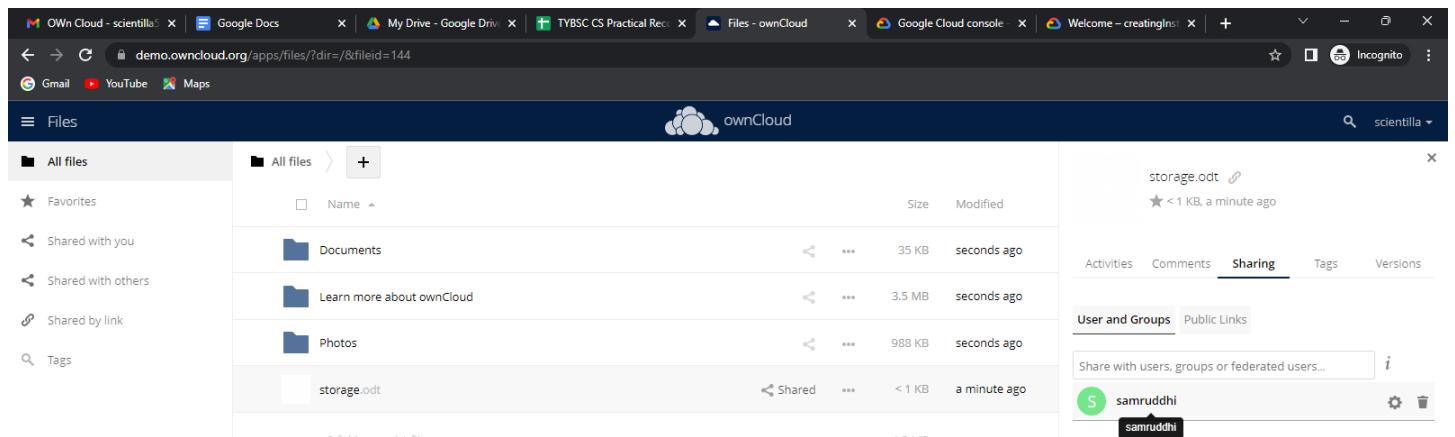


C. Owncloud (local)

Step 01: Login to owncloud.org as admin to create user **Scientilla**. Now this is personal cloud storage, add or upload files



Step 02: Sharing the created storage.odt file with **samruddhi**(also an user of the owncloud). You can view it in the ‘Shared with others’ section.



The screenshot shows the ownCloud web interface. On the left sidebar, 'Shared with others' is selected. In the main area, a file named 'storage.odt' is listed, shared with 'samruddhi' 2 minutes ago. The 'Sharing' tab is active. Below it, the 'User and Groups' tab is selected, showing 'samruddhi' as a sharee. Other tabs include 'Activities', 'Comments', 'Public Links', and 'Versions'.

Step 03: Change permission over the file as per you convince

The image displays two side-by-side screenshots of the ownCloud sharing interface for the 'storage.odt' file. Both screenshots show the 'Sharing' tab selected. In the left screenshot, under 'User and Groups', 'samruddhi' is listed with checkboxes for 'can share' (checked), 'can edit' (unchecked), and 'change' (unchecked). In the right screenshot, the same user 'samruddhi' is listed with checkboxes for 'can share' (checked), 'can edit' (checked), and 'change' (checked).

CONCLUSION: Successfully studied and implemented Storage as a Service using A. Google Drive B. OwnCloud (online) C. Owncloud (local)

PRACTICAL 5

AIM: User Management in Cloud A. OwnCloud (local) B. AWS/...

THEORY:

User management describes the ability for administrators to manage devices, systems, applications, storage systems, networks, SaaS services, and user access to other various IT resources. User management is a core part to any identity and access management (IAM) solution, in particular directory services tools. Controlling and managing user access to IT resources is a fundamental security essential for any organization. A user management system enables admins to control user access and on-board and off-board users to and from IT resources. Subsequently a directory service will then authenticate, authorize, and audit user access to IT resources based on what the IT admin had dictated.

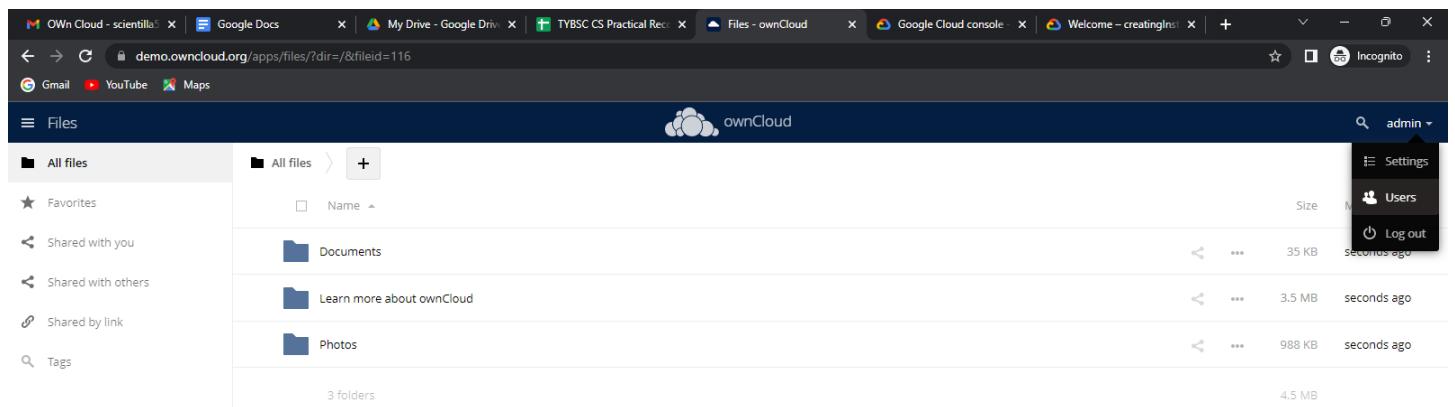
Why Do We Need User Management?

Simply put, user management solves the problem of managing user access to various resources. For example, the marketing team generally requires access to different resources than the accounting team. Further, an employee on the marketing team likely doesn't need access to internal financial systems and vice versa, a finance employee isn't requiring access to Salesforce or Marketo. User management enables IT administrators to manage resources and provision users based on need and role while keeping their digital assets secure. For end users, the tasks of user management are often invisible to them, but the results are not. End users want secure, frictionless access to their IT resources so that they can get their jobs done.

IMPLEMENTATION & OUTPUT:

A. OwnCloud (local)

Step 01: Sign into owncloud.org as admin , navigate to users section



The screenshot shows the ownCloud web interface. The top navigation bar includes links for Gmail, YouTube, and Maps, followed by tabs for 'Own Cloud - scientilla', 'Google Docs', 'My Drive - Google Drive', 'TYBSC CS Practical Rec...', 'Files - ownCloud' (which is currently active), 'Google Cloud console', and 'Welcome - creating...'. The main content area is titled 'Files' and shows a list of files and folders. On the right side, there is a sidebar with 'admin' dropdown settings, 'Users' (highlighted), and 'Logout'. The file list includes:

Name	Type	Size	Last Modified
Documents	Folder	35 KB	seconds ago
Learn more about ownCloud	File	3.5 MB	seconds ago
Photos	Folder	988 KB	seconds ago
			4.5 MB

Step 02: Create user 'Scientilla' and assign password.

The screenshot shows the 'Users' page in the ownCloud web interface. A new user 'scientilla' has been created with the following details:

Username	E-Mail	Groups	Create	
admin	admin	admin	no group	Default
demo	demo	no group	no group	Default
scientilla	scientilla	no group	no group	Default
test	test	no group	no group	Default

Step 03: Managing permissions to user and adding them to group

The screenshot shows the 'Users' page in the ownCloud web interface. The 'Groups' dropdown for the user 'scientilla' is open, showing the 'admin' group selected. A tooltip indicates 'Password successfully changed!'.

Step 04: Login using the credentials received on email used while creating user.

The screenshot shows the ownCloud login page. The user 'scientilla' has logged in successfully, as indicated by the message 'Username: demo Password: demo'. The bottom status bar shows the file 'Google Drive Prac.docx' is open.

Step 01: Create a new GCP project and enable APIs

The screenshot shows the Google Cloud IAM & Admin interface. On the left sidebar, under the 'IAM & Admin' section, the 'IAM' option is selected. In the main content area, the heading 'Permissions for project "My Project 457"' is displayed. Below it, a note states: 'These permissions affect this project and all of its resources.' A link to 'Learn more' is provided. A checkbox labeled 'Include Google-provided role grants' is present. Two tabs are available: 'VIEW BY PRINCIPALS' (selected) and 'VIEW BY ROLES'. A table lists one principal: 'scientilla5524@gmail.com' with the role 'Owner'. The table includes columns for Type, Principal, Name, Role, Security insights, and Inheritance.

Type	Principal	Name	Role	Security insights	Inheritance
	scientilla5524@gmail.com	457 Scientilla Nadar	Owner		

Step 02: Go to the IAM section where you can manage all users related to the project

The screenshot shows the Google Cloud IAM & Admin interface with a detailed navigation sidebar on the left. The 'IAM & Admin' section is pinned at the top of the sidebar. Other pinned sections include 'Cloud overview', 'Recent', 'View all products', 'Billing', 'APIs & Services', 'Marketplace', 'Compute Engine', 'Cloud Storage', 'VPC network', 'Kubernetes Engine', 'BigQuery', and 'SQL'. The main content area displays the same 'Permissions for project "My Project 457"' information as the previous screenshot, including the 'VIEW BY PRINCIPALS' table with the single entry for 'scientilla5524@gmail.com'.

Step 03: Managing users and granting or revoking permissions

Grant access to "My Project 457"

Grant principals access to this resource and add roles to specify what actions the principals can take. Optionally, add conditions to grant access to principals only when a specific criteria is met. [Learn more about IAM conditions](#)

Resource
My Project 457

Add principals
Principals are users, groups, domains, or service accounts. [Learn more about principals in IAM](#)

New principals
scientilla5524@gmail.com

Assign roles
Roles are composed of sets of permissions and determine what the principal can do with this resource. [Learn more](#)

Role * Logs Viewer
IAM condition (optional) [?](#)
[+ ADD IAM CONDITION](#)

Access to view logs, except for logs with private contents.

[+ ADD ANOTHER ROLE](#)

SAVE **CANCEL**

CONCLUSION: Successfully demonstrated user Management in Cloud A. OwnCloud (local) B. AWS/...

PRACTICAL 6

AIM: Study and implement Identity and Access Management (IAM). A. AWS/...

THEORY:

What is IAM?

AWS Identity and Access Management (IAM) is a web service that helps you securely control access to AWS resources. With IAM, you can centrally manage permissions that control which AWS resources users can access. You use IAM to control who is authenticated (signed in) and authorized (has permissions) to use resources.

When you create an AWS account, you begin with one sign-in identity that has complete access to all AWS services and resources in the account. This identity is called the AWS account *root user* and is accessed by signing in with the email address and password that you used to create the account. We strongly recommend that you don't use the root user for your everyday tasks. Safeguard your root user credentials and use them to perform the tasks that only the root user can perform. For the complete list of tasks that require you to sign in as the root user.

IAM Features

- Shared access to your AWS account
- Multi-factor authentication (MFA)
- Granular permissions
- Identity information for assurance

IMPLEMENTATION & OUTPUT:

Free trial status: ₹24,497.88 credit and 48 days remaining - with a full account, you'll get unlimited access to all of Google Cloud Platform.

DISMISS ACTIVATE

Google Cloud My Project 457 Search (/) for resources, docs, products, and more

IAM & Admin IAM GRANT ACCESS REMOVE ACCESS HELP ASSISTANT LEARN

PERMISSIONS RECOMMENDATIONS HISTORY

Permissions for project "My Project 457"

These permissions affect this project and all of its resources. [Learn more](#)

Include Google-provided role grants

VIEW BY PRINCIPALS VIEW BY ROLES

Type	Principal	Name	Role	Security insights	Inheritance
User	scientilla5524@gmail.com	457 Scientilla Nadar	Owner	Logs Viewer	Edit

LEARN Tutorial Step 1 of 6

Create a new Google Cloud project and enable APIs

- For this quickstart, you need a new Google Cloud project. You can also use an existing project. However, if you use an existing project, then completing this quickstart will enable some users to access resources in that project.

[Create a new project](#) to ensure that you have the permissions you need, or select an existing project in which you have the relevant permissions.

My Project 457 Upgrade

Upgrade your Free Trial

If you've used all of your credits or reached the end of your Free Trial, you must activate a full account to continue using Google Cloud. Activate to keep any remaining credits to spend during your trial and to avoid a disruption in service.

Enable APIs This will enable Google Cloud API

PREVIOUS NEXT

ENG IN 10:27 AM 2/11/2023

Free trial status: ₹24,497.88 credit and 48 days remaining - with a full account, you'll get unlimited access to all of Google Cloud Platform.

DISMISS ACTIVATE

Google Cloud My Project 457 Search (/) for resources, docs, products, and more

Cloud overview Recent View all products IAM & Admin Billing APIs & Services Marketplace Compute Engine Cloud Storage VPC network Kubernetes Engine BigQuery SQL

IAM GRANT ACCESS REMOVE ACCESS HELP ASSISTANT LEARN

RECOMMENDATIONS HISTORY

Permissions for project "My Project 457"

These permissions affect this project and all of its resources. [Learn more](#)

Include Google-provided role grants

VIEW BY ROLES

Type	Principal	Name	Role	Security insights	Inheritance
User	scientilla5524@gmail.com	457 Scientilla Nadar	Owner	Logs Viewer	Edit

LEARN Tutorial Step 2 of 6

Grant an IAM role

Grant a principal the Logs Viewer role on the project.

- In the Google Cloud console navigation menu, click **IAM & Admin > IAM**. You can see where it is by clicking the following button:

IAM & Admin > IAM

- Click **Grant access** ([Show me](#))
- Enter the email address of a principal.
- From the **Select a role** menu, search for **Logs Viewer**, then click **Logs Viewer**.
- Click **Save**.

To learn how to see this IAM role in action, click **Next**.

PREVIOUS NEXT

https://console.cloud.google.com/iam-admin/iam?tutorial=iam--quickstart&project=my-project-457-376506

ENG IN 10:29 AM 2/11/2023

Grant access to "My Project 457"

Grant principals access to this resource and add roles to specify what actions the principals can take. Optionally, add conditions to grant access to principals only when a specific criteria is met. [Learn more about IAM conditions](#)

Resource
My Project 457

Add principals
Principals are users, groups, domains, or service accounts. [Learn more about principals in IAM](#)

New principals: scientilla5524@gmail.com

Assign roles
Roles are composed of sets of permissions and determine what the principal can do with this resource. [Learn more](#)

Role: Logs Viewer

IAM condition (optional): + ADD IAM CONDITION

+ ADD ANOTHER ROLE

SAVE CANCEL

LEARN Tutorial Step 2 of 6

Grant an IAM role
Grant a principal the Logs Viewer role on the project.

- In the Google Cloud console navigation menu, click **IAM & Admin > IAM**
- Click **Grant access** [\[Show me\]](#)
- Enter the email address of a principal.
- From the **Select a role** menu, search for **Logs Viewer**, then click **Logs Viewer**.
- Click **Save**.

To learn how to see this IAM role in action, click **Next**.

Introducing Log Analytics
Transform and aggregate your log data with SQL to generate useful insights.

Query results: 1 log entry

SEVERITY	TIMESTAMP	MESSAGE
Notice	2023-02-11 10:32:22.300 IST	cloudresourcemanager.googleapis.com SetIamPolicy projects/my-project-457-376506 scientilla5524@gmail.com

REFINE SCOPE Project

RECOMMENDED FOR YOU

- Using the Logs Explorer
- Cloud Logging tour and introduction
- Use cases for Logging
- Architecture guides for monitoring and logging
- Build queries in the Logs Explorer

The screenshot shows the Google Cloud IAM interface for a project named "My Project 457". On the left, the navigation menu is visible with "IAM & Admin" selected. In the main area, under "PERMISSIONS", a principal "scientilla5524@gmail.com" is assigned the "Logs Viewer" and "Owner" roles. A third role, "Compute Viewer", is being added. The "TEST CHANGES" button is highlighted. On the right, a "LEARN Tutorial" sidebar provides step-by-step instructions for granting additional roles.

Principal: scientilla5524@gmail.com **Project:** My Project 457

Assign roles

These permissions affect this resource.

Role: Logs Viewer **IAM condition (optional):** + ADD IAM CONDITION

Role: Owner **IAM condition (optional):** + ADD IAM CONDITION

Role: Compute Viewer **IAM condition (optional):** + ADD IAM CONDITION

+ ADD ANOTHER ROLE

SUMMARY OF CHANGES

Roles removed: n/a

Role added: Compute Viewer

TEST CHANGES

LEARN Tutorial

Step 4 of 6

Grant additional roles to the same principal

- Locate the row that contains the principal that you granted a role to.
- Click Edit principal (pencil) in that row.
- Click Add another role.
- From the Select a role menu, search for Compute Viewer, then click Compute Viewer.
- Click Save.

To learn how to revoke IAM roles, click Next.

PREVIOUS NEXT

This screenshot shows the continuation of the tutorial, where the "Compute Viewer" role has been successfully removed from the principal. The "TEST CHANGES" button is highlighted. The "LEARN Tutorial" sidebar now provides instructions for revoking IAM roles.

Principal: scientilla5524@gmail.com **Project:** My Project 457

Assign roles

These permissions affect this resource.

Role: Compute Viewer **IAM condition (optional):** + ADD IAM CONDITION

+ ADD ANOTHER ROLE

SUMMARY OF CHANGES

Roles removed: Logs Viewer, Owner

Roles added: n/a

TEST CHANGES

LEARN Tutorial

Step 5 of 6

Revoke IAM roles

- Locate the row that contains the principal that you granted roles to.
- Click Edit principal (pencil) in that row.
- Click Delete role (trash) next to the Logs Viewer and Compute Viewer roles.
- Click Save.

You have now removed the principal from both of the roles. If they try to view the Logs Explorer page, they see the following error message:

You don't have permissions to view logs.

You have successfully granted roles to a principal, then revoked those roles. To avoid incurring charges to your account and learn about next steps, click Next.

PREVIOUS NEXT

The screenshot shows the Google Cloud Logs Explorer interface. At the top, there's a message about a free trial and an 'ACTIVATE' button. Below that is a search bar and a 'REFINE SCOPE' dropdown. The main area has tabs for 'Query', 'Suggested', and 'Library'. A sidebar on the left shows 'Log fields' and a 'Histogram' section with a warning message: 'Permission denied. Review your IAM permissions or contact your admin.' The histogram displays data from Feb 11, 9:56 AM to 10:30 AM. The 'Query results' section shows 0 log entries. On the right, there's a 'Recommended for you' sidebar with links like 'Using the Logs Explorer', 'Cloud Logging tour and introduction', 'Use cases for Logging', 'Architecture guides for monitoring and logging', and 'Build queries in the Logs Explorer'.

The screenshot shows the Google Cloud IAM & Admin Settings page for project 'My Project 457'. The left sidebar lists various IAM services like IAM, Identity & Organization, Policy Troubleshooter, etc. The main area shows settings for the project, including the project name (My Project 457), project ID (my-project-457-376506), and project number (826037923024). A 'Settings' tab is selected. A modal dialog at the bottom says 'Shutting down project "My Project 457."'. On the right, there's a 'Tutorial' sidebar with steps for deleting a project, a rating section, and a 'Help us improve' link.

Google Cloud Search (/) for resources, docs, products, and more Manage resources MOVE DELETE TAGS HIDE INFO PANEL

No resource selected

Name	ID	Last accessed	Status	Charges	Carb
No organization		February 11, 2023			
My Project 457	my-pr...	February 11, 2023	Shut down	₹0.00	

RESOURCES PENDING DELETION

Project is pending deletion

Project "My Project 457" is now shut down and scheduled to be deleted after Mar 13, 2023.

OK

Shutting down project "My Project 457".

LEARN Tutorial Step 6 of 6

- You cannot reuse the custom project ID of a deleted project.

If you plan to explore multiple tutorials and quickstarts, reusing projects can help you avoid exceeding project quota limits.

To delete your project, do the following:

- In the Google Cloud console navigation menu, click IAM & Admin > Settings

You can see where it is by clicking the following button:

- Confirm that the project name is the name of the project you want to delete. If it isn't, choose the project you want to delete from the project selector.
- Click Shut down.
- In the dialog, type the project ID, then click Shut down to delete the project.

How do you rate this tutorial?

Help us improve

PREVIOUS MORE TUTORIALS

ENG IN 10:42 AM 2/11/2023

CONCLUSION: Successfully studied and implemented Identity and Access Management (IAM). A. AWS/...

PRACTICAL 7

AIM: Study and implement MFA in the environment of popular Cloud Service Provider A. AWS/...

THEORY:

What is MFA (multi-factor authentication)?

Multi-factor authentication (MFA) is a multi-step account login process that requires users to enter more information than just a password. For example, along with the password, users might be asked to enter a code sent to their email, answer a secret question, or scan a fingerprint. A second form of authentication can help prevent unauthorized account access if a system password has been compromised.

What are the benefits of multi-factor authentication?

- **Reduces security risk:** Multi-factor authentication minimizes risks due to human error, misplaced passwords, and lost devices.
- **Enables digital initiatives:** Organizations can undertake digital initiatives with confidence. Businesses use multi-factor authentication to help protect organizational and user data so that they can carry out online interactions and transactions securely.
- **Improves security response:** Companies can configure a multi-factor authentication system to actively send an alert whenever it detects suspicious login attempts. This helps both companies and individuals to respond faster to cyberattacks, which minimizes any potential damage.

IMPLEMENTATION & OUTPUT:

Step 01: Login to your GCP account and Go to the Identity Platform MFA page in the Google Cloud console. Create a new project to demonstrate MFA for that project.

The screenshot shows the 'New Project' creation interface. It includes a quota warning message, fields for 'Project name' (MFA Demo), 'Project ID' (mfa-demo-379006), and 'Location' (No organization). There are 'CREATE' and 'CANCEL' buttons at the bottom.

You have 21 projects remaining in your quota. Request an increase or delete projects. [Learn more](#)

Project name * MFA Demo

Project ID * mfa-demo-379006

Project ID can have lowercase letters, digits, or hyphens. It must start with a lowercase letter and end with a letter or number.

Location * No organization

BROWSE

Parent organization or folder

CREATE **CANCEL**

Step 02: Enable API : Identity platform API

The screenshot shows the 'Product details' page for the Identity Platform. It features a summary, an 'ENABLE IDENTITY PLATFORM' button, and navigation links for Overview, Pricing, Documentation, Support, and Key Features.

Free trial status: ₹24,492.23 credit and 33 days remaining - with a full account, you'll get unlimited access to all of Google Cloud Platform.

DISMISS ACTIVATE

Google Cloud MFA Demo

Product details

Identity Platform

Add Google-grade identity and access management to your applications and services

ENABLE IDENTITY PLATFORM VIEW DOCUMENTATION

Click to enable Identity Platform

OVERVIEW PRICING DOCUMENTATION SUPPORT KEY FEATURES

Step 03: Now your ID platform is enabled click Add a provider select Email/Password as your provider

The screenshot shows the Google Cloud Identity Platform configuration interface. On the left sidebar, under 'Identity Platform', the 'Providers' option is selected. The main content area is titled 'New identity provider' and contains the following sections:

- Sign-in method:** A dropdown menu is set to 'Email / Password'. A blue checkmark indicates it is 'Enabled'.
- Configure email/password:** Includes sections for 'Passwords' (with an option to 'Allow passwordless login'), 'Templates' (with a 'CONFIGURE TEMPLATES' link), and 'Import users' (with a note about using password hash parameters and a 'Learn more' link).
- Project Settings:** Contains a 'Authorized Domains' section listing three domains: 'localhost' (Custom), 'mfa-demo-379006.firebaseio.com' (Custom), and 'mfa-demo-379006.web.app' (Custom). An 'ADD DOMAIN' button is available. A 'Custom SMTP settings' section is also present, with an 'Enable' checkbox.

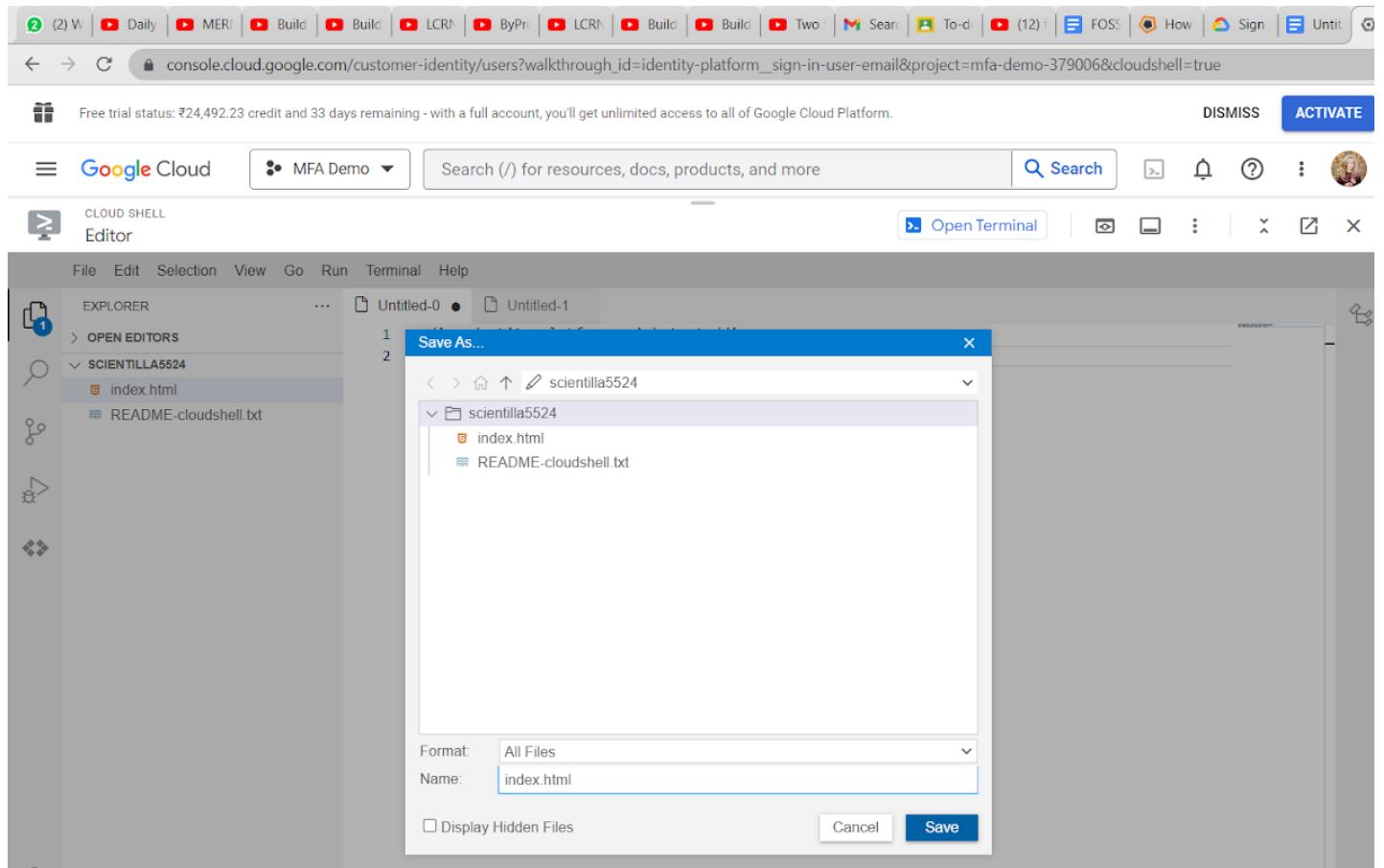
A success message at the bottom right of the main area reads: 'Successfully enabled Identity Platform.' with a close button.

The screenshot shows the Google Cloud Identity Platform interface. On the left, a sidebar menu includes 'Providers', 'MFA', 'Users', 'Settings', and 'Tenants'. The main area is titled 'Identity Providers' with a sub-section 'Providers'. It displays a table with one row: 'Email / Password' (selected), 'Enabled' (checked), and edit/delete icons. A success message 'Successfully updated the identity provider.' is visible at the bottom.

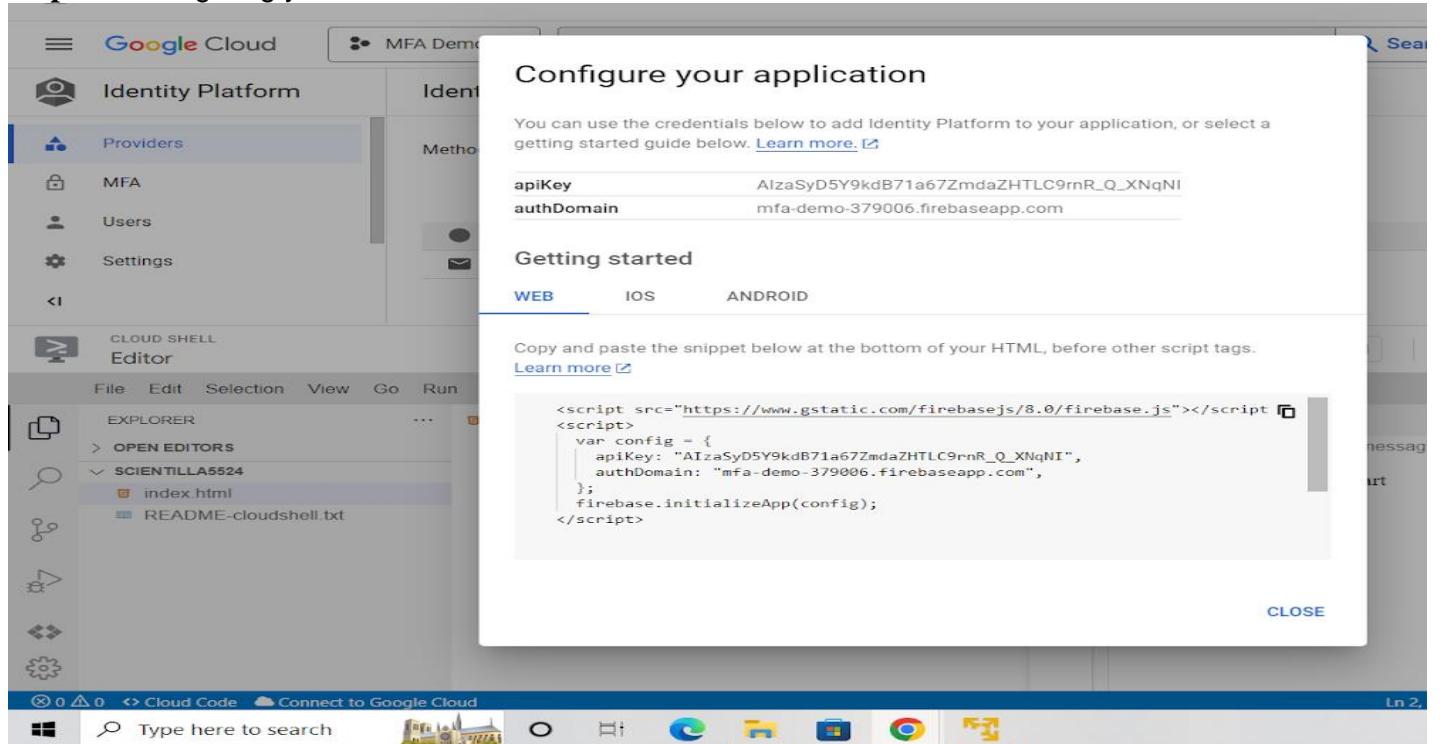
Step 04: Adding a new user

The screenshot shows the Google Cloud Identity Platform interface. The sidebar menu is identical to the previous screenshot. The main area is titled 'Users' with 'ADD USER' and 'IMPORT USERS' buttons. A modal dialog titled 'Add user' is open, prompting for 'Email *' (nadarscientilla@gmail.com) and 'Password *' (a masked password). The 'ADD' button is visible at the bottom right of the dialog.

Step 05: Creating a new file in cloud shell



Step 06: Configuring your details



Step 07: Editing your index.html

```

EXPLORER index.html <--> Untitled-1
OPEN EDITORS index.html
SCIENTILLA5524 README-cloudshell.txt
index.html

index.html > script > ...
apiKey: "AIzaSyD5Y9kdB71a67ZmdaZHTLC9rnR_Q_XNqNI",
authDomain: "mfa-demo-379006.firebaseioapp.com",
);
firebase.initializeApp(config);
</script>
<script>
var email = "nadarscientilla@gmail.com";
var password = "Scientilla@5524";
firebase.auth().onAuthStateChanged(function(user) {
  if (user) {
    document.getElementById("message").innerHTML = "User is signed in!";
  } else {
    document.getElementById("message").innerHTML = "User is signed out!";
  }
});
</script>

```

Step 08: In a new terminal start your server in port 8080

```

EXPLORER index.html <--> Untitled-1
OPEN EDITORS index.html
SCIENTILLA5524 README-cloudshell.txt
index.html

index.html > script > ...
apiKey: "AIzaSyD5Y9kdB71a67ZmdaZHTLC9rnR_Q_XNqNI",
authDomain: "mfa-demo-379006.firebaseioapp.com",
);
firebase.initializeApp(config);
</script>
<script>
var email = "nadarscientilla@gmail.com";
var password = "Scientilla@5524";
firebase.auth().onAuthStateChanged(function(user) {
  if (user) {
    document.getElementById("message").innerHTML = "User is signed in!";
  } else {
    document.getElementById("message").innerHTML = "User is signed out!";
  }
});
</script>

```

Welcome to Cloud Shell! Type "help" to get started.
Your Cloud Platform project in this session is set to `mfa-demo-379006`.
Use "gcloud config set project [PROJECT_ID]" to change to a different project.
`scientilla5524@cloudshell:~ (mfa-demo-379006)$ python -m http.server 8080`

Step 09: The preview page will be displayed as follows



Step 10: Now you have the prerequisites to enable MFA. Go to MFA section and enable SMS based MFA

Free trial status: ₹24,492.23 credit and 33 days remaining - with a full account, you'll get unlimited access to all of Google Cloud Platform.

Google Cloud Search (/) for resources, docs, products, and more Search

Identity Platform Multi-Factor Authentication

Providers MFA

SMS Based Multi-Factor Authentication

Allow your users to add an extra layer of security to their account. Once enabled, users can sign in to their account in two steps, using SMS. [Learn more](#)

ENABLE

You have successfully enabled Identity Platform with multi-factor authentication.

Free trial status: ₹24,492.23 credit and 33 days remaining - with a full account, you'll get unlimited access to all of Google Cloud Platform.

Google Cloud Search (/) for resources, docs, products, and more Search

Identity Platform Multi-Factor Authentication EDIT

Providers MFA

Multi-factor SMS is enabled on this project, and you can allow users to enroll in it by integration with your current app using Client SDK. [Learn more](#)

Status Enabled

Testing phone numbers None

Step 11: Deleting the project

The screenshot shows a Google Cloud Shell terminal window. The terminal output is as follows:

```
Welcome to Cloud Shell! Type "help" to get started.  
Your Cloud Platform project in this session is set to mfa-demo-379006.  
Use "gcloud config set project [PROJECT_ID]" to change to a different project.  
scientilla5524@cloudshell:~ (mfa-demo-379006)$ gcloud projects delete mfa-demo-379006  
Your project will be deleted.  
  
Do you want to continue (Y/n)? y  
  
Deleted [https://clouddresourcemanager.googleapis.com/v1/projects/mfa-demo-379006].  
You can undo this operation for a limited period by running the command below.  
$ gcloud projects undelete mfa-demo-379006  
  
See https://cloud.google.com/resource-manager/docs/creating-managing-projects for information on shutting down projects.  
scientilla5524@cloudshell:~ (mfa-demo-379006)$
```

The terminal window has a dark background with white text. The title bar says "CLOUD SHELL Terminal (mfa-demo-379006) X +". The bottom of the window shows a taskbar with icons for File, Open Editor, Settings, Help, and others, along with a search bar and a weather widget showing "34°C Smc".

CONCLUSION: Successfully studied and implemented MFA in the environment of popular Cloud Service Provider A. AWS/...

PRACTICAL 8

AIM: Write a program for Web Feed

THEORY:

Web Feed

On the World Wide Web, a web feed (or news feed) is a data format used for providing users with frequently updated content. Content distributors syndicate a web feed, thereby allowing users to subscribe a channel to it by adding the feed resource address to a news aggregator client (also called a feed reader or a news reader). Users typically subscribe to a feed by manually entering the URL of a feed or clicking a link in a web browser or by dragging the link from the web browser to the aggregator, thus "RSS and Atom files provide news updates from a website in a simple form for your computer." [1]

The kinds of content delivered by a web feed are typically HTML (webpage content) or links to webpages and other kinds of digital media. Often when websites provide web feeds to notify users of content updates, they only include summaries in the web feed rather than the full content itself.

RSS Generators

Create RSS feeds out of any webpage: Twitter, YouTube, Soundcloud, Facebook, etc... The following are just two examples of products you could use to generate RSS feeds. RSS.app. Get RSS Feeds from almost any webpage.

IMPLEMENTATION & OUTPUT:

RSS RSS Builder - 457.rss

File Topic View Settings Help

Feed Properties

Title	webfeed457
Website URL	http://www.w3schools.com
Copyright	1999-2019
Language	en-us . English - United States
Editor	author@w3school.com
Webmaster	webmaster@w3school.com
Description	

Image Properties

Image URL	
Width	
Height	

Style Sheet

Type	text/xsl
Link	

Topic Title Date

Topic Title	Date
webfeed457	Wed, 21 Dec 2022 11:01:57

Topic Properties | Enclosure | Advanced

Title	webfeed457	
Link	GUID	http://www.w3schools.com
Category	General	
Comments	http://www.w3schools.com/comments.aspx	
Author	author@w3school.com	
Publish Date	Wed, 21 Dec 2022 11:01:57	
GMT Offset	5	
Description:	HTML Editor	
<h1>This is Cloud Computing practical for RSS</h1>		

Done

The screenshot shows a Microsoft Visual Studio interface. In the top-left, the code editor displays an RSS feed XML file named '457.rss' with the following content:

```
<?xml version="1.0" encoding="utf-8"?>
<rss version="2.0">
  <channel>
    <generator>RSS Builder by BiSoft</generator>
    <title>webfeed457</title>
    <link>http://www.w3schools.com</link>
    <description />
    <language>en-us</language>
    <managingEditor>author@3school.com</managingEditor>
    <webMaster>webmaster@3school.com</webMaster>
    <copyright>1999-2019</copyright>
    <item>
      <title>webfeed457</title>
      <pubDate>Wed, 28 Dec 2022 11:01:57 +0500</pubDate>
      <link>http://www.w3schools.com</link>
      <author>author@3school.com</author>
      <comments>http://www.w3schools.com/comments.aspx</comments>
      <category>General</category>
      <description><![CDATA[<h1>This is Cloud Computing practical for RSS</h1>]]></description>
    </item>
  </channel>
</rss>
```

The Solution Explorer on the right shows a project named 'C3-L457' containing files like Default.aspx, Global.asax, Site.master, and Web.config.

Below the IDE, a browser window displays the application's home page titled 'My ASP.NET APPLICATION'. The page features a navigation bar with 'Home' and 'About' links, and a main content area with the heading 'WELCOME TO ASP.NET!'. It also includes links to the official ASP.NET website and MSDN documentation.

CONCLUSION: Successfully demonstrated writing a program for Web Feed

PRACTICAL 9

AIM: Study and implementation of Single-Sign-On (SSO) AWS/...

THEORY:

What is Single Sign-On?

Single sign-on (SSO) is an authentication method that enables users to securely authenticate with multiple applications and websites by using just one set of credentials.

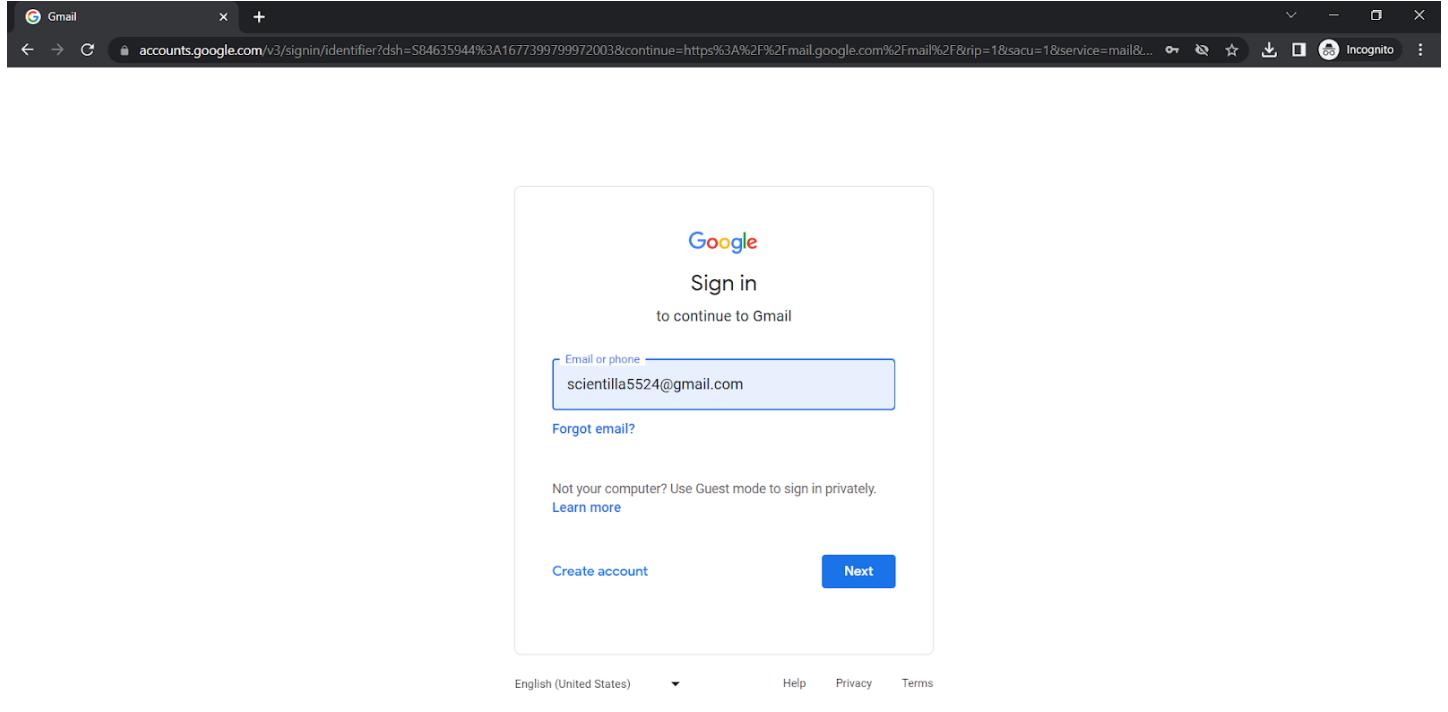
How is SSO Implemented?

The specifics on how an SSO solution is implemented will differ depending on what exact SSO solution you are working with. But no matter what the specific steps are, you need to make sure you have set clear objectives and goals for your implementation. Make sure you answer the following questions:

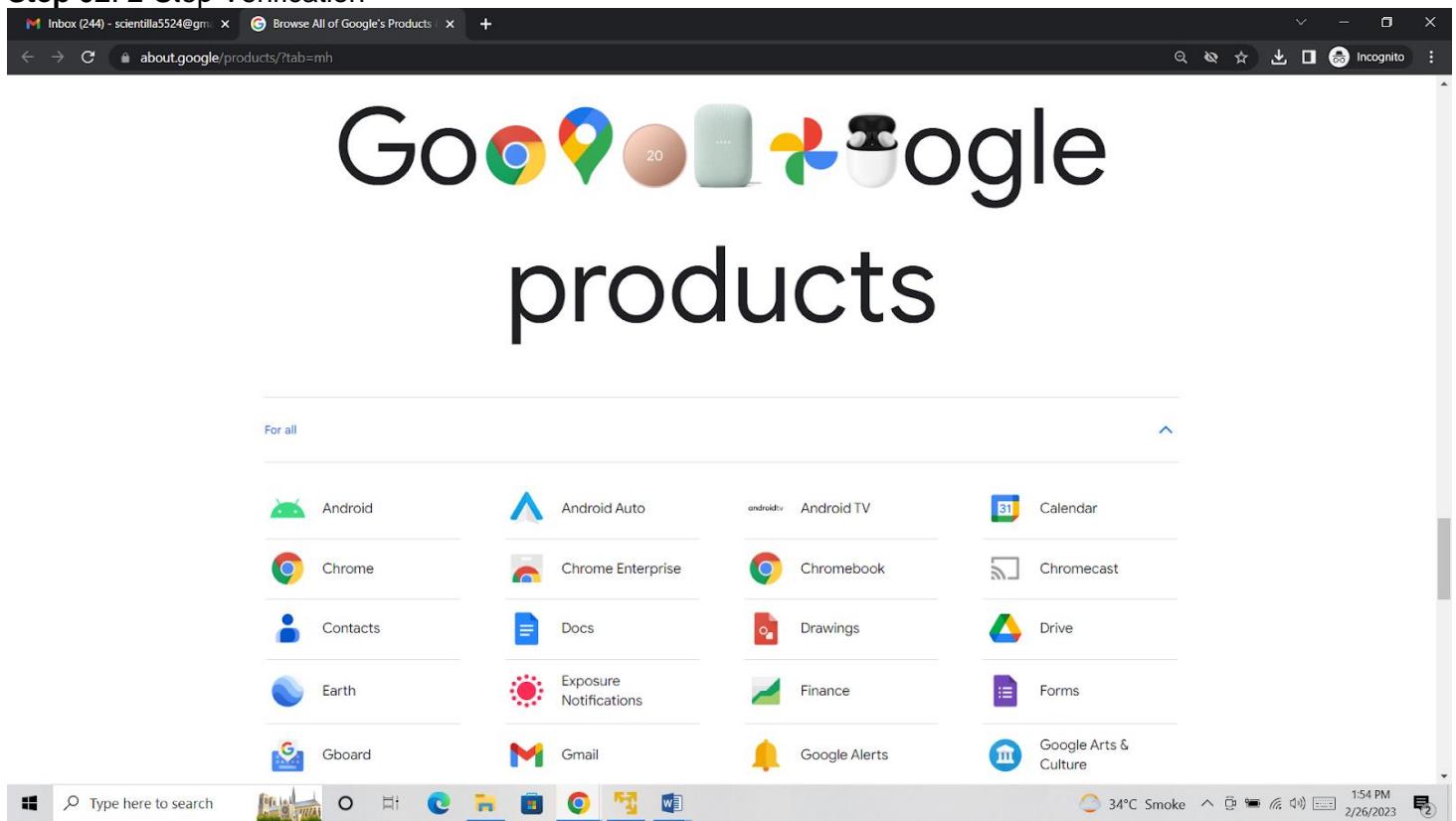
- What different types of users are you serving and what are their different requirements?
- Are you looking for an On Prem solution or a Cloud Based solution?
- Will this solution be able to grow with your company and your needs?
- What features are you looking for to ensure only trusted users are logging in? MFA, Adaptive Authentication, Device Trust, IP Address Whitelisting, etc.?
- What systems do you need to integrate with?
- Do you need API access?

IMPLEMENTATION & OUTPUT:

Step 01: Sign into your google account or simply create a new account through which you can access all the application provided by google.



Step 02: 2-Step Verification

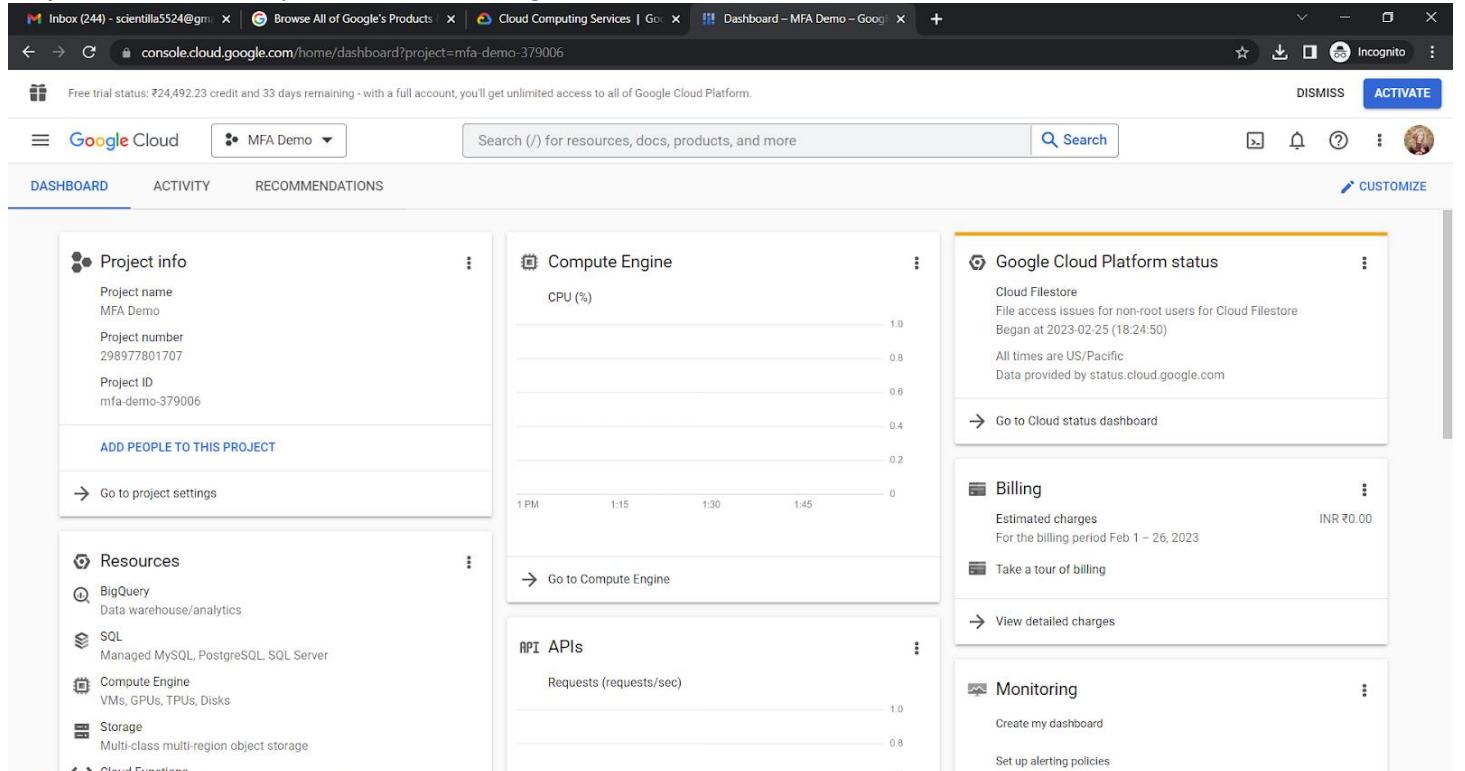


The image shows two side-by-side search results pages from Google. The left page displays a grid of icons and names for consumer Google products, including Google Fit, Google Flights, Google Fonts, Google Groups, Google Input Tools, Google Maps, Google Meet, Google One, Google Pay, Google Photos, Google Play, Google Play Books, Google Play Games, Google Play Movies & TV, Google Shopping, Google Store, Google Street View, Google TV, Google Wallet, Google WiFi, Keep, Lens, Messages, Nest, News, Pixel, Play Protect, Podcasts, Scholar, Search, Sheets, Sites, Slides, Tilt Brush, Translate, Travel, YouTube Kids, YouTube Music, and YouTube TV. The right page displays a grid of icons and names for business-related Google products, including AdMob, AdSense, Analytics, Android, Blogger, Business Messages, Business Profile, Chrome Enterprise, Google Ad Manager, Google Ads, Google Assistant, Google Cloud, Google Digital Garage, Google Domains, Google Enterprise Search, Google Maps Platform, Google Marketing Platform, Google Merchant Center, Google Podcasts Manager, Google Shopping Campaigns, Google Trends, Google Web Designer, Search Console, Shopping Actions, Tag Manager, and Waze Local. Both pages have a top navigation bar with tabs like 'Inbox (244)', 'Browse All of Google's Products', 'Cloud Computing Services', and 'Cloud Computing Services'.

Step 03: Demonstrating SSO using GCP. Sign into your GCP account. Few products are listed below.

The image shows the Google Cloud homepage. At the top, there is a navigation bar with tabs for 'Overview', 'Solutions', 'Products', 'Pricing', 'Resources', and 'Contact Us'. Below the navigation bar, a large blue button says 'Get \$300 in free credits and free usage of 20+ products'. The main headline reads 'Dream, build, and transform with Google Cloud' in large, bold, blue and green text. Below the headline, a subtext says 'Build apps faster, make smarter business decisions, and connect people anywhere.' There are two buttons at the bottom: 'Go to console' and 'Contact sales'. To the right of the main content is a large image of a city skyline at sunset, with a play button icon overlaid. Below the image, text reads 'Meet the businesses using Google Cloud to drive change from within'. At the bottom of the page, there are sections for 'What's new' and 'For developers'. The footer features a search bar with 'Type here to search', a taskbar with icons for 'FOR STARTUPS', 'CUSTOMER SUCCESS', and 'EVENT', and a system tray with weather information ('34°C Smoke'), date ('2/26/2023'), and time ('1:57 PM').

Step 04: Access all the products of GCP using SSO



The screenshot shows the Google Cloud Platform Dashboard for project 'mfa-demo-379006'. The dashboard includes sections for Project info, Compute Engine, Google Cloud Platform status, Resources, API APIs, Billing, and Monitoring. Each section displays real-time metrics and provides links to detailed views.

Project info: Project name: MFA Demo, Project number: 208977801707, Project ID: mfa-demo-379006.

Compute Engine: CPU usage over time (1 PM to 1:45). Current usage is 0.8%.

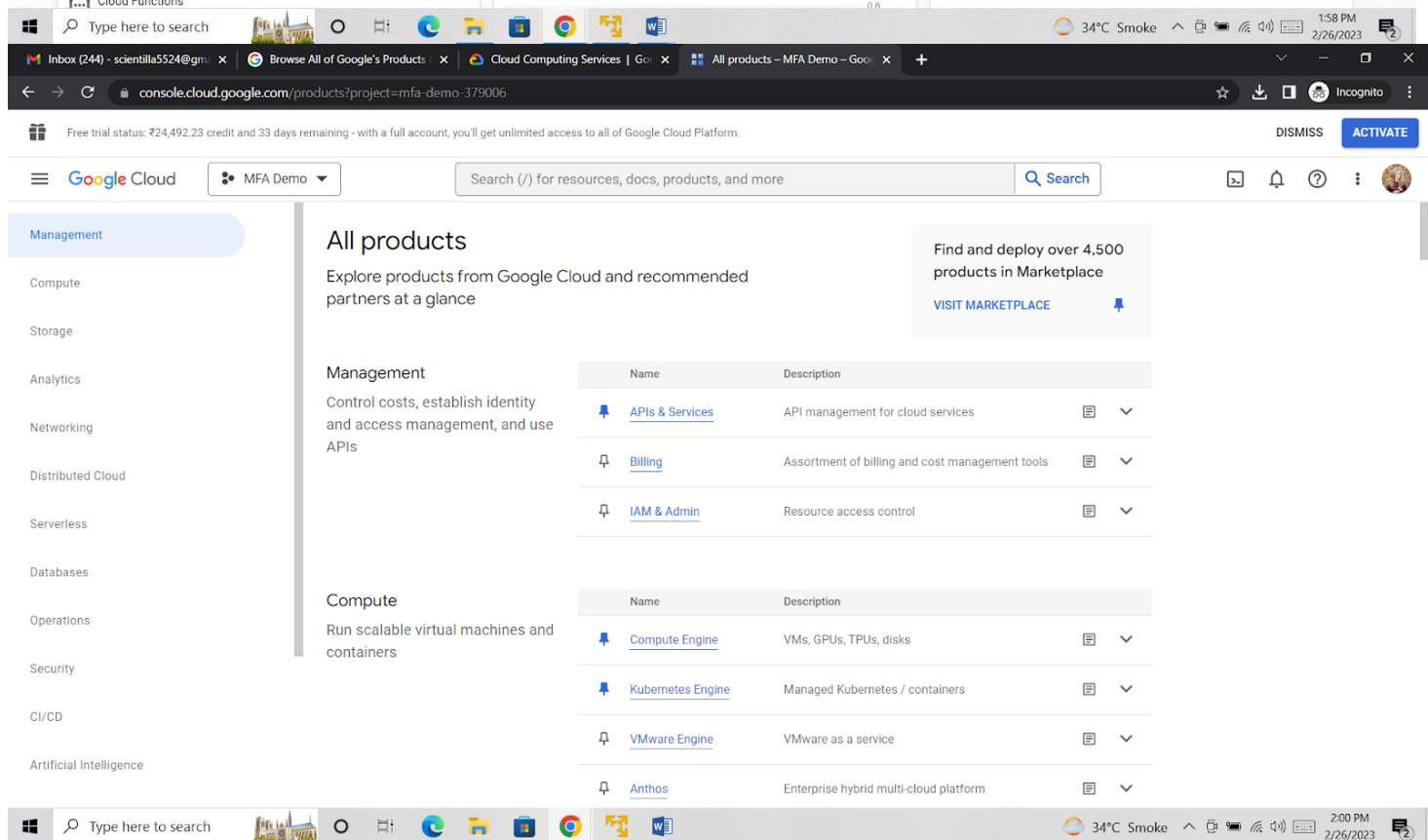
Google Cloud Platform status: Cloud Filestore status message: 'File access issues for non-root users for Cloud Filestore' began at 2023-02-25 (18:24:50).

Resources: BigQuery, SQL, Compute Engine, Storage, Cloud Functions.

API APIs: Requests per second over time (1 PM to 1:45). Current requests are 0.8.

Billing: Estimated charges for Feb 1 – 26, 2023: INR 0.00.

Monitoring: Create my dashboard, Set up alerting policies.



The screenshot shows the 'All products' page for the same project. It features a sidebar with categories like Management, Compute, Storage, Analytics, Networking, Distributed Cloud, Serverless, Databases, Operations, Security, CI/CD, and Artificial Intelligence. The main content area displays 'All products' with a sub-section for 'Management' and 'Compute'.

All products: Explore products from Google Cloud and recommended partners at a glance.

Management: Control costs, establish identity and access management, and use APIs.

Name	Description
APIs & Services	API management for cloud services
Billing	Assortment of billing and cost management tools
IAM & Admin	Resource access control

Compute: Run scalable virtual machines and containers.

Name	Description
Compute Engine	VMs, GPUs, TPUs, disks
Kubernetes Engine	Managed Kubernetes / containers
VMware Engine	VMware as a service
Anthos	Enterprise hybrid multi-cloud platform

All of Google's Products | Cloud Computing Services | All products – MFA Demo – Google

Cloud Computing Services | Google Cloud Platform

products?project=mfa-demo-379006

Training - with a full account, you'll get unlimited access to all of Google Cloud Platform.

Storage
Store long-term, short-term, VM, and Filestore securely

Name	Description
Cloud Storage	Enterprise-ready object storage
Filestore	Fully managed NFS server
Data Transfer	Secure and flexible way to move data
PowerScale	Cloud-native enterprise-grade file service

Analytics
Collect, store, process, and analyze large amounts of data

Name	Description
BigQuery	Data warehouse/analytics
Pub/Sub	Global real-time messaging
Dataflow	Streaming analytics service
Composer	Managed workflow orchestration service
Dataproc	Managed Apache Hadoop
Dataprep	Visual data wrangling

All of Google's Products | Cloud Computing Services | All products – MFA Demo – Google

Cloud Computing Services | Google Cloud Platform

products?project=mfa-demo-379006

Training - with a full account, you'll get unlimited access to all of Google Cloud Platform.

Networking
Manage, connect, secure, and scale your networks

Name	Description
VPC network	Virtual private cloud
Network services	Network management tools
Hybrid Connectivity	Network connectivity options
Network Security	Tools that power safe networking
Network Intelligence	Network monitoring and topology
Network Service Tiers	Price vs performance tiering

Distributed Cloud

Name	Description
Edge	Managed edge infrastructure
Appliances	Devices for edge and transfer workloads

Serverless

Build applications powered by

All of Google's Products | Cloud Computing Services | All products – MFA Demo – Google

Cloud Computing Services | Google Cloud Platform

products?project=mfa-demo-379006

The screenshot shows the GCP dashboard with the search bar at the top. On the left, there's a sidebar for 'Databases' with a brief description: 'Create, manage, and migrate relational and non-relational databases'. Below this, a list of database services is displayed in a table format:

Name	Description	Actions
SQL	Managed MySQL, PostgreSQL, SQL Server	
Datastore	NoSQL database for your web and mobile apps	
Firestore	Serverless NoSQL document DB	
Spanner	Horizontally scalable relational DB	
Bigtable	Petabyte-scale, low-latency, non-relational	
Memorystore	Managed Redis and Memcached	
Database Migration	Cloud SQL migrations simplified	
MongoDB Atlas	JSON-like data models, querying, & scaling	
Neo4j Aura	Integrated, fully managed graph databases	
Redis Enterprise	Robust in-memory database platform	
AlloyDB for PostgreSQL	Enterprise-grade, PostgreSQL-compatible databases	

At the bottom, there's a toolbar with various icons and a weather widget showing '34°C Smoke'.

CONCLUSION: Successful studied and implemented Single-Sign-On (SSO) using GCP

PRACTICAL 10

AIM: Case study on Google Cloud Platform

THEORY:

Why Google Cloud?

Cloud solutions have become critical to improve operations, reduce costs, and increase the speed of service delivery at academic institutions. Google Cloud Platform (GCP) has emerged as a key suite of tools to power university infrastructure, research, and teaching. However, without key customizations for the unique needs of the academic enterprise, there were many impediments to institutions adopting, and researchers utilizing this important solution.

Digital transformation is more than “lifting and shifting” old IT infrastructure to the cloud for cost saving and convenience. True transformation spans the entire business and enables every person to transform. We deeply understand today's technology requirements and the need to continuously innovate. That's why organizations build their transformation cloud and solve their biggest challenges with Google Cloud.

Google Cloud Platform (GCP) lets organizations take advantage of the powerful network and technologies that Google uses to deliver its own products. Global companies like Coca-Cola and cutting-edge technology stars like Spotify are already running sophisticated applications on GCP. This course will help you design an enterprise-class Google Cloud infrastructure for your own organization.

When you architect an infrastructure for mission-critical applications, not only do you need to choose the appropriate compute, storage, and networking components, but you also need to design for security, high availability, regulatory compliance, and disaster recovery. This course uses a case study to demonstrate how to apply these design principles to meet real-world requirements.

Example: Current: Current uses Google Kubernetes Engine on Google Cloud to improve time to market for app development by 400% while eliminating downtime for users of its debit card app.

Google Cloud results

- Improves time to market for app development by 400%
- Eliminates downtime for customers
- Enables deployment of new services in hours versus days

- Reduces total cloud hosting costs by 60%
- 80% reduction in error resolution time

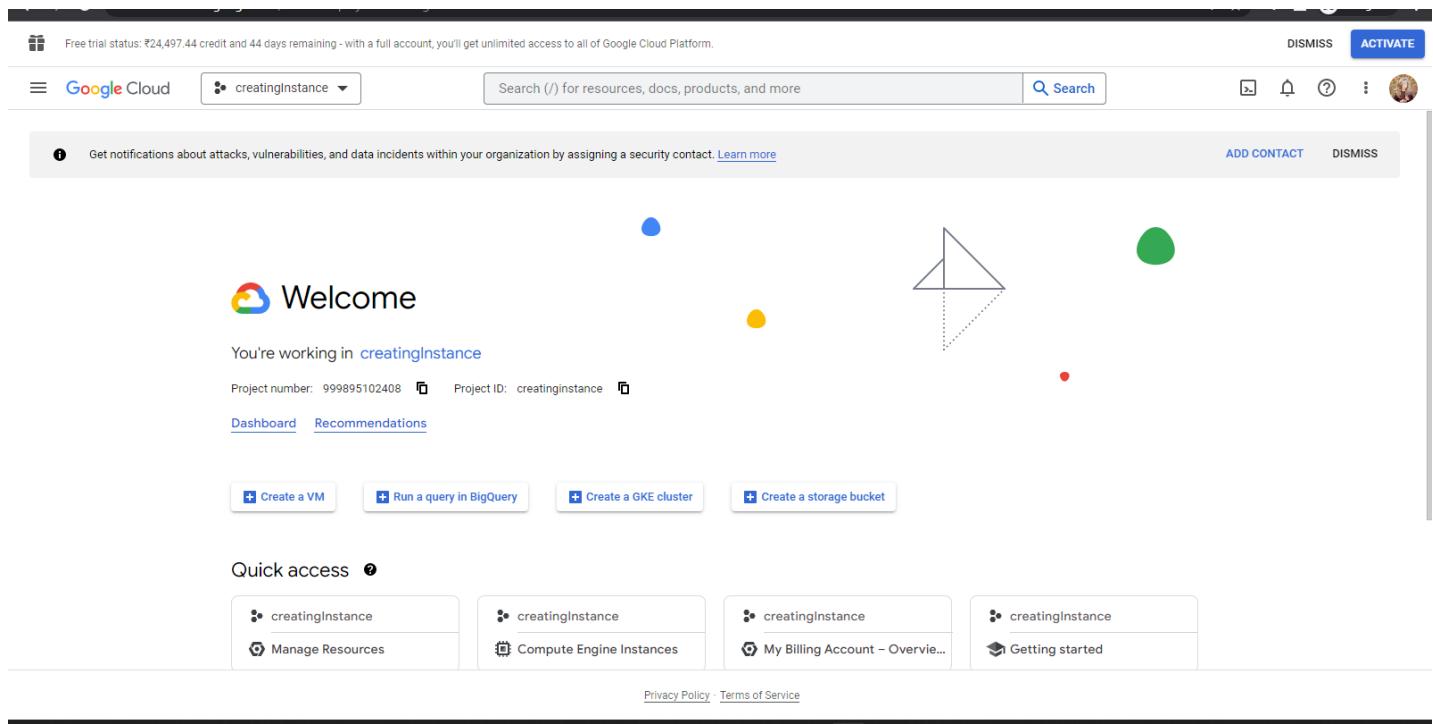
IMPLEMENTATION & OUTPUT:

A) Implementing Infrastructure as a service

B) Implementing Platform as a service

C) Implementing Software as a service

Step 01 : Log onto your GCP account



Step 02 : Creating an Linux VM Instance in GCP Compute Engine

To create a VM instance, select one of the options:

- New VM instance** Create a single VM instance from scratch
- New VM instance from template** Create a single VM instance from an existing template
- New VM instance from machine image** Create a single VM instance from an existing machine image
- Marketplace** Deploy a ready-to-go solution onto a VM instance

Name instance-1

Labels [+ ADD LABELS](#)

Region us-west4 (Las Vegas) **Zone** us-west4-b

Machine configuration

Machine family GENERAL-PURPOSE COMPUTE-OPTIMIZED MEMORY-OPTIMIZED GPU

Series E2

Machine type e2-medium (2 vCPU, 4 GB memory)

Item	Monthly estimate
2 vCPU + 4 GB memory	\$27.55
10 GB balanced persistent disk	\$1.10
Use discount	-\$0.00
Total	\$28.65

[Compute Engine pricing](#) [LESS](#)

Boot disk

Select an image or snapshot to create a boot disk; or attach an existing disk. Can't find what you're looking for? Explore hundreds of VM solutions in [Marketplace](#)

PUBLIC IMAGES CUSTOM IMAGES SNAPSHOTS ARCHIVE SNAPSHOTS EXISTING DISKS

Operating system Ubuntu

Version Ubuntu 20.04 LTS

x86/64, amd64 focal image built on 2023-01-25, supports Shielded VM features

Boot disk type Balanced persistent disk

Size (GB) 10

Identity and API access

Service accounts Service account: Compute Engine default service account

Step 03 : Configuring and loading Ubuntu OS in VM instance

To create a VM instance, select one of the options:

- New VM instance** Create a single VM instance from scratch
- New VM instance from template** Create a single VM instance from an existing template
- New VM instance from machine image** Create a single VM instance from an existing machine image
- Marketplace** Deploy a ready-to-go solution onto a VM instance

Boot disk

Select an image or snapshot to create a boot disk; or attach an existing disk. Can't find what you're looking for? Explore hundreds of VM solutions in [Marketplace](#)

PUBLIC IMAGES CUSTOM IMAGES SNAPSHOTS ARCHIVE SNAPSHOTS EXISTING DISKS

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Identity and API access

Service accounts

Compute Engine default service account

Requires the Service Account User role (`roles/iam.serviceAccountUser`) to be set for users who want to access VMs with this service account. [Learn more](#)

Access scopes

Allow default access

Allow full access to all Cloud APIs

Set access for each API

Firewall

Add tags and firewall rules to allow specific network traffic from the Internet

Allow HTTP traffic

Allow HTTPS traffic

Advanced options

Networking, disks, security, management, sole-tenancy

Your free trial credit will be used for this VM instance. [Google Cloud Free Tier](#)

Monthly estimate
\$28.65
That's about \$0.04 hourly
Pay for what you use: No upfront costs and per second billing

Item	Monthly estimate
2 vCPU + 4 GB memory	\$27.55
10 GB balanced persistent disk	\$1.10
Use discount	-\$0.00
Total	\$28.65

[Compute Engine pricing](#)

[LESS](#)

CREATE **CANCEL** **EQUIVALENT CODE**

Step 04 : Once the instance is created connect to OS using ssh protocol

Free trial status: ₹24,497.88 credit and 48 days remaining - with a full account, you'll get unlimited access to all of Google Cloud Platform.

VM instances

Status	Name	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>	<input checked="" type="checkbox"/> linuxinstance	us-west4-b			10.182.0.2 (nic0)	34.125.82.135 (nic0)	SSH

Related actions

- Explore Backup and DR** NEW
- View billing report**
- Monitor VMs**
- Explore VM logs**
- Set up firewall rules**
- Patch management**
- Load balance between VMs**

The screenshot shows a terminal window titled "SSH-in-browser" connected to an Ubuntu 20.04.5 LTS instance. The terminal displays system information, including system load (0.33), memory usage (19.5% of 9.51GB), and swap usage (0%). It also shows the number of processes (109) and users logged in (0). The terminal then prompts for updates, stating "0 updates can be applied immediately." It also notes that the list of available updates is more than a week old and provides a command to check for new updates: "To check for new updates run: sudo apt update". The bottom of the terminal shows the prompt "scientilla5524@linuxinstance:~\$".

Step 01: Refer to IAAS implementation and once the Infrastructure is set up open terminal and type command
touch app.py

sudo vi app.py

The screenshot shows a terminal window titled "SSH-in-browser" connected to an Ubuntu 20.04.5 LTS instance. The terminal displays system information, including system load (0.33), memory usage (19.5% of 9.51GB), and swap usage (0%). It also shows the number of processes (109) and users logged in (0). The terminal then prompts for updates, stating "0 updates can be applied immediately." It also notes that the list of available updates is more than a week old and provides a command to check for new updates: "To check for new updates run: sudo apt update". The bottom of the terminal shows the prompt "scientilla5524@linuxinstance:~\$".

ROLL NO: 457
TYCS

CLOUD COMPUTING

(TCSCCSP601)

**NADAR SCIENTILLA STEPHEN
DIV:B**

https://ssh.cloud.google.com/v2/ssh/projects/creatinginstance/zones/us-west4-b/instances/instance-insu?authuser=0&hl=en_US&projectNumber=999895102408&useAdminProxy=true - Google Chrome

SSH-in-browser UPLOAD FILE

```
Get:2 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic-updates/main amd64 python2.7-minimal amd64 2.7.17-1~18.04ubuntul.10 [1290 kB]
Get:3 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic/main amd64 python-minimal amd64 2.7.15-rc1-1 [28.1 kB]
Get:4 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic-updates/main amd64 libpython2.7-stdlib amd64 2.7.17-1~18.04ubuntul.10 [1917 kB]
Get:5 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic-updates/main amd64 python2.7 amd64 2.7.17-1~18.04ubuntul.10 [248 kB]
Get:6 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic/main amd64 libpython2.7-stdlib amd64 2.7.15-rc1-1 [7620 B]
Get:7 http://us-west4.gce.archive.ubuntu.com/ubuntu bionic/main amd64 python amd64 2.7.15-rc1-1 [140 kB]
Fetched 3956 kB in 0s (11.2 MB/s)
Selecting previously unselected package libpython2.7-minimal:amd64.
(Reading database ... 66683 files and directories currently installed.)
Preparing to unpack .../0-libpython2.7-minimal_2.7.17-1~18.04ubuntul.10_amd64.deb ...
Unpacking libpython2.7-minimal:amd64 (2.7.17-1~18.04ubuntul.10) ...
Selecting previously unselected package python2.7-minimal.
Preparing to unpack .../1-python2.7-minimal_2.7.17-1~18.04ubuntul.10_amd64.deb ...
Unpacking python2.7-minimal (2.7.17-1~18.04ubuntul.10) ...
Selecting previously unselected package python-minimal.
Preparing to unpack .../2-python-minimal_2.7.15-rc1-1_amd64.deb ...
Unpacking python-minimal (2.7.15-rc1-1) ...
Selecting previously unselected package libpython2.7-stdlib:amd64.
Preparing to unpack .../3-libpython2.7-stdlib_2.7.17-1~18.04ubuntul.10_amd64.deb ...
Unpacking libpython2.7-stdlib:amd64 (2.7.17-1~18.04ubuntul.10) ...
Selecting previously unselected package python2.7.
Preparing to unpack .../4-python2.7_2.7.17-1~18.04ubuntul.10_amd64.deb ...
Unpacking python2.7 (2.7.17-1~18.04ubuntul.10) ...
Selecting previously unselected package libpython-stdlib:amd64.
Preparing to unpack .../5-libpython-stdlib_2.7.15-rc1-1_amd64.deb ...
Unpacking libpython-stdlib:amd64 (2.7.15-rc1-1) ...
Setting up libpython2.7-minimal:amd64 (2.7.17-1~18.04ubuntul.10) ...
Setting up python2.7-minimal (2.7.17-1~18.04ubuntul.10) ...
Linking and byte-compiling packages for runtime python2.7...
Setting up python-minimal (2.7.15-rc1-1) ...
Selecting previously unselected package python.
(Reading database ... 67431 files and directories currently installed.)
Preparing to unpack .../python_2.7.15-rc1-1_amd64.deb ...
Unpacking python (2.7.15-rc1-1) ...
Setting up libpython2.7-stdlib:amd64 (2.7.17-1~18.04ubuntul.10) ...
Setting up python2.7 (2.7.17-1~18.04ubuntul.10) ...
Setting up libpython-stdlib:amd64 (2.7.15-rc1-1) ...
Setting up python (2.7.15-rc1-1) ...
Processing triggers for man-db (2.8.3-2ubuntul.0.1) ...
Processing triggers for mime-support (3.60ubuntul) ...
scientilla5524@instance-insu:~$ touch app.py
scientilla5524@instance-insu:~$ sudo gedit app.py
sudo: gedit: command not found
scientilla5524@instance-insu:~$ sudo vi app.py
scientilla5524@instance-insu:~$ python app.py
Enter first number:5
Enter second number:6
scientilla5524@instance-insu:~$
```

Step 02: Vi editor opens an interface where you can create applications.

https://ssh.cloud.google.com/v2/ssh/projects/creatinginstance/zones/us-west4-b/instances/instance-aditya?authuser=0&hl=en_US&projectNumber=999895102408&useAdminProxy=true - Google Chrome

ssh.cloud.google.com/v2/ssh/projects/creatinginstance/zones/us-west4-b/instances/instance-aditya?authuser=0&hl=en_US&projectNumber=999895102408&useAdminProxy=true

SSH-in-browser

```
x=input("Enter a number")
y=input("Enter a number")
sum=x+y
print(sum)
~
```

"edit" 4L, 71C

Step 01: Refer to IAAS & PAAS implementation mentioned above and once the application is ready to execute open terminal and type command

python app.py

Step 02: Take user inputs and displays output

```
Unpacking python (2.7.15-rc1-1) ...
Setting up libpython2.7-stdlib:amd64 (2.7.17-1~18.04ubuntu1.10) ...
Setting up python2.7 (2.7.17-1~18.04ubuntu1.10) ...
Setting up libpython-stdlib:amd64 (2.7.15-rc1-1) ...
Setting up python (2.7.15-rc1-1) ...
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scientilla5524@instance-insu:~$ touch app.py
scientilla5524@instance-insu:~$ sudo gedit app.py
sudo: gedit: command not found
scientilla5524@instance-insu:~$ sudo vi app.py
scientilla5524@instance-insu:~$ python app.py
Enter first number:5
Enter second number:6
11
scientilla5524@instance-insu:~$
```



CONCLUSION: Successfully conducted case study on Google Cloud Platform