



S.I.E.S College of Arts, Science and Commerce(Autonomous)
Sion(W), Mumbai – 400 022.

CERTIFICATE

This is to certify that Miss. Kimaya Naik Roll No. TCS2324048 has successfully completed the necessary course of experiments in the subject of **Cloud Computing** during the academic year **2023 – 2024** complying with the requirements of **University of Mumbai**, for the course of **T.Y.BSc Computer Science [Semester-VI]**.

Prof. In-Charge
MAYA NAIR

Examination date:

Examiner's Signature & Date:

Head of the Department
Prof. Manoj Singh

College Seal

Index Page

| Sr. No | Description | Pg No | Date | Sign |
|--------|--|-------|------|------|
| 1 | Study of Cloud Computing & Architecture(Theory) | 3 | | |
| 2 | Study and implementation of Infrastructure as a Service(FOSS Cloud) | 5 | | |
| 3 | Study and implementation of Storage as a Service (Own Cloud) | 11 | | |
| 4 | Google cloud Linux VM creation | 14 | | |
| 5 | Google cloud Windows VM creation | 16 | | |
| 6 | Perform the following in google cloud: a A “Hello world “ website on IIS-Create an IIS web server VM using Compute Engine in b A “Hello World” website on Apache. Create an Apache web server on a Linux VM c Transfer files to Windows VMs d Transfer files to Linux VMs e Back up a VM's persistent disk f Configure periodic backups with a snapshot schedule g Restore a boot disk from a snapshot h Restore a persistent disk from a snapshot | 20 | | |
| 7 | Write a program for web feed. | 41 | | |
| 8 | Case study on Amazon EC2/Microsoft Azure/Google Cloud Platform (Research paper analysis) | 43 | | |

Practical 1

Aim : Study of Cloud Computing & Architecture(Theory)

Cloud Computing Fundamentals

Introduction :

Get a foundational understanding of what cloud computing is, how it works, and its core principles. This includes exploring the concept of "everything as a service" (EaaS) and the benefits it offers businesses and organizations.

Service Models :

Deep dive into the different cloud service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Understand the key characteristics, functionalities, and use cases of each model to determine which best suits different needs.

Deployment Models: Learn about the various cloud deployment models - Public, Private, and Hybrid clouds. Understand the advantages and considerations for each model to choose the most appropriate deployment strategy.

Cloud Architecture

Components :

Explore the building blocks of a cloud architecture. This includes the front-end (client side), back-end infrastructure (servers, storage), cloud services, runtime platforms, and the network that connects everything. Analyze how these components interact to deliver cloud services.

Virtualization :

Virtualization is a fundamental technology in cloud computing. Grasp the concept of virtualization and its role in creating a scalable and efficient cloud infrastructure.

Security :

Cloud security is paramount. Understand the security considerations and best practices for securing data, applications, and access in the cloud environment.

Additional Topics

Management :

Cloud management encompasses tools and techniques for provisioning, monitoring, and optimizing cloud resources. Explore different cloud management solutions.

Benefits and Challenges :

Cloud computing offers numerous benefits like scalability, cost-efficiency, and agility. However, it also comes with challenges such as security concerns and vendor lock-in. Weigh the pros and cons to make informed decisions.

Case Studies :

Learning from real-world implementations is valuable. Explore case studies of successful cloud adoption across various industries to understand how organizations are leveraging cloud computing for their advantage.

Practical 2

Aim : Study and implementation of Infrastructure as a Service(FOSS Cloud)

FOSS-Cloud (FOSS-Cloud software and hardware) is an integrated and redundant server infrastructure to provide virtualization- and cloud-services, Windows or Linux based SaaS-, Terminal Server-, Virtual Desktop Infrastructure (VDI) or virtual server environments.

FOSS-Cloud covers all aspects of an virtualized IT environment. FOSS-Cloud is a pure Open Source solution, is licensed under EUPL and is available on the sourceforge.net. FOSS-Cloud is the most advanced Open Source Cloud. FOSS-Cloud is a cost-effective alternative to Citrix and VMware.

Functionality

- ☐ VDI (Virtual Desktop Infrastructure)
- ☐ VSI (Virtual Server Infrastructure)
 - o Infrastructure as a Service (IaaS)
 - o Platform as a Service (PaaS)
 - o Software as a Service (SaaS)
- ☐ Storage Cloud

Features

- ☐ Full integration into existing Windows and Linux environments
- ☐ Cloud for server- and desktop virtualization
- ☐ Powerful virtualization for Windows and Linux 32/64bit
- ☐ Published Desktop
- ☐ Persistent virtual machines including session transfer to other devices
- ☐ Dynamic desktop with Golden Image to serve user groups
- ☐ Application streaming
- ☐ Published application support with RDS
- ☐ Video streaming (M-Jpeg)
- ☐ High resolution display
- ☐ Pools of network- and hardware-resources or virtual machines
- ☐ VDI access through Windows and Linux, PXE boot and handhelds
- ☐ Bi-directional audio and video
- ☐ Smartcard authentication (including pass through)
- ☐ USB redirection

Minimal Requirements

- ☐ Dedicated hardware
- ☐ 64-Bit Intel with VT-Technology
- ☐ 4 Gigabyte memory
- ☐ 320 Gigabyte disk space
- ☐ Network interface

The Demo System is really just a playing environment and not for professional use. It is very easy to install. The Demo System is made to get a feeling of the possibilities of the FOSS-Cloud.

Limitation of Demo System

There is no access to the VMs from outside of FOSS-Cloud. That means, for example, pinging a VM is not possible.

Steps to implement FOSS Cloud

Windows

Open FOSS CLOUD on the LOCAL Server and LOGIN using admin username & Password

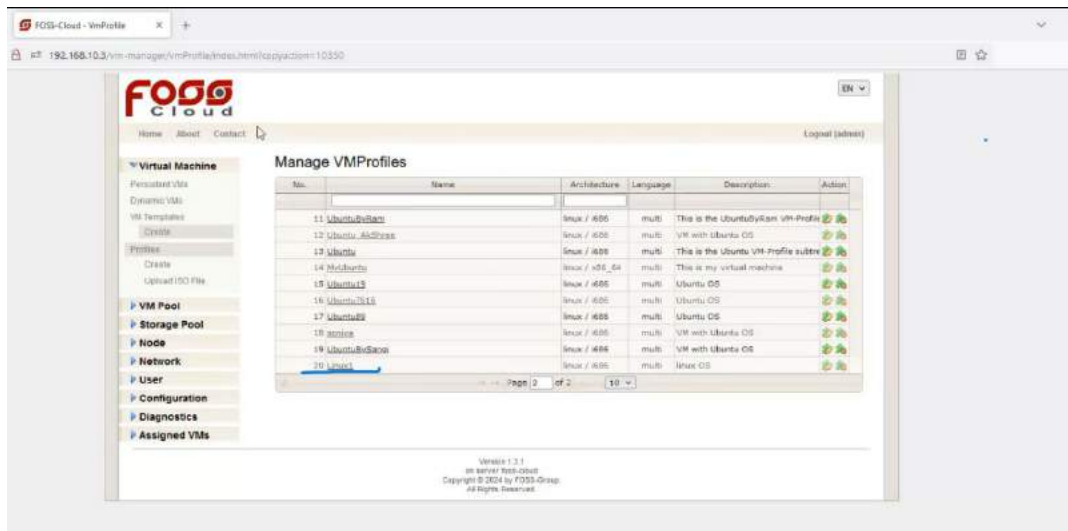


Local Windows computer with WinSCP installed (Download WinSCP)

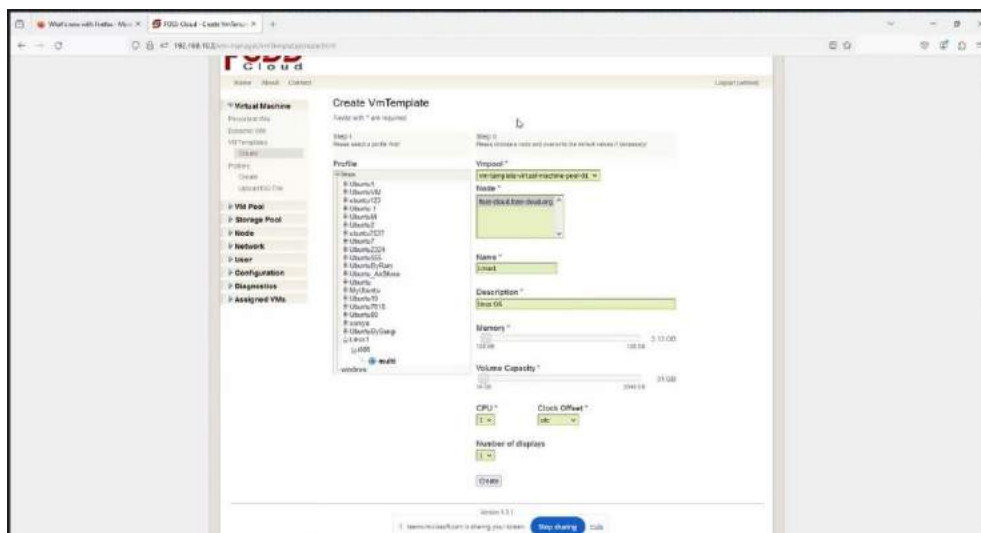
1. You've downloaded ISO-File to your computer. This example is done with: ubuntu-11.04-desktop-i386.iso
 2. The IP-address of the FOSS-Cloud Node. This example is done with: 2.168.1.216
- Run WinSCP and establish a connection to the FOSS-Cloud Node:
username: root password: admin

Connect to FOSS CLOUD Node

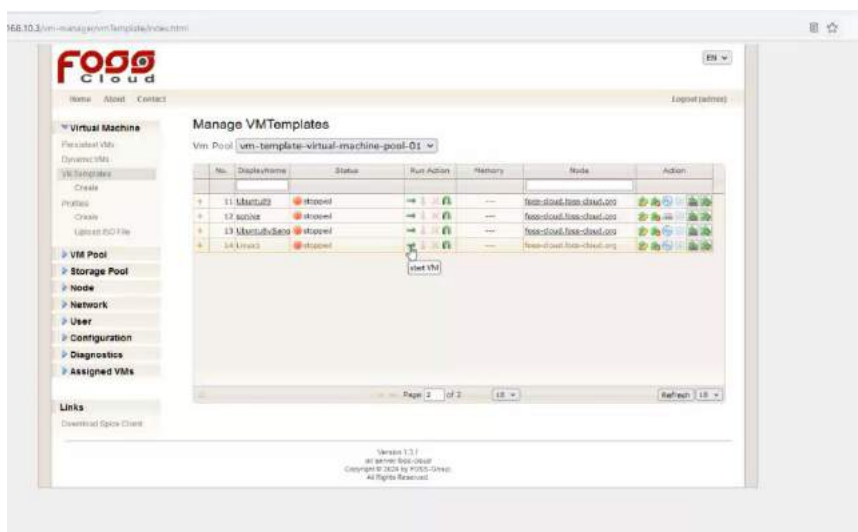
[illegible]

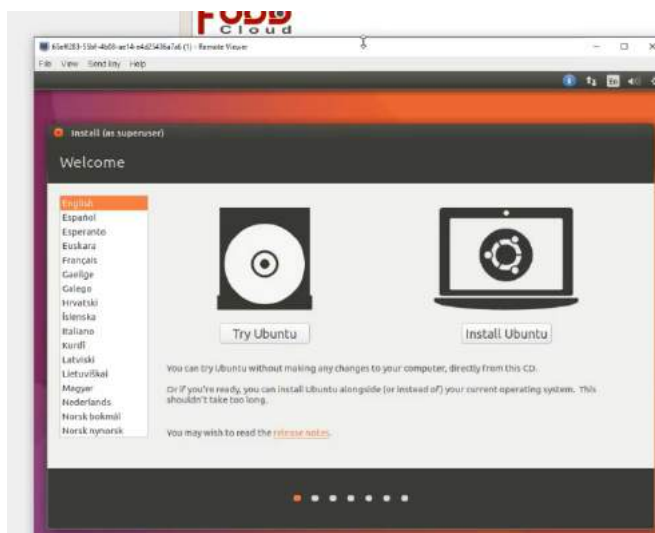
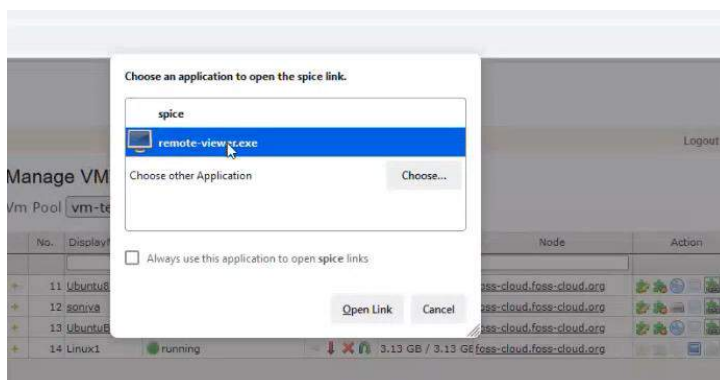
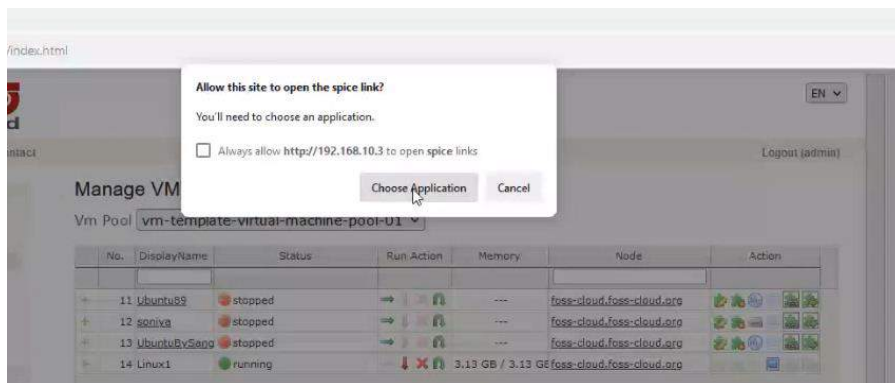


Create VM Template



Manage VM Templates and Start the VM



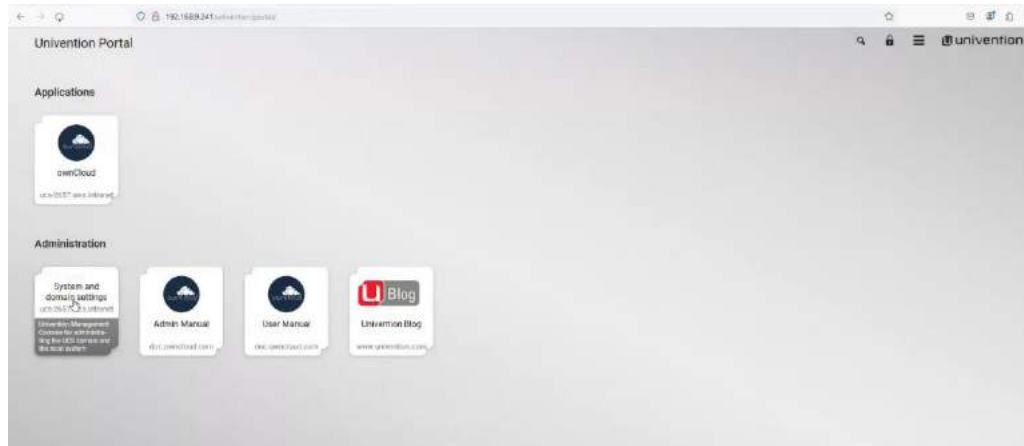


Practical 3

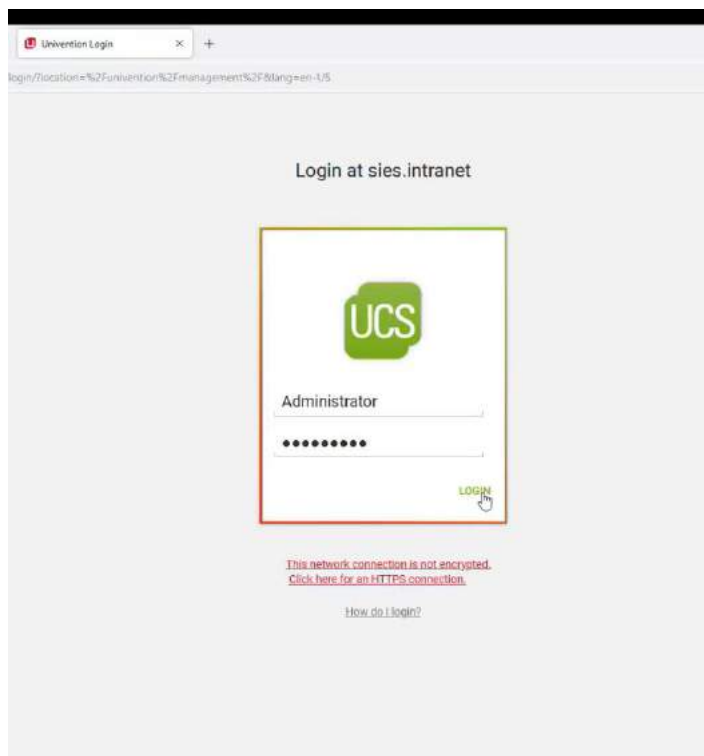
Aim : Study and implementation of Storage as a Service (Own Cloud)

Go to the OwnCloud IP address

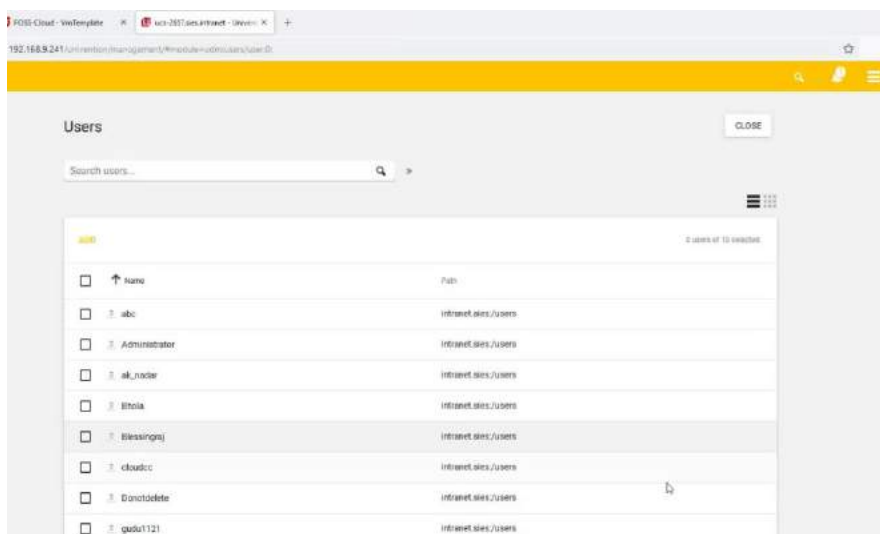
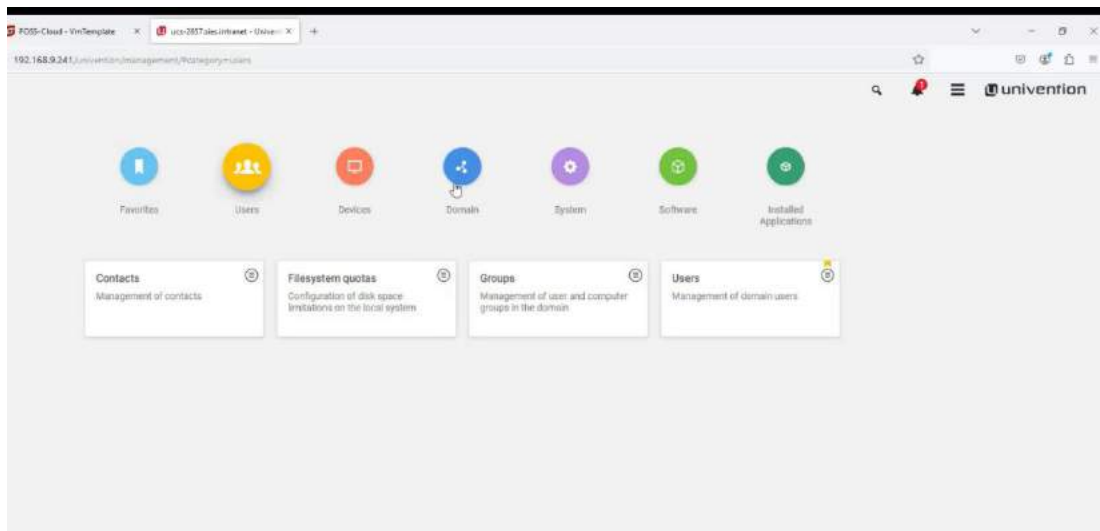
Click on System and Domain Settings



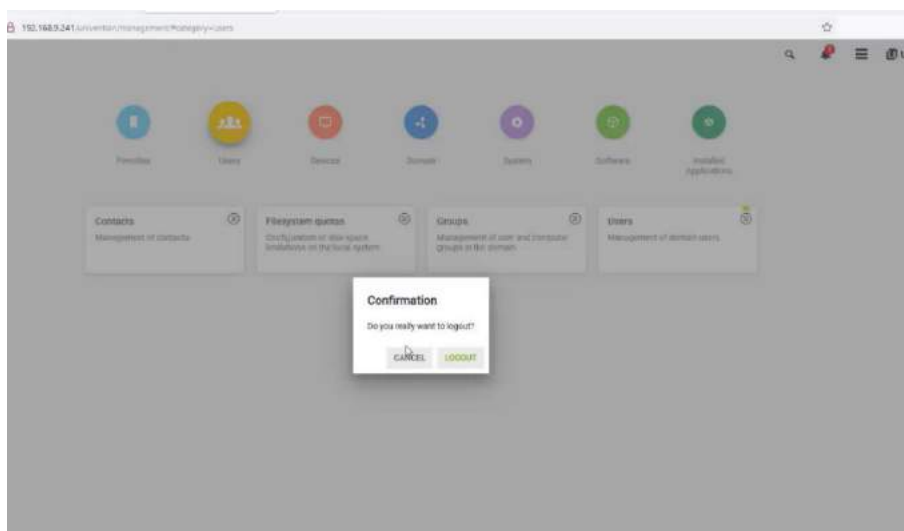
Login using Administrator & admin@I23 as username & password



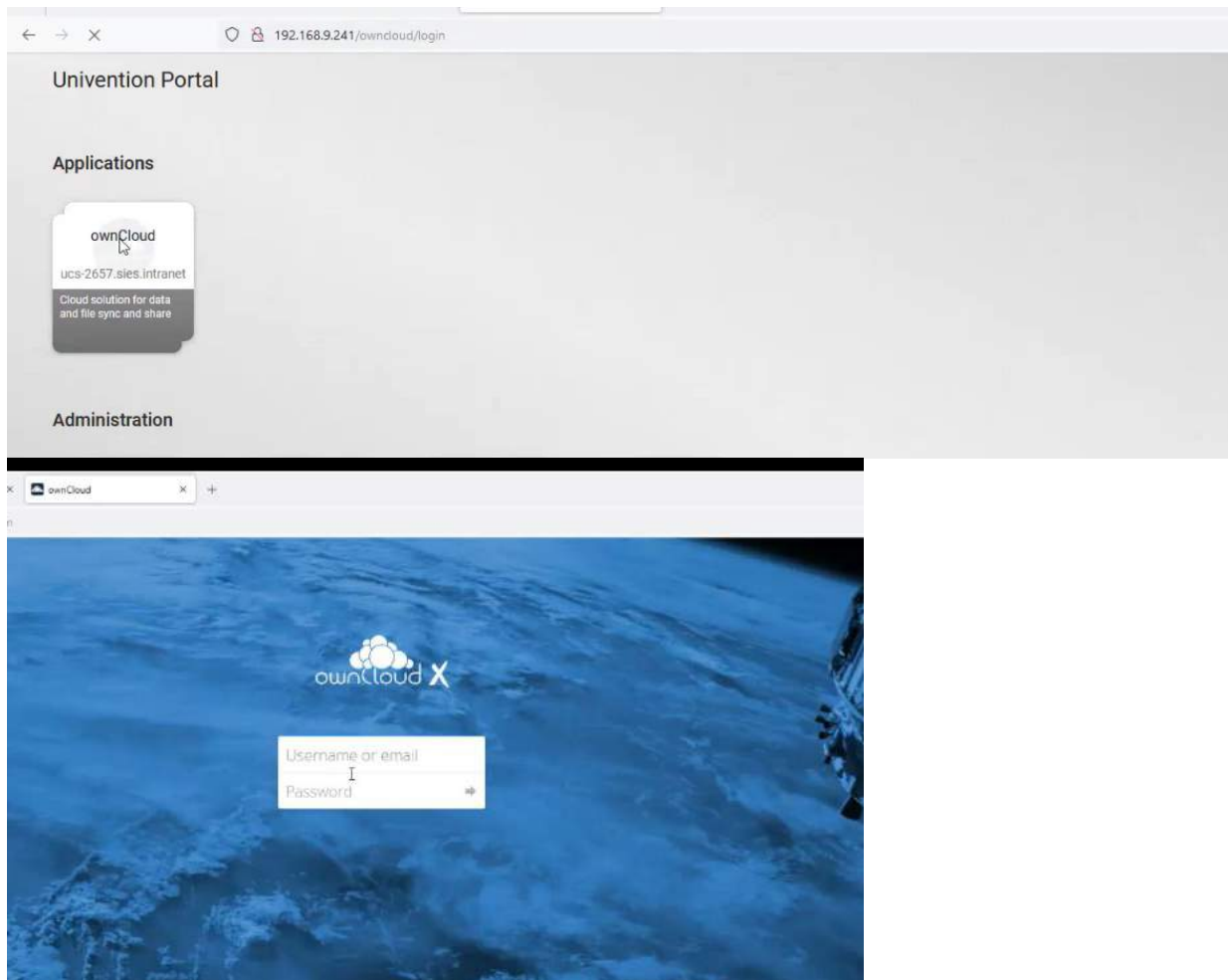
Click on Create New Users & Add new Users



Then Logout



Click on OwnCloud application
And Login using the Created User Credentials



Practical 4

Aim : Google cloud Linux VM creation

- a. On the Compute Engine page, click VM instances → Create Instance
- b. In Boot disk, click Change, and then:
 - a. In the Operating system list, select Debian.
 - b. In the Version list, keep the default value.
 - c. In the Boot disk type list, select SSD persistent disk.
 - d. Click Select.

In the Firewall section, select Allow HTTP traffic.

Click Create.

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

Debian

Version *

Debian GNU/Linux 12 (bookworm)

x86_64, amd64 built on 20240213

Boot disk type *

SSD persistent disk

COMPARE DISK TYPES

Size (GB) *

10

Provision between 10 and 65536 GB

SHOW ADVANCED CONFIGURATION

SELECT

CANCEL

Firewall ?

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

- ☒ Allow HTTP traffic
- ☐ Allow HTTPS traffic
- ☐ Allow Load Balancer Health Checks

Observability - Ops Agent ?

Monitor your system through collection of logs and key metrics.

- ☐ Install Ops Agent for Monitoring and Logging














Advanced options

Networking, disks, security, management, sole-tenancy

CREATE

CANCEL

 EQUIVALENT CODE

| <input type="checkbox"/> | Status | Name  | Zone | Recommendations | In use by | Internal IP | External IP | Connect | |
|--------------------------|---|--|---------------|-----------------|-----------|-------------------------------------|---|---------|---|
| <input type="checkbox"/> |  | assignment77 | us-central1-a | | | 10.128.0.3 <small>(nic0)</small> | 34.42.119.163  <small>(nic0)</small> | SSH |   |
| <input type="checkbox"/> |  | iis-web-server | asia-south1-c | | | 10.160.0.2 <small>(nic0)</small> | 35.200.154.74  <small>(nic0)</small> | RDP |   |
| <input type="checkbox"/> |  | linux-web-server | us-central1-a | | | 10.128.0.2 <small>(nic0)</small> | 34.134.218.144  <small>(nic0)</small> | SSH |   |

Practical 5

Aim : Google cloud Windows VM creation

- c. Create new Project
- d. Enable Compute Engine APIs
- e. On the Compute Engine page, click VM instances.
- f. On the VM instances page, click Create instance.
- g. In Boot disk, click Change, and then:

In the Operating system list, select Windows Server.

In the Version list, select Windows Server 2019 Datacenter.

In the Boot disk type list, select SSD persistent disk.

Click Select.

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

Windows Server

Version *

Windows Server 2019 Datacenter

x86_64, Server with Desktop Experience, x64 built on 20240214

Boot disk type *

SSD persistent disk

COMPARE DISK TYPES

Size (GB) *

50

Provision between 50 and 65536 GB

SHOW ADVANCED CONFIGURATION

SELECT

CANCEL

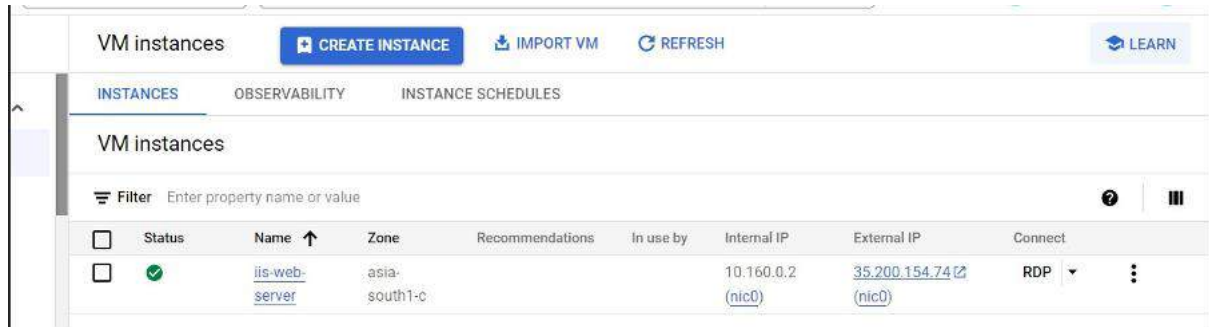
- h. In the Firewall section, select Allow HTTP traffic.

Firewall

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

- ☒ Allow HTTP traffic
- ☐ Allow HTTPS traffic
- ☐ Allow Load Balancer Health Checks

i. Click Create.



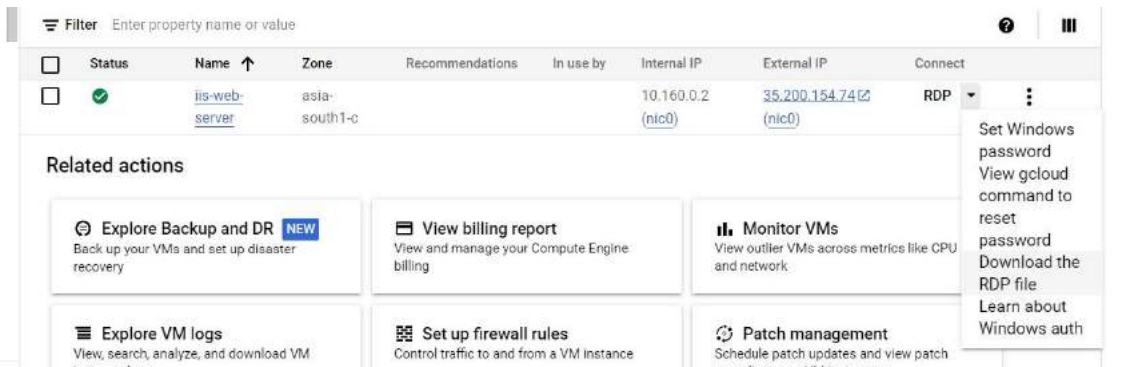
j. Connect to the VM:

k. Click the arrow next to RDP and click Set Windows password.

Verify username is correct, then click Set.

l. Copy the password that is shown. Save this password for reference.

m. Click the arrow next to the RDP button, and then select Download the RDP file.

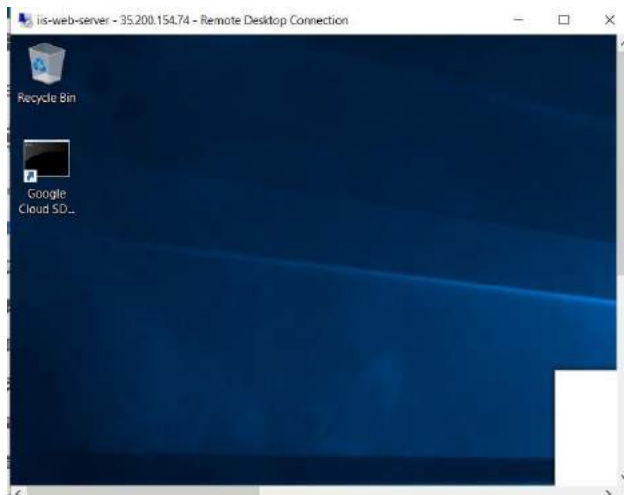
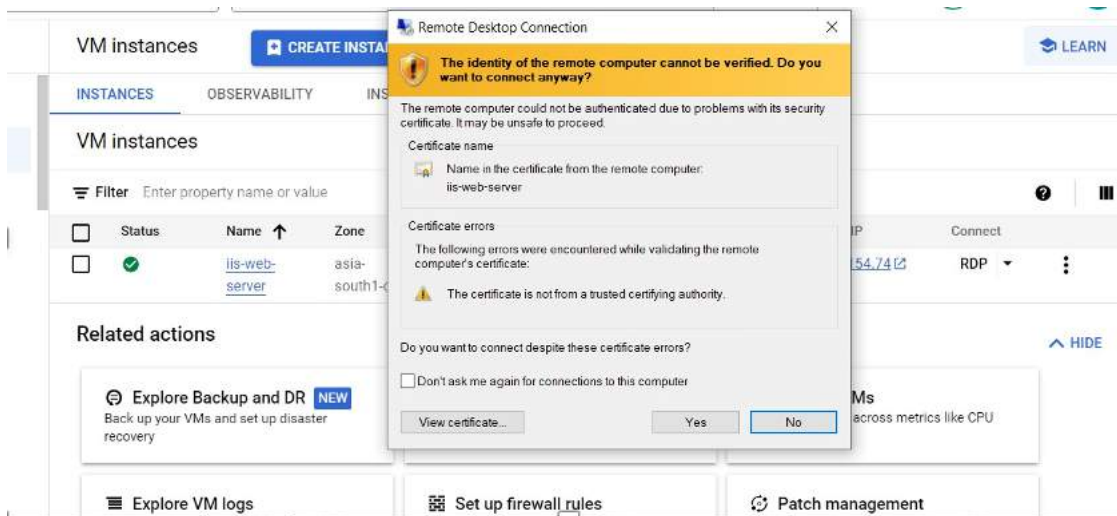
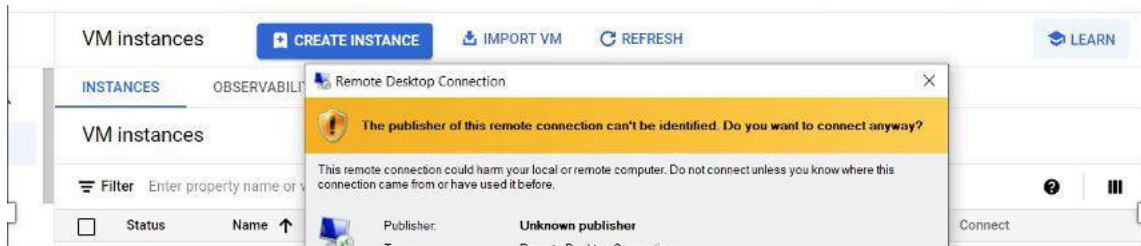


n. Open the RDP file by using the RDP client you downloaded.

o. When your RDP client prompts for a password, enter the password that you generated earlier.

p. When you're prompted whether you want your computer discoverable by other PCs and devices on the network, click No.

q.



Practical 6

1. A “Hello world “ website on IIS-Create an IIS web server VM using Compute Engine in

1. Create new Project
2. Enable Compute Engine APIs
3. On the Compute Engine page, click VM instances.
4. On the VM instances page, click Create instance.

Create an instance

Name *
iis-web-server

MANAGE TAGS AND LABELS

Region *
asia-south1 (Mumbai)
Region is permanent

Zone *
asia-south1-c
Zone is permanent

Monthly estimate
\$73.16
That's about \$0.10 hourly
Pay for what you use: no upfront costs and per second billing

| Item | Monthly estimate |
|---------------------------|------------------|
| 2 vCPU + 4 GB memory | \$29.38 |
| Premium image usage fee* | \$33.58 |
| 50 GB SSD persistent disk | \$10.20 |
| Total | \$73.16 |

Machine configuration

NEW: General-purpose machine series in Preview
Try the new N4 series, ideal for workloads that prioritize flexibility and cost-optimization
[SIGN UP](#)

☒ General purpose ☐ Compute optimized ☐ Memory optimized
☐ Storage optimized **NEW** ☐ GPUs

Machine types for common workloads, optimized for cost and flexibility

CREATE **CANCEL** [EQUIVALENT CODE](#)


5. In Boot disk, click Change, and then:
 - a. In the Operating system list, select Windows Server.
 - b. In the Version list, select Windows Server 2019 Datacenter.
 - c. In the Boot disk type list, select SSD persistent disk.

d. Click Select.

Boot disk ?

| | |
|----------------|--|
| Name | iis-web-server |
| Type | New SSD persistent disk |
| Size | 50 GB |
| License type ? | PAYG (Pay-as-you-go) |
| Image |  Windows Server 2019 Datacenter |

If you are using Windows and intend to run additional Microsoft software, please fill out the [License Verification Form](#)

[Learn more](#)  about Microsoft license mobility requirements







CHANGE

Google Cloud

My Project 54542

Search (/) for resources, docs, prod...

Search



Create an instance

EQUIVALENT CODE

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

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

☐ Allow Load Balancer Health Checks

Observability - Ops Agent ?

Monitor your system through collection of logs and key metrics.

☐ Install Ops Agent for Monitoring and Logging

Advanced options

Networking, disks, security, management, sole-tenancy

Monthly estimate

\$73.16

That's about \$0.10 hourly

Pay for what you use: no upfront costs and per second billing

| Item | Monthly estimate |
|---------------------------|------------------|
| 2 vCPU + 4 GB memory | \$29.38 |
| Premium image usage fee* | \$33.58 |
| 50 GB SSD persistent disk | \$10.20 |
| Total | \$73.16 |

* Image usage fee is billed by Google.

Compute Engine pricing

LESS

CREATE

CANCEL

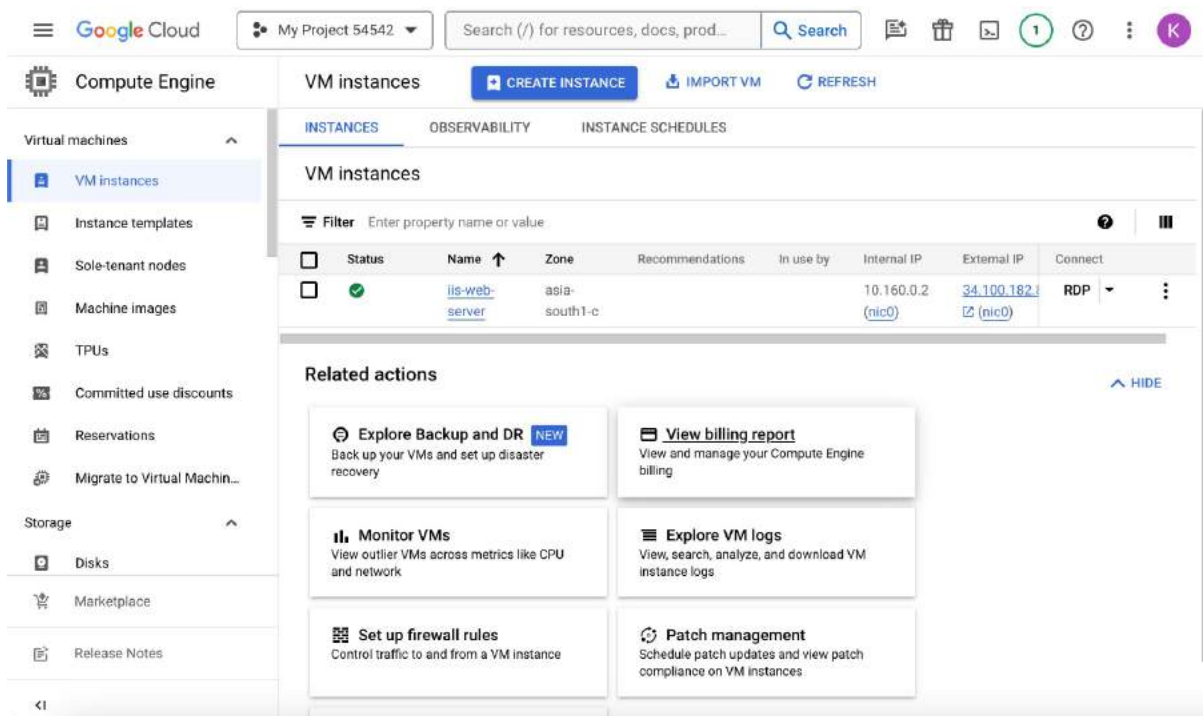
EQUIVALENT CODE

6. In the Firewall section, select Allow HTTP traffic.

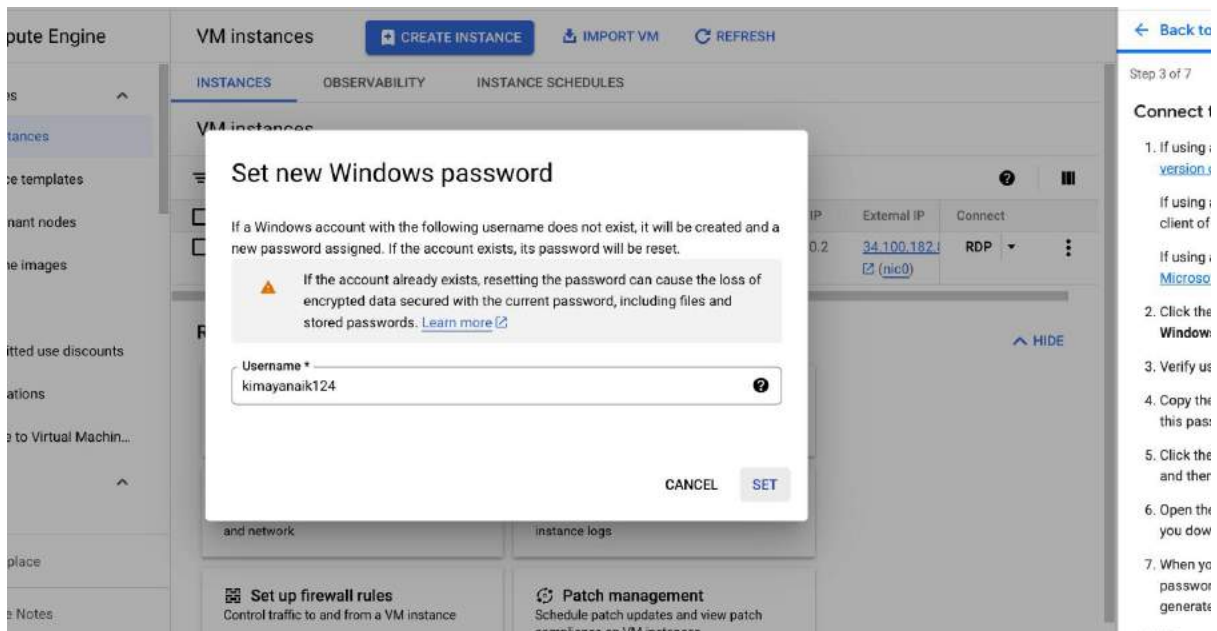
7. Click Create.

8. Connect to the VM:

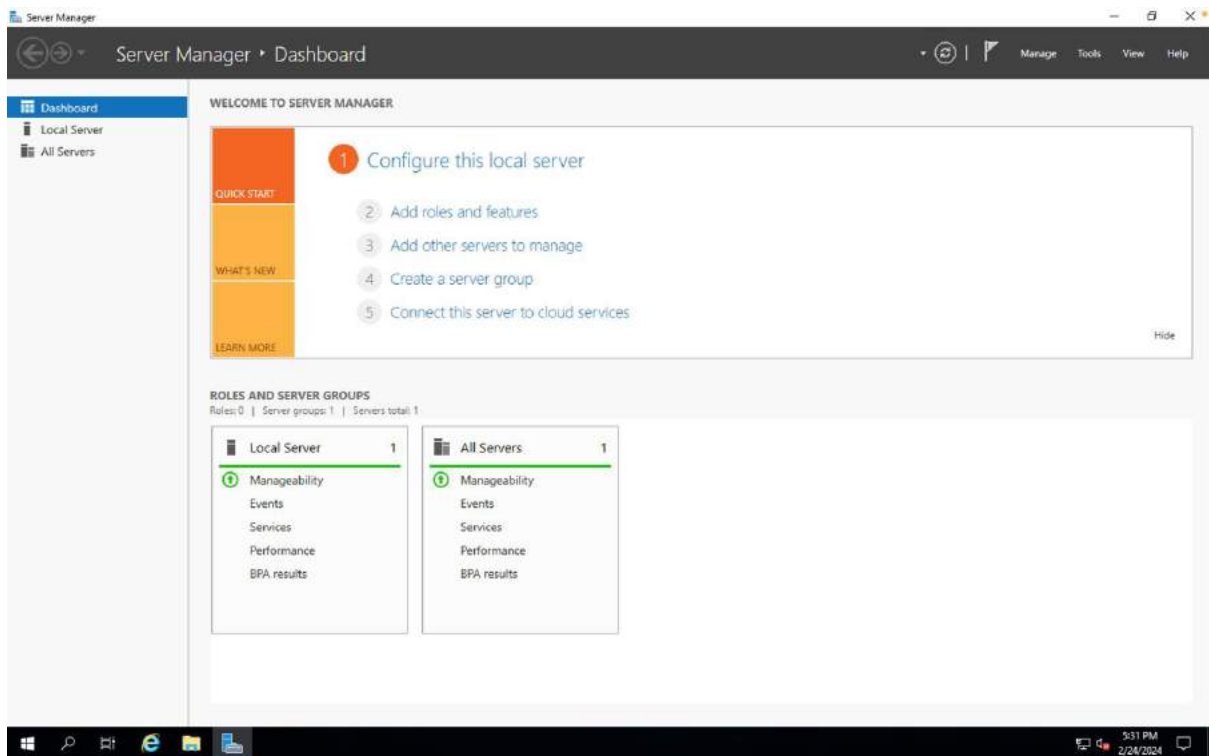
If using an Apple computer, get Mac version of Microsoft RDP.



1. Click the arrow next to RDP and click Set Windows password.
2. Click the arrow next to RDP and click Set Windows password.
3. Verify username is correct, then click Set.

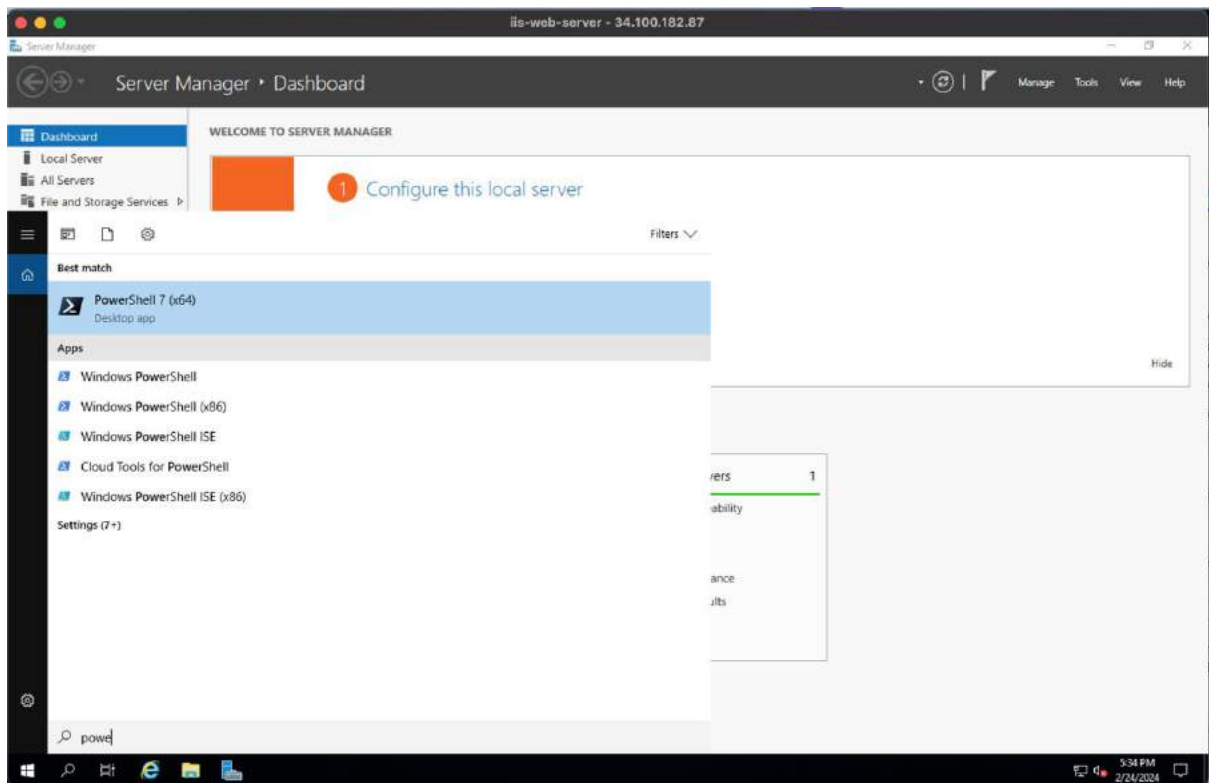


4. Copy the password that is shown. Save this password for reference.
5. Click the arrow next to the RDP button, and then select Download the RDP file.
6. Open the RDP file by using the RDP client you downloaded.
7. When your RDP client prompts for a password, enter the password that you generated earlier.
8. When you're prompted whether you want your computer discoverable by other PCs and devices on the network, click No.



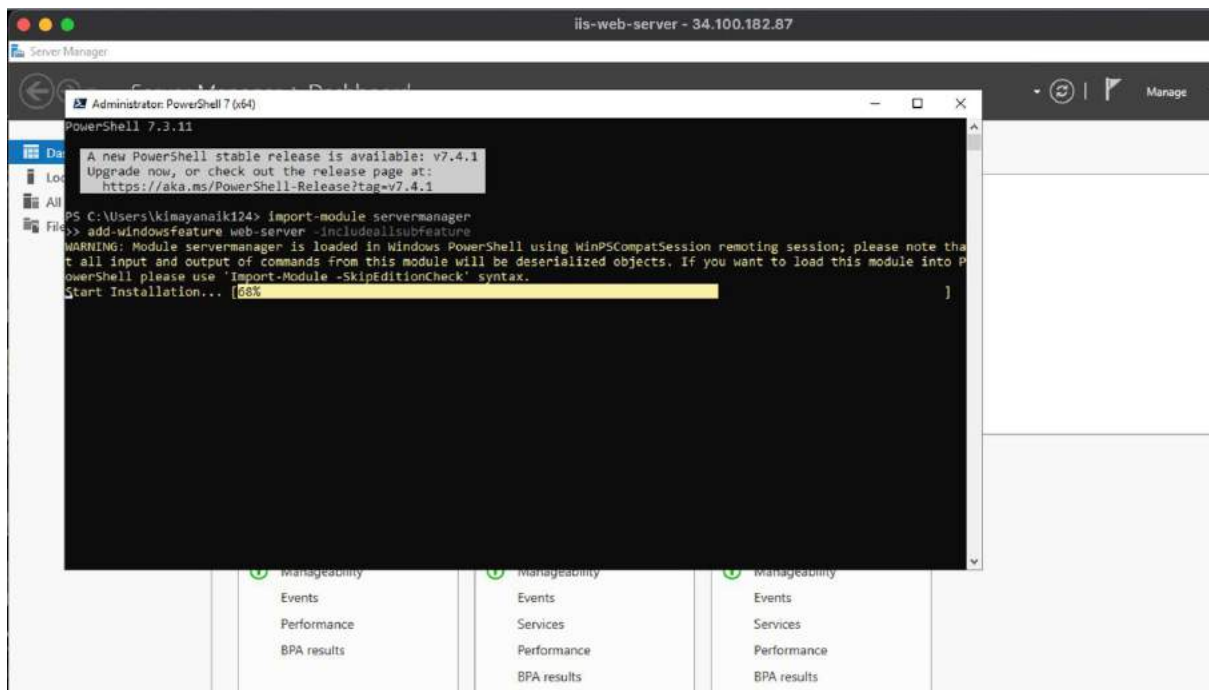
9. Create and view the website

1. In your VM, in the Search field in the Windows Server toolbar, type PowerShell.
2. Right-click on the PowerShell application icon to invoke the sub-menu, and then select Run as administrator.



3. Install IIS services with the following commands:

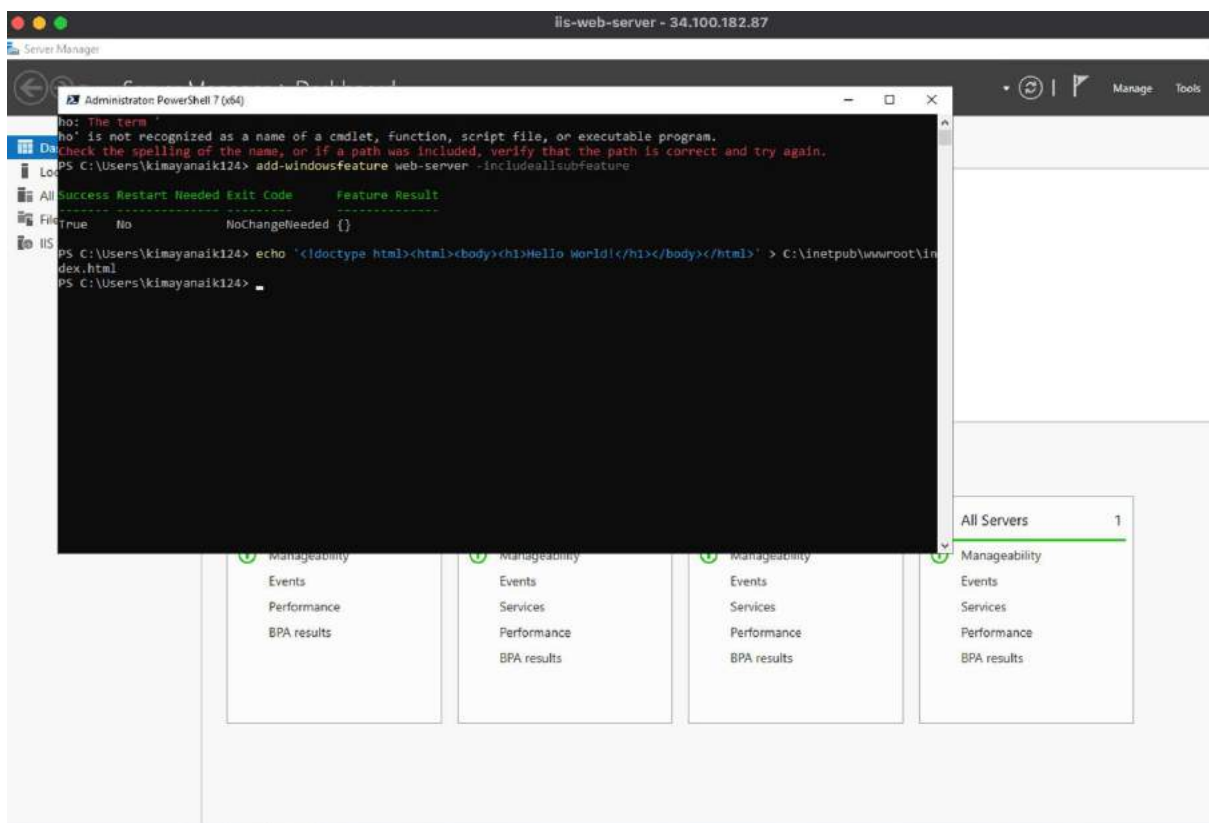
`import-module servermanager`




```
add-windowsfeature web-server -includeallsubfeature
```

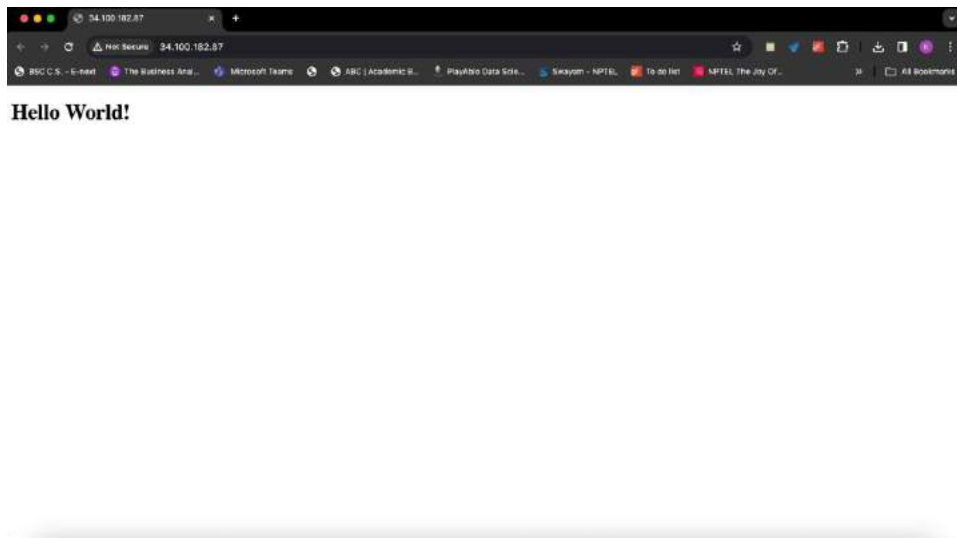
Overwrite the IIS web server default web page with the following command:

```
echo '<!doctype html><html><body><h1>Hello World!</h1></body></html>' > C:\inetpub\wwwroot\index.html
```



Copy the VM's IP address from the External IP column.

Paste the IP address in a new browser tab.



2. A “Hello World” website on Apache. Create an Apache web server on a Linux VM

- a. On the Compute Engine page, click VM instances → Create Instance
- b. In Boot disk, click Change, and then:
 - a. In the Operating system list, select Debian
 - b. In the Version list, keep the default value.
 - c. In the Boot disk type list, select SSD persistent disk
 - d. Click Select.

In the Firewall section, select Allow HTTP traffic.

Click Create.

Google Cloud

My Project 2

🔍

📄

📦

📁

🔔


?

⋮

K

←

Product details



Compute Engine API

Google Enterprise API

Compute Engine API

🔄

TRY THIS API

OVERVIEW

DOCUMENTATION

SUPPORT

RELATED PRODUCTS

Overview

Creates and runs virtual machines on Google Cloud Platform.

Additional details

Type: [SaaS & APIs](#)

Last product update: 3/24/23

Category: [Compute](#), [Networking](#), [Google Enterprise APIs](#)

Now viewing project "My Project 2" in organization "No organization"

Tutorials and documentation

Google Cloud

My Project 2

Search (/) for resources, docs, products, ...

🔍 Search

📄

📦

📁

2

🔔

?

⋮

K

←

Create an instance

EQUIVALENT CODE

⏪

+

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 *

linux-web-server

?

MANAGE TAGS AND LABELS

Region *

asia-south1 (Mumbai)

?

Zone *

asia-south1-c

?

Region is permanent

Zone is permanent

Machine configuration

NEW: General-purpose machine series in Preview

Try the new N4 series, ideal for workloads that prioritize flexibility and cost-optimization

SIGN UP

General purpose

Compute optimized

Memory optimized

Storage optimized

NEW

GPUs

Machine types for common workloads, optimized for cost and flexibility

| Series | Description | vCPUs | Mem |
|-------------------------------------|--------------------------------|-----------|-------|
| <input type="radio"/> C3 | Consistently high performance | 4 - 176 | 8 - 1 |
| <input type="radio"/> C3D | Consistently high performance | 4 - 360 | 8 - 2 |
| <input checked="" type="radio"/> E2 | Low cost, day-to-day computing | 0.25 - 32 | 1 - 1 |
| <input type="radio"/> M2 | Balanced price & performance | 2 - 138 | 2 - 1 |

Monthly estimate

\$30.58

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 | \$29.38 |
| 10 GB balanced persistent disk | \$1.20 |
| Total | \$30.58 |

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

CREATE

CANCEL

EQUIVALENT CODE

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

Debian

Version *

Debian GNU/Linux 12 (bookworm)

x86/64, amd64 built on 20240213

Boot disk type *

SSD persistent disk

COMPARE DISK TYPES

Size (GB) *

10

Provision between 10 and 65536 GB

✓ SHOW ADVANCED CONFIGURATION

SELECT

CANCEL

Firewall ?

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



Allow HTTP traffic



Allow HTTPS traffic



Allow Load Balancer Health Checks

c. Install an Apache server

To open a terminal to your instance, in the **Connect** column, click **SSH**.

Update the package lists on your instance:

```
sudo apt-get update
```

Install the Apache2 HTTP Server:

```
sudo apt-get install apache2 php7.0
```

```

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

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
kimayanaik124@linux-web-server:~$ sudo apt-get update
Get:1 file:/etc/apt/mirrors/debian.list Mirrorlist [30 B]
Get:5 file:/etc/apt/mirrors/debian-security.list Mirrorlist [39 B]
Get:2 https://deb.debian.org/debian bookworm InRelease [151 kB]
Get:7 https://packages.cloud.google.com/apt/google-compute-engine-bookworm-stable InRelease [5146 B]
Get:8 https://packages.cloud.google.com/apt/cloud-sdk-bookworm InRelease [6406 B]
Get:9 https://packages.cloud.google.com/apt/google-compute-engine-bookworm-stable/main amd64 Packages [1936 B]
Get:3 https://deb.debian.org/debian bookworm-updates InRelease [55.4 kB]
Get:4 https://deb.debian.org/debian bookworm-backports InRelease [56.5 kB]
Get:6 https://deb.debian.org/debian-security bookworm-security InRelease [48.0 kB]
Get:10 https://packages.cloud.google.com/apt/cloud-sdk-bookworm/main amd64 Packages [455 kB]
Get:11 https://deb.debian.org/debian bookworm-backports/main Sources.diff/Index [63.3 kB]
Get:12 https://deb.debian.org/debian bookworm-backports/main amd64 Packages.diff/Index [63.3 kB]
Get:16 https://deb.debian.org/debian bookworm-backports/main Sources T-2024-02-26-1409.10-F-2024-02-13-2006.01.pdiff [12.5 kB]
Get:16 https://deb.debian.org/debian bookworm-backports/main Sources T-2024-02-26-1409.10-F-2024-02-13-2006.01.pdiff [12.5 kB]
Get:17 https://deb.debian.org/debian bookworm-backports/main amd64 Packages T-2024-02-24-0213.12-F-2024-02-13-2006.01.pdiff [11.5 kB]
Get:17 https://deb.debian.org/debian bookworm-backports/main amd64 Packages T-2024-02-24-0213.12-F-2024-02-13-2006.01.pdiff [11.5 kB]
Get:13 https://deb.debian.org/debian-security bookworm-security/main Sources [82.2 kB]
Get:14 https://deb.debian.org/debian-security bookworm-security/main amd64 Packages [143 kB]
Get:15 https://deb.debian.org/debian-security bookworm-security/main Translation-en [85.4 kB]
Fetched 1242 kB in 2s (796 kB/s)
Reading package lists... Done
kimayanaik124@linux-web-server:~$ sudo apt-get install apache2 php7.0
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Note, selecting 'php7.0-thrift' for regex 'php7.0'
Note, selecting 'php7.0-common' for regex 'php7.0'
Note, selecting 'php7.0-curl' for regex 'php7.0'
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap libjansson4 liblua5.3-0 ssl-cert
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom www-browser
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1 libaprutil1-dbd-sqlite3 libaprutil1-ldap libjansson4 liblua5.3-0 ssl-cert
0 upgraded, 11 newly installed, 0 to remove and 5 not upgraded.
Need to get 2341 kB of archives.
After this operation, 8389 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 file:/etc/apt/mirrors/debian.list Mirrorlist [30 B]
Get:2 https://deb.debian.org/debian bookworm/main amd64 libapr1 amd64 1.7.2-3 [102 kB]
Get:3 https://deb.debian.org/debian bookworm/main amd64 libaprutil1 amd64 1.6.3-1 [87.8 kB]

```

Overwrite the Apache web server default web page with the following command:

```
echo '<!doctype html><html><body><h1>Hello World!</h1></body></html>' | sudo tee /var/www/html/index.html
```

```

Processing triggers for libc-bin (2.36-9+deb12u4) ...
kimayanaik124@linux-web-server:~$ echo '<!doctype html><html><body><h1>Hello World!</h1></body></html>' | sudo tee /var/www/html/index.html
<!doctype html><html><body><h1>Hello World!</h1></body></html>
kimayanaik124@linux-web-server:~$

```

d. Test your server

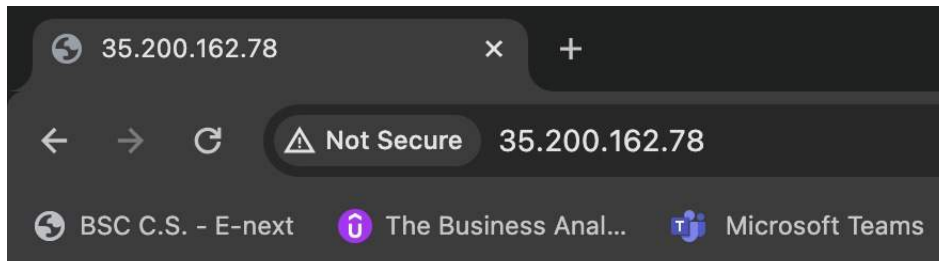
In the Google Cloud Console, go to the VM instances.

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

Engine chevron_right VM instances

Copy the VM's IP address from the External IP column.

Paste the IP address in a new browser tab.



Hello World!

3. Transfer files to Windows VMs

1. In the Google Cloud console navigation menu, click **Cloud Storage**, and then select **Buckets**.

[Go to Buckets](#)

Google Cloud | My Project 2 | Search (/) for resources, docs, products, ... | Search

Cloud Storage | Buckets | CREATE | REFRESH | LEARN

Buckets

Monitoring | Settings

Marketplace | Release Notes

Transfer **New** X

Power near real-time analytics and replication with event-driven transfers

You can now capture changes faster at your Google Cloud Storage and Amazon S3 sources via event-driven transfers, enabling you to act on your data in near real time. To get started, create a transfer job with a Pub/Sub- or AWS SQS-based event stream configured to send event notifications when objects are created or updated.

CREATE TRANSFER JOB | LEARN MORE

Security X

View security recommendations

Improve security by applying security recommendations to your buckets. The security insights column in the table describes which buckets have excess permissions.

VIEW IN TABLE | LEARN MORE

Filter | Filter buckets

| Name | Created | Location type | Location | Default storage class | Last modified |
|------|---------|---------------|----------|-----------------------|---------------|
| | | | | | |

https://console.cloud.google.com/storage/create-bucket?hl=en&project=driven-seer-415517

Click **Create** to finish creating the bucket.

Google Cloud | My Project 2 | Search (/) for resources, docs, products, ... | Search

Cloud Storage | Create a bucket

Pick a globally unique, permanent name. [Naming guidelines](#)

windows-files-driven-seer-415517

Tip: Don't include any sensitive information

LABELS (OPTIONAL)

CONTINUE

Choose where to store your data

Location: us (multiple regions in United States)
Location type: Multi-region

Choose a storage class for your data

Default storage class: Standard

Choose how to control access to objects

Public access prevention: On
Access control: Uniform

Choose how to protect object data

Object versioning: Disabled
Bucket retention policy: Disabled
Object retention: Disabled
Encryption type: Google-managed

Location pricing

Storage rates vary depending on the storage class of your data and location of your bucket. [Pricing details](#)

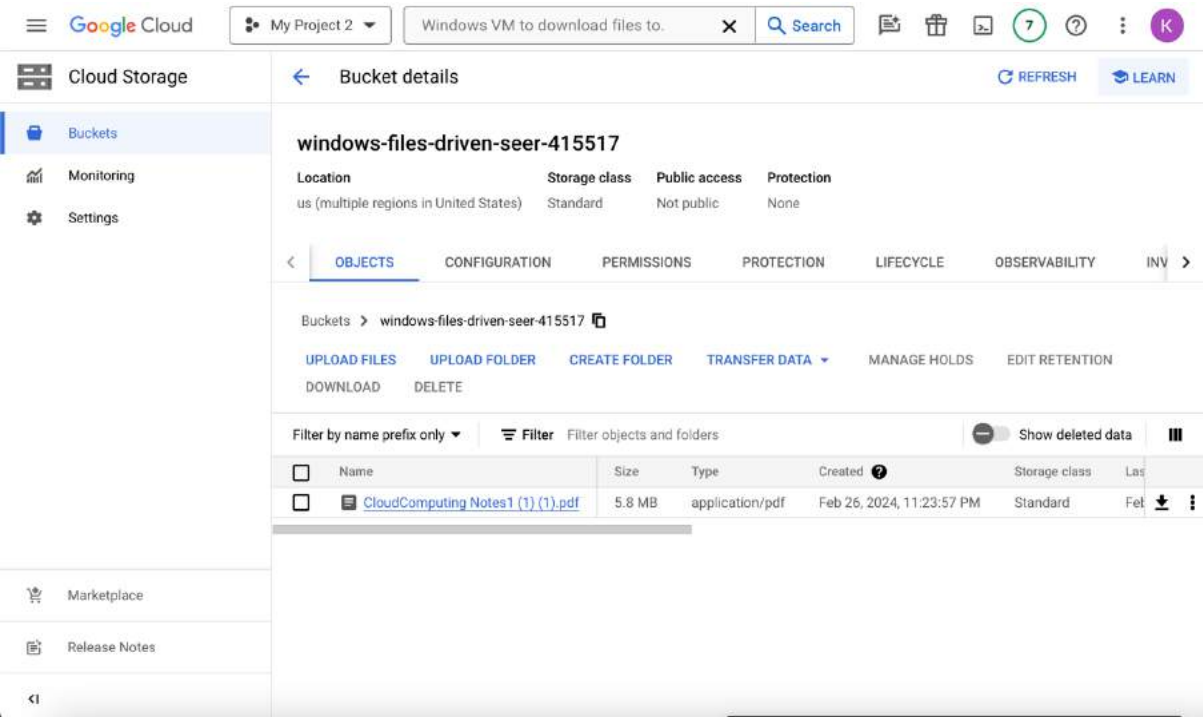
Current configuration: Multi-region / Standard

| Item | Cost |
|--|------------------------|
| us (multiple regions in United States) | \$0.026 per GB-month |
| With default replication | \$0.020 per GB written |

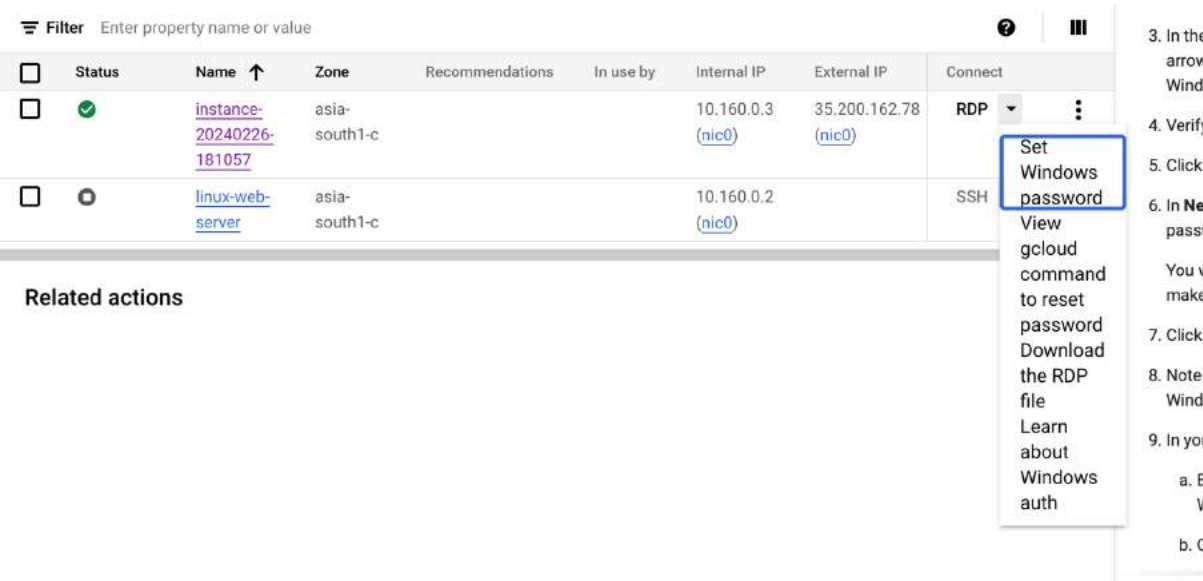
ESTIMATE YOUR MONTHLY COST

CREATE | CANCEL

On the **Buckets** page, click the name of the bucket to upload files to.

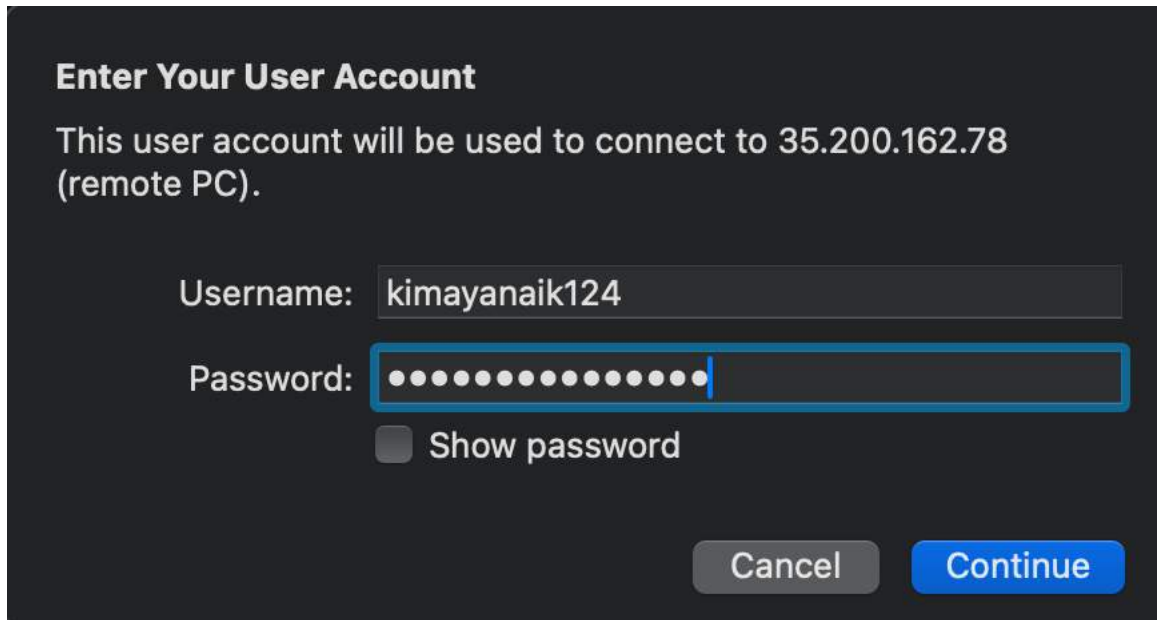


In the **Connect** column, click the down arrow to set the password for the Windows VM.



In your remote desktop application:

- a. Enter the external IP address of the Windows VM
- b. Connect to the Windows VM
- c. Enter the username and password



Enter Your User Account

This user account will be used to connect to 35.200.162.78 (remote PC).

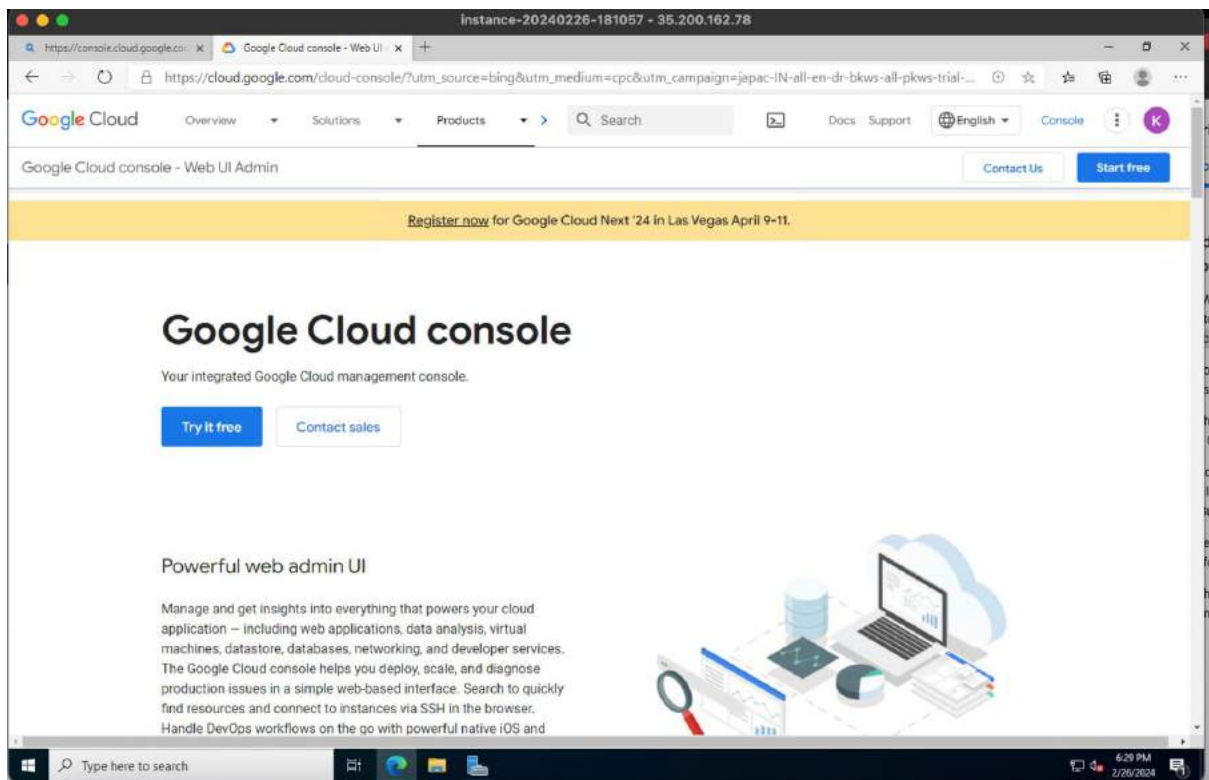
Username: kimayanaik124

Password: ●●●●●●●●●●●●●●

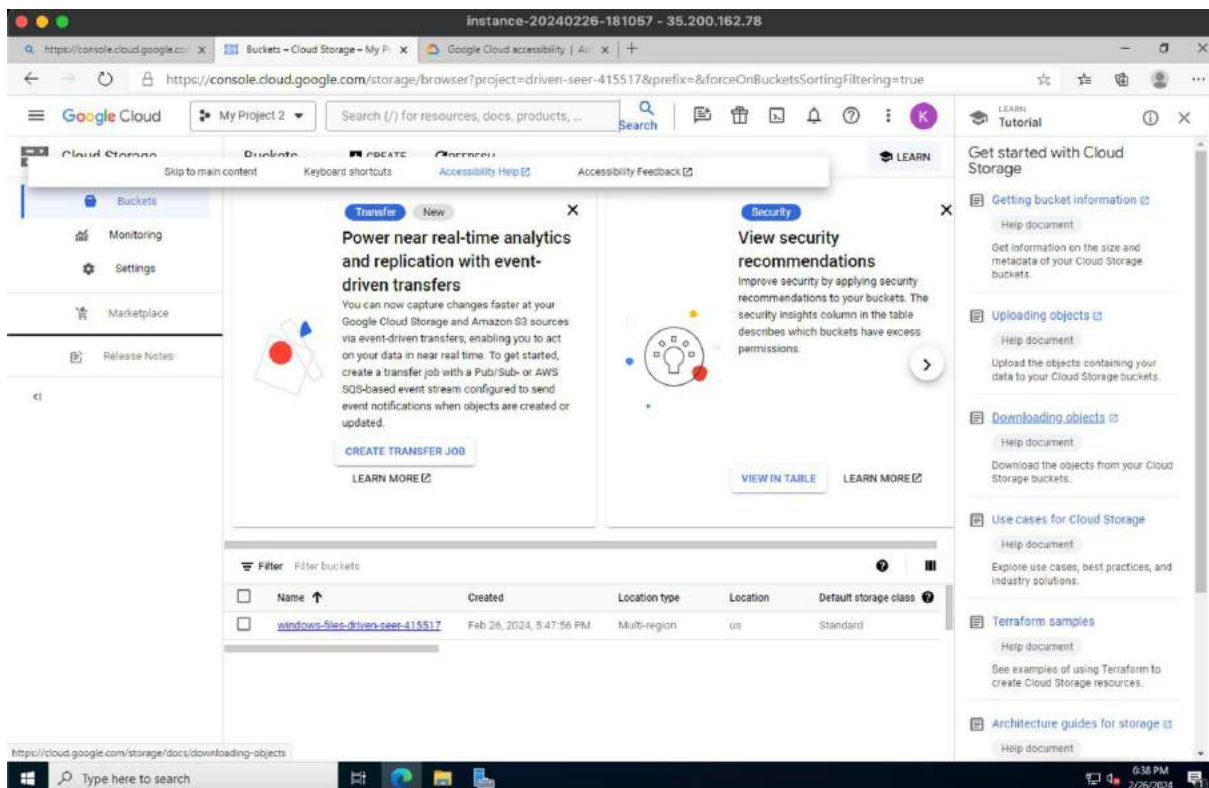
☐ Show password

Cancel Continue

On the Windows VM, open a web browser and go to <https://console.cloud.google.com/>.

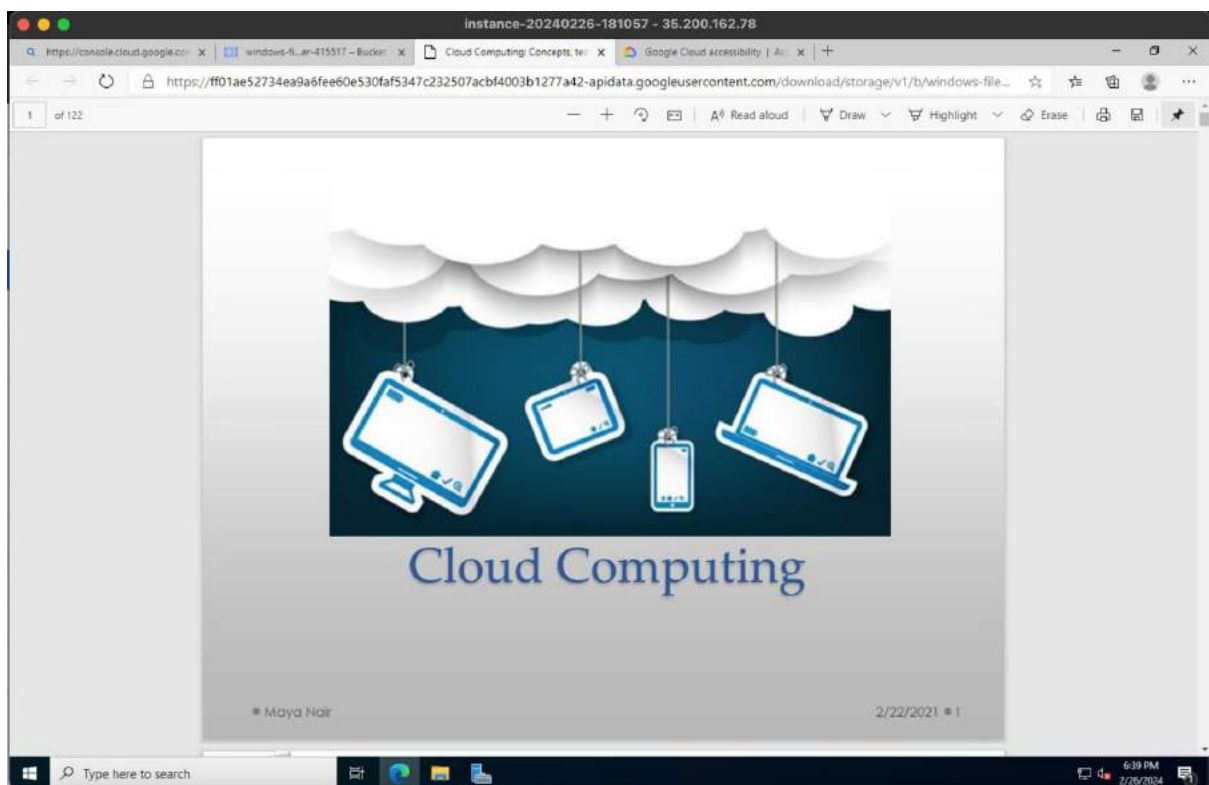
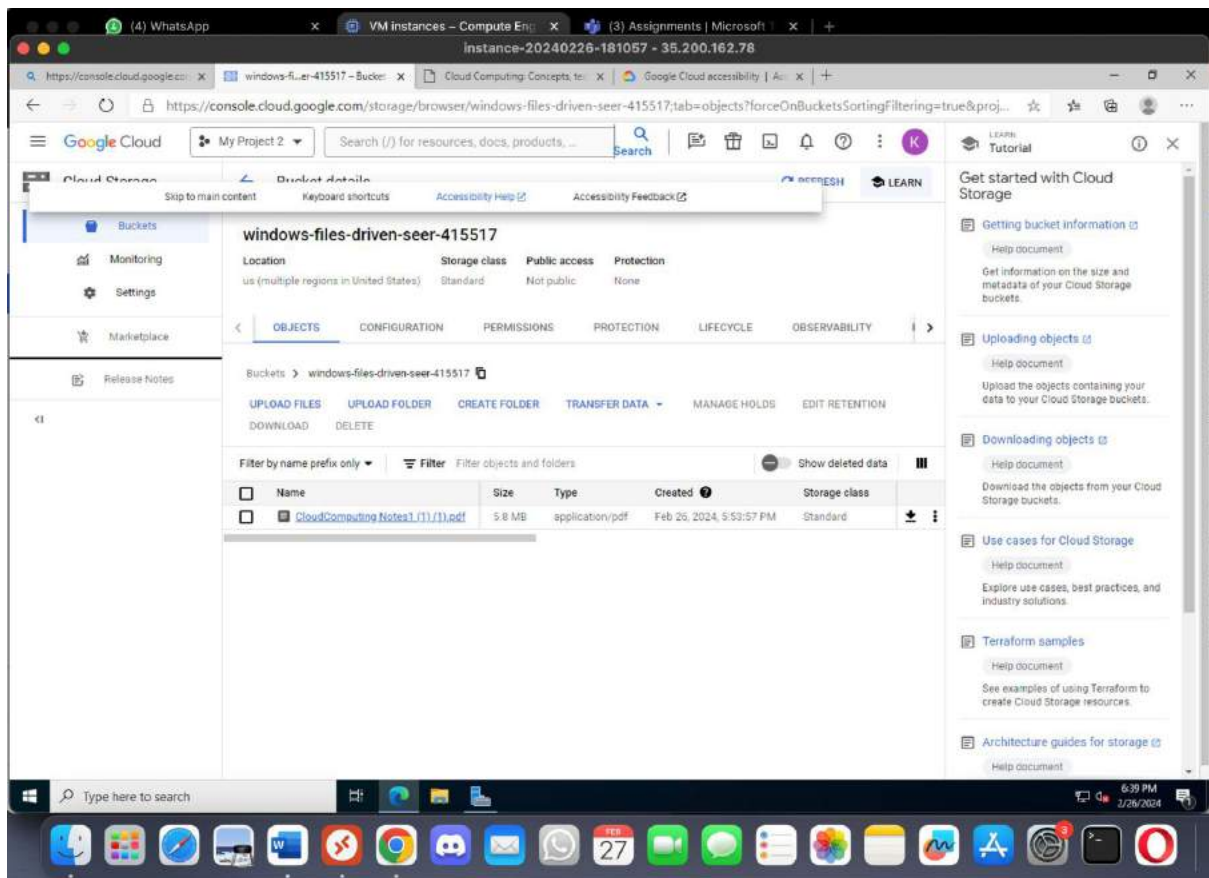


Select the project that has the previously created Cloud Storage bucket.



Click the name of the bucket that has the files or folders you previously uploaded.

Select the files or folders to download, and then click **Download**.



4. Transfer files to Linux VMs

- Create a VM instance

Google Cloud | My Project 54542 | Search (/) for resources, docs, prod... | Search

Create an instance

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 *
cc-4

MANAGE TAGS AND LABELS

Region *
us-central1 (Iowa)
Region is permanent

Zone *
us-central1-a
Zone is permanent

Monthly estimate
\$26.16
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 | \$24.46 |
| 10 GB SSD persistent disk | \$1.70 |
| Total | \$26.16 |

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

Machine configuration

NEW: General-purpose machine series in Preview
Try the new N4 series, ideal for workloads that prioritize flexibility and cost-optimization
[SIGN UP](#)

☒ General purpose ☐ Compute optimized ☐ Memory optimized
☐ Storage optimized ☒ NEW ☐ GPUs

Machine types for common workloads, optimized for cost and flexibility

[CREATE](#) [CANCEL](#) [EQUIVALENT CODE](#)

Open Cloud Shell

Google Cloud | My Project 4 | Search (/) for resources, docs, products... | Search

Compute Engine

VM instances [CREATE INSTANCE](#) [IMPORT VM](#) [REFRESH](#) [LEARN](#)

INSTANCES **OBSERVABILITY** **INSTANCE SCHEDULES**

VM instances

Filter Enter property name or value

| Status | Name | Zone | Recommendations | In use by | Internal IP | External IP | Connect |
|-------------------------------------|------|--------------|-----------------|-----------|-------------------|--------------------|---------|
| <input checked="" type="checkbox"/> | cc-4 | us-central1- | | | 10.128.0.2 (nic0) | 35.226.145. (nic0) | SSH |

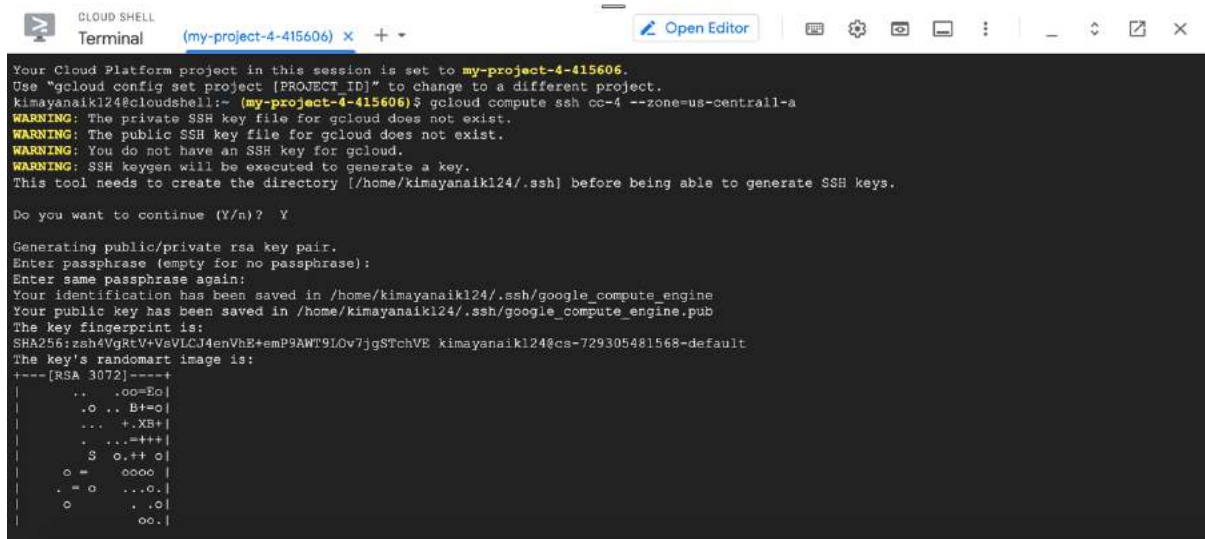
CLOUD SHELL
Terminal (my-project-4-415606) [Open Editor](#)

```
Welcome to Cloud Shell! Type "help" to get started.
Your Cloud Platform project in this session is set to my-project-4-415606.
Use "gcloud config set project [PROJECT_ID]" to change to a different project.
kimayanaik124@cloudshell:~ (my-project-4-415606) $
```

[Click here to see details about your Cloud Shell session and usage quota](#)
Got it!

To connect to the VM, run the following command:

```
gcloud compute ssh cc-4 --zone=us-central1-a
```



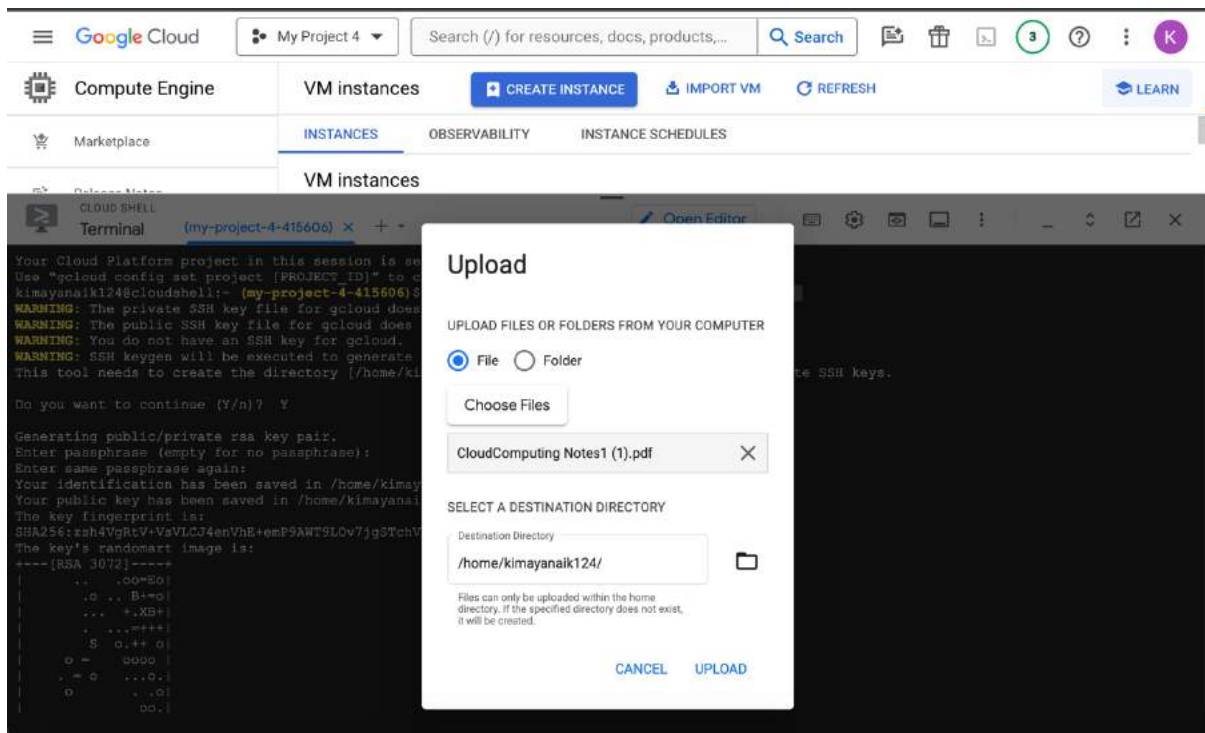
```
CLOUD SHELL
Terminal (my-project-4-415606) x +
Open Editor

Your Cloud Platform project in this session is set to my-project-4-415606.
Use "gcloud config set project [PROJECT ID]" to change to a different project.
kimayanaik124@cloudshell:~ (my-project-4-415606) $ gcloud compute ssh cc-4 --zone=us-central1-a
WARNING: The private SSH key file for gcloud does not exist.
WARNING: The public SSH key file for gcloud does not exist.
WARNING: You do not have an SSH key for gcloud.
WARNING: SSH keygen will be executed to generate a key.
This tool needs to create the directory [/home/kimayanaik124/.ssh] before being able to generate SSH keys.

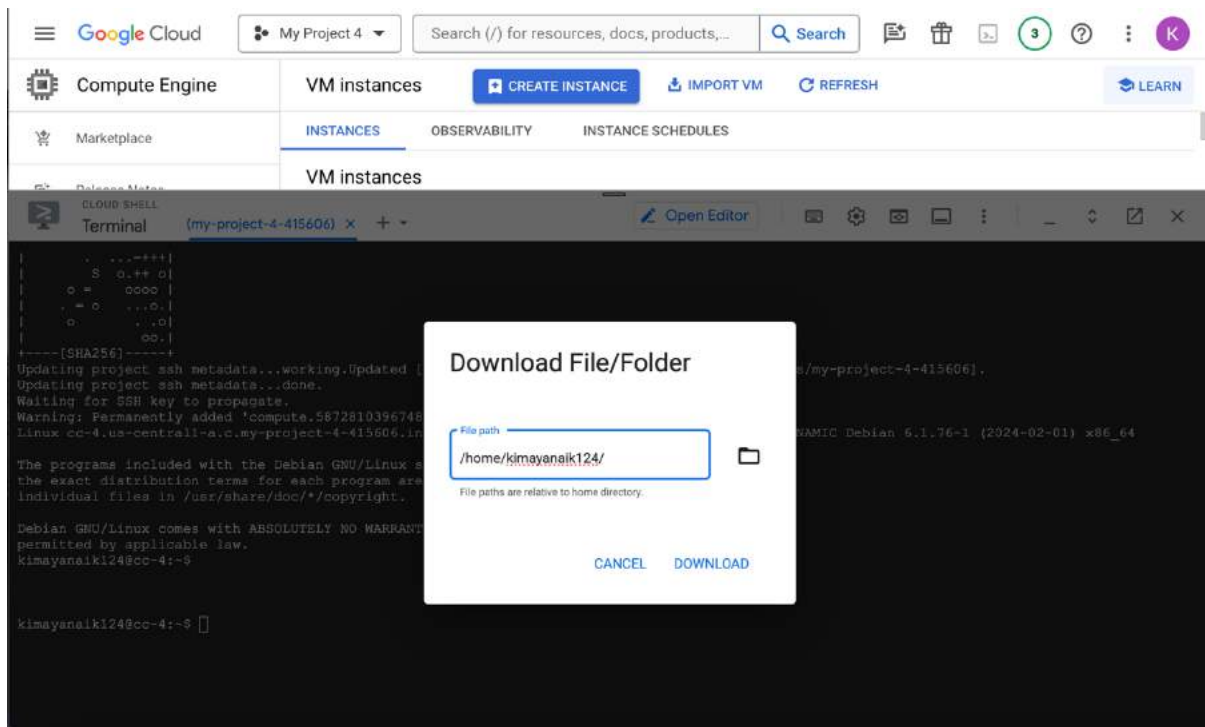
Do you want to continue (Y/n)? Y

Generating public/private rsa key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/kimayanaik124/.ssh/google_compute_engine
Your public key has been saved in /home/kimayanaik124/.ssh/google_compute_engine.pub
The key fingerprint is:
SHA256:zsh4VgRtV+VsVLCJ4enVhE+emP9ANT9LOv7jgSTchVE kimayanaik124@cs-729305481568-default
The key's randomart image is:
+---[RSA 3072]-----+
  .. .oo=Eo|
  .o .. B+o|
  ... +.XB+|
  . ...=+++|
  S o.++ o|
  o = oooo |
  . = o ...o|
  o . .o|
  . oo.|
```

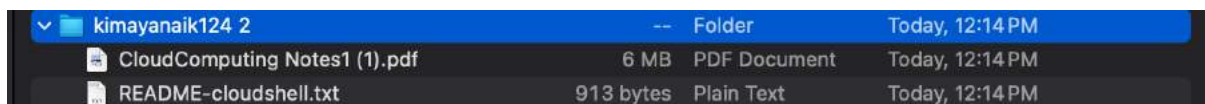
After the connection is established, click **More** and select **Upload**.



After the connection is established, click **More** and select **Download**.



The file is downloaded on your machine. If you downloaded a folder, it is downloaded as a zipped file.



5. Back up a VM's persistent disk

Create a Linux VM instance

1. On the **Public images** tab, change the following settings:
 - **Operating system** to **Ubuntu**
 - **Version** to **Ubuntu 20.04 LTS**

Google Cloud | My Project 29298 | Search (/) for resources, docs, prod... | Search

Create an instance | EQUIVALENT CODE

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

Container

Deploy a container image to this VM instance

[DEPLOY CONTAINER](#)

Boot disk

| | |
|--------------|------------------------------|
| Name | cc-5 |
| Type | New balanced persistent disk |
| Size | 10 GB |
| License type | Free |
| Image | Ubuntu 20.04 LTS |

[CHANGE](#)

Identity and API access

Service accounts

Service account: 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](#)

Monthly estimate

\$25.46
That's about \$0.03 hourly

Pay for what you use: no upfront costs and per second billing

| Item | Monthly estimate |
|--------------------------------|------------------|
| 2 vCPU + 4 GB memory | \$24.46 |
| 10 GB balanced persistent disk | \$1.00 |
| Total | \$25.46 |

[Compute Engine pricing](#)

[LESS](#)

[CREATE](#) [CANCEL](#) [EQUIVALENT CODE](#)

1. Select the project that contains your VM instances. Show me.
2. In the Name column, click the name of the VM that has the persistent disk to back up.

Google Cloud | My Project 29298 | Search (/) for resources, docs, prod... | Search

Compute Engine

Virtual machines

- VM instances
- Instance templates
- Sole-tenant nodes
- Machine images
- TPUs
- Committed use discounts
- Reservations
- Migrate to Virtual Machin...

Storage

- Disks
- Marketplace
- Release Notes

cc-5 | EDIT | RESET | CREATE MACHINE IMAGE | OPERATIONS

DETAILS | OBSERVABILITY | OS INFO | SCREENSHOT

Storage

Boot disk

| Name | Image | Interface type | Size (GB) | Device name | Type | Architecture | Enc |
|----------------------|---|----------------|-----------|-------------|--------------------------|--------------|---------|
| cc-5 | ubuntu-2004-focal-v20240226 | SCSI | 10 | cc-5 | Balanced persistent disk | x86_64 | Gor mai |

Local disks

None

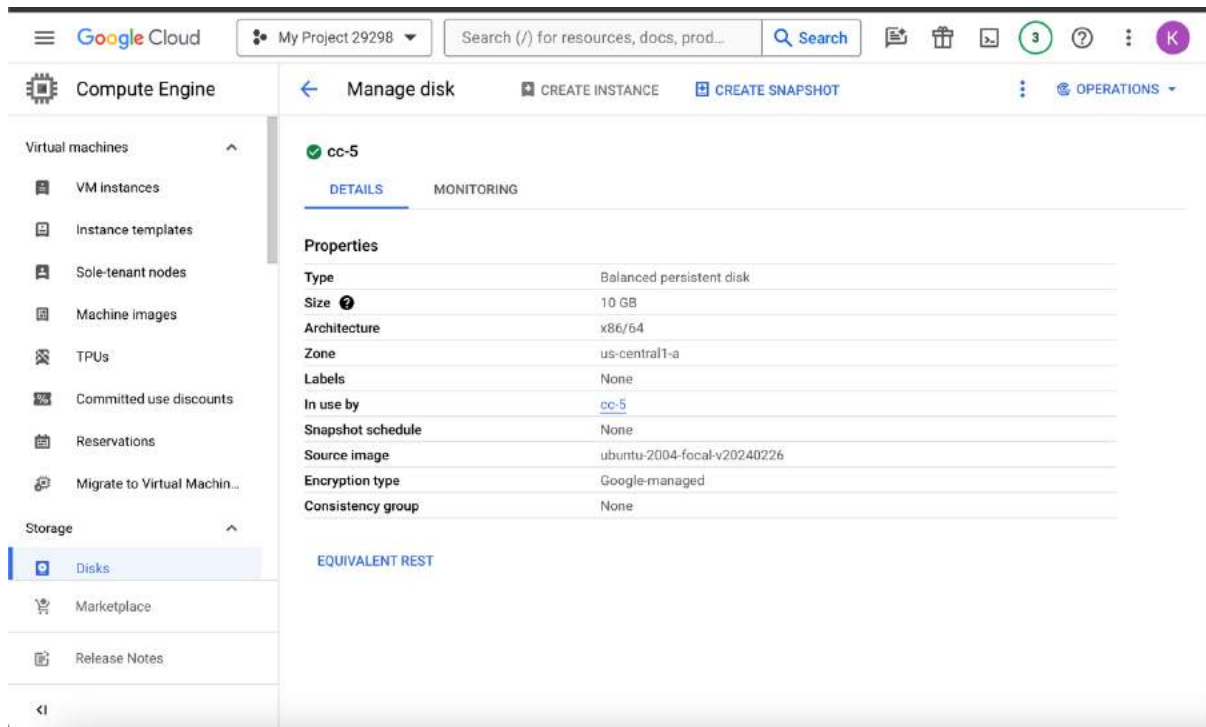
Additional disks

None

Security and access

1. In Storage:

To back up the boot disk, in the Boot disk section, click the Name of the boot disk.



Click **Create snapshot**.

5. In Name, enter a unique name to help identify the purpose of the snapshot, for example:

o boot-disk-snapshot-assignment-09

6. In Type, the default is a regular snapshot, which is best for long-term back up and disaster recovery.

Choose Archive snapshot for more cost-efficient data retention

7. In the Location section,

Choose the type of storage location that you want for your snapshot.

- Choose Multi-regional for higher availability at a higher cost.
- Choose Regional snapshots for more control over the physical location of your data at a lower cost.

In the Select location field, select the specific region or multi-region that you want to use.

To use the region or multi-region that is closest to your source disk, select Based on disk's location.

8. To create a manual snapshot, click Create.

← Create a snapshot EQUIVALENT CODE

Snapshots are backups of persistent disks. They're commonly used to recover, transfer, or make data accessible to other resources in your project. [Learn more](#)

Name *
snapshot-1
Name is permanent

Description

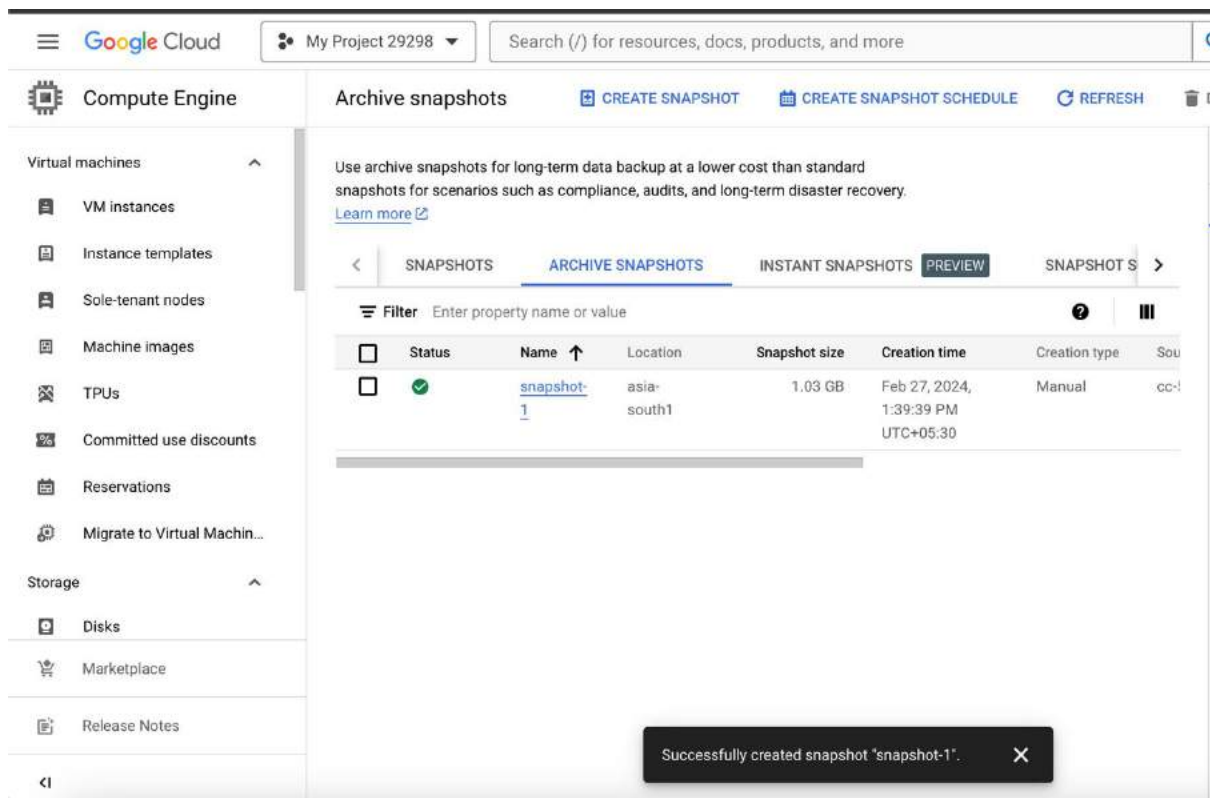
Snapshot source type *
Disk

Source disk *
cc-5

Type *

- ☐ Snapshot
Standard backup and disaster recovery; stored in a separate location from your disk
- ☐ Instant snapshot
Rapid restoration; stored in the same location as your disk
- ☒ Archive snapshot
Long-term storage for infrequently-accessed data; stored in a separate location from your disk

CREATE **CANCEL** EQUIVALENT CODE



6. Configure periodic backups with a snapshot schedule

1. click Compute Engine → VM instances.
2. In the Name column, click the name of the VM that has the persistent disk to create a snapshot schedule for.
3. In Storage, click the name of the Boot disk or the Additional disk to create a snapshot schedule for.
4. Click Edit.

Manage disk CREATE INSTANCE CREATE SNAPSHOT OPERATIONS

cc-5

DETAILS MONITORING

Properties

| | |
|-------------------|-----------------------------|
| Type | Balanced persistent disk |
| Size | 10 GB |
| Architecture | x86/64 |
| Zone | us-central1-a |
| Labels | None |
| In use by | cc-5 |
| Snapshot schedule | None |
| Source image | ubuntu-2004-focal-v20240226 |
| Encryption type | Google-managed |
| Consistency group | None |

EQUIVALENT REST

CREATE IMAGE
CLONE DISK
CREATE SECONDARY DISK
EDIT
DELETE

5. In Snapshot schedule, choose Create a schedule.

Manage disk CREATE INSTANCE CREATE SNAPSHOT OPERATIONS

cc-5

Properties

Size * 10 GB ?
Provision between 10 and 65,536 GB

Snapshot schedule

Select or create a snapshot schedule

Filter Type to filter

There are no schedules in us-central1

CREATE A SCHEDULE

Labels

+ ADD LABEL

| | |
|--------------|-----------------------------|
| Type | Balanced persistent disk |
| Architecture | x86/64 |
| Zone | us-central1-a |
| In use by | cc-5 |
| Source image | ubuntu-2004-focal-v20240226 |

6. In Name, enter one of the Name

In the Location section, choose your snapshot storage location. The predefined or customized default location defined in your snapshot settings is automatically selected. Optionally, you can override the snapshot settings and store your snapshots

In a custom storage location by doing the following:

Choose the type of storage location that you want for your snapshot.

- Choose Multi-regional for higher availability at a higher cost.
- Choose Regional snapshots for more control over the physical location of your data at a lower cost.

In the Select location field, select the specific region or multi-region that you want to use. To use the region or multi-region that is closest to your source disk, select Based on disk's location.

Create a schedule

Create a snapshot schedule to regularly and automatically back up your persistent disks. First create a schedule, then attach it to the disks you wish to back up. [Learn more](#)

Name *

schedule-1

Lowercase letters, numbers, hyphens allowed

Description

Schedule location

Choose where to use this schedule. You can only attach a snapshot schedule to a persistent disk in this region.

Region

us-central1

Snapshot storage location

Choose where to store snapshots generated by this schedule. Location can affect availability and networking costs. [Learn more](#)

☐ Multi-regional

☒ Regional

Select location

asia-south1 (Mumbai)

CREATE

CANCEL

To attach this snapshot schedule to the persistent disk, click Save.

Manage disk

CREATE INSTANCECREATE SNAPSHOTCREATE IMAGECLONE DISK

cc-5

DETAILSMONITORING

Properties

| | |
|-------------------|-----------------------------|
| Type | Balanced persistent disk |
| Size | 10 GB |
| Architecture | x86/64 |
| Zone | us-central1-a |
| Labels | None |
| In use by | cc-5 |
| Snapshot schedule | schedule-1 |
| Source image | ubuntu-2004-focal-v20240226 |
| Encryption type | Google-managed |
| Consistency group | None |

EQUIVALENT REST

7. Restore a boot disk from a snapshot

Detach the boot disk and configure a new boot disk

1. click Compute Engine, and then select VM instances.
2. Click the Name of the VM with the persistent disk to restore.
3. Stop the VM.

INSTANCESOBSERVABILITYINSTANCE SCHEDULES

1START / RESUMESTOPSUSPENDRESETDELETELABELS

Stop cc-5?

You'll be billed only for these preserved resources:

- Persistent disks
- Static IP addresses

The VM will gracefully shut down in 90 seconds. If processes are still running, the VM will be forced to stop and files may get corrupted.

CANCELSTOP

Monitor VMs

View outlier VMs across metrics like CPU and network

Explore VM logs

View, search, analyze, and download VM instance logs

✓ **Stop VM instance "cc-5"**
My Project 29298

Just now

3. Click Edit the VM.
4. In Storage, click Detach boot disk

☐ Use a custom device name

Device name

cc-5

Based on disk name (default)

✕ DETACH BOOT DISK

Additional disks

Storage

Boot disk

No disk selected. You can add a new disk or attach an existing disk.

 CONFIGURE BOOT DISK

8. In Snapshots, choose a snapshot to create a disk from.
9. In Name, enter new-boot-disk-essential-415518

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

Snapshot
snapshot-1

Created on Feb 27, 2024, 1:39:39 PM, cc-5

Name *
new-boot-disk-essential-cairn-415518

Name is permanent

Boot disk type *
Balanced persistent disk

COMPARE DISK TYPES

Size (GB) *
10


Provision between 10 and 65536 GB

SHOW ADVANCED CONFIGURATION


SELECT CANCEL

10. After configuring the source for the new boot disk, click Select.

11. To finish configuring the VM, click Save.

 **Edit VM instance "cc-5"** Just now
My Project 29298

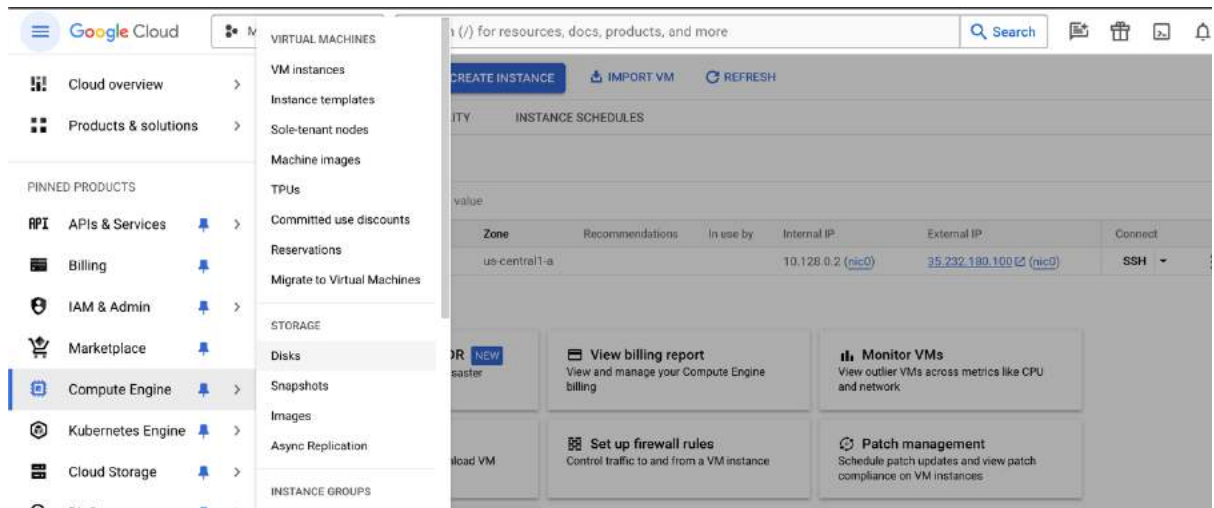
12. To start the VM, click Start

 **Start VM instance "cc-5"** Just now
My Project 29298

| VM instances | | | | | | | | | |
|-------------------------------------|--------|--------|---------------|-----------------|-----------|----------------------|-----------|---------|---|
| Filter Enter property name or value | | | | | | | | | |
| <input type="checkbox"/> | Status | Name ↑ | Zone | Recommendations | In use by | Internal IP | Ex | Connect | |
| <input type="checkbox"/> | ✓ | cc-5 | us-central1-a | | | 10.128.0.2 (nic0) | 35 232 | SSH | ⋮ |

Optionally delete the disk

To delete the original disk if you no longer need it, do the following:
click Compute Engine, and then select Disks.



2. In the In use by column, note that the original disk is no longer in use by any VM.

You can't delete a disk that is in use by a VM.

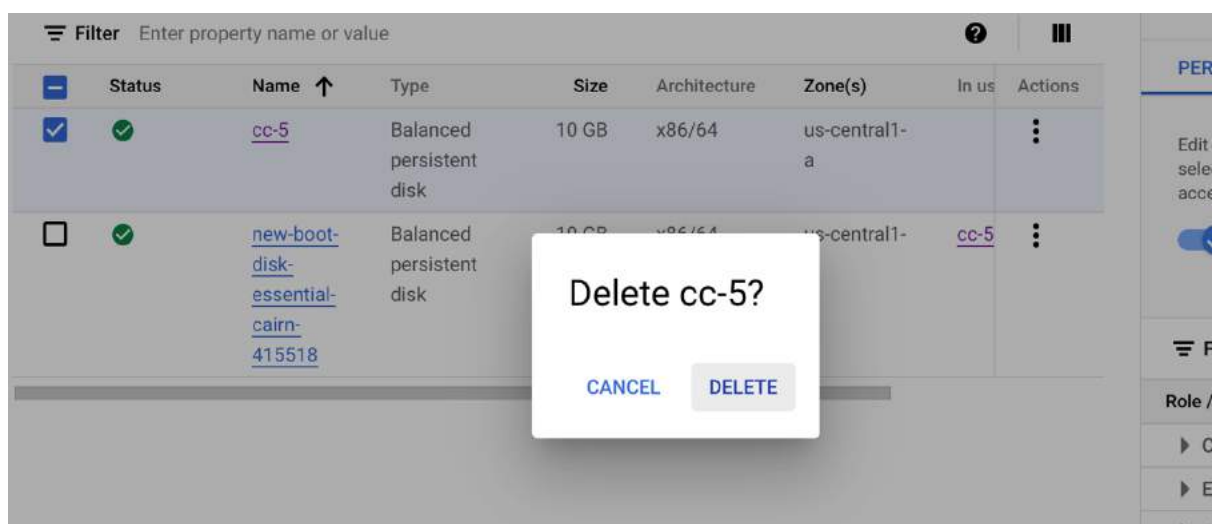
3. Click the Name of the original disk

Disks CREATE DISK REFRESH DELETE

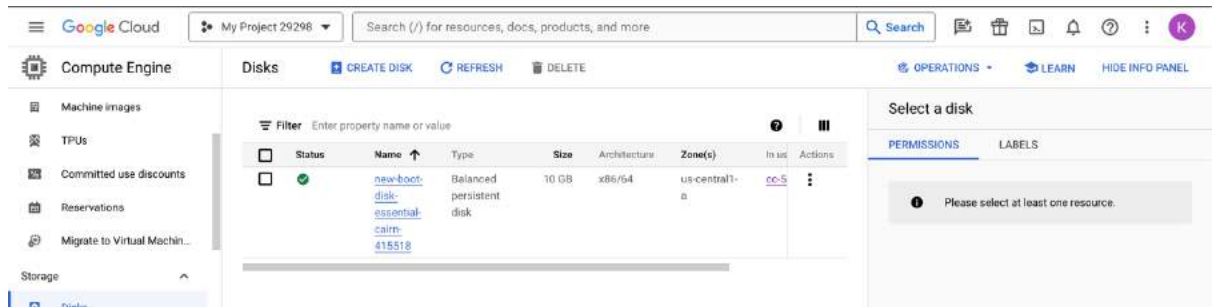
Filter Enter property name or value

| | Status | Name ↑ | Type | Size | Architecture | Zone(s) | In use | Actions |
|-------------------------------------|--------|--|--------------------------|-------|--------------|---------------|----------------------|---------|
| <input checked="" type="checkbox"/> | ✓ | cc-5 | Balanced persistent disk | 10 GB | x86/64 | us-central1-a | | ⋮ |
| <input type="checkbox"/> | ✓ | new-boot-disk-essential-cairn-415518 | Balanced persistent disk | 10 GB | x86/64 | us-central1-a | cc-5 | ⋮ |

4. Click Delete, and then confirm by clicking Delete again.

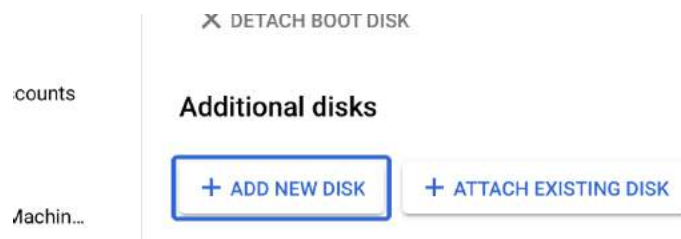


5. You have successfully restored the boot disk to the VM.



8. Restore a persistent disk from a snapshot

1. click Compute Engine, and then select VM instances. → Select the project which contains VM instance.
2. Click the Name of the VM with the persistent disk to restore.
3. Edit the VM
4. In Additional disks, detach the disk.
5. In Additional disks, click Add new disk.



6. In Name, enter new-persistent-disk-assignment88.
Wait a moment for Compute Engine to verify that the default name is unique. If you get a Name is already in use error, enter a new name for the disk
7. In Disk source type, choose Snapshot.
8. In Source snapshot, select the name of a previously created snapshot.

Add new disk

Name *

disk-1

?

Name is permanent

Description

Source

Create a blank disk, apply a bootable disk image, or restore a snapshot of another disk in this project.

Disk source type *

Archive snapshot

▼

Source archive snapshot *

snapshot-1

▼

?

Disk settings

Disk type *

Balanced persistent disk

▼

?

COMPARE DISK TYPES

Size *

10

GB

?

Provision between 10 and 65,536 GB

SAVE

CANCEL

9. To attach the snapshot to the VM, click Save.

10. To update the VM details, click Save.

Practical 7

Aim : Write a program for web feed.

Code:

```
rssurl.php - Notepad
File Edit Format View Help

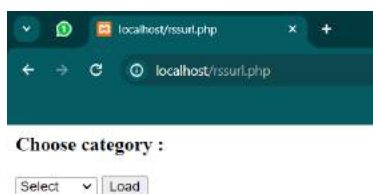
<h3><b> Choose category : </b></h3>
<form method="post" id="myform">
    <select name="rssurl" required>
        <option value="">Select</option>
        <option value="http://timesofindia.indiatimes.com/rssfeeds/-2128672765.cms">Science</option>
        <option value="https://timesofindia.indiatimes.com/rssfeeds/65857041.cms">Astrology</option>
        <option value="http://timesofindia.indiatimes.com/rssfeeds/66949542.cms">Tech</option>
    </select>
    <input type="submit" value="Load"/>
</form>

<?php
if(isset($_POST['rssurl']))
{
    echo '<h1> Search Result for RSS url: ' . $_POST['rssurl'] . '</h1>';
    $rssurl=$_POST['rssurl'];
    $rss=new DOMDocument();
    $rss->load($rssurl);
    $feed=array();

    foreach($rss->getElementsByTagName('item') as $node)
    {
        $item=array('title'=>$node->getElementsByTagName('title')->item(0)->nodeValue, 'desc'=>$node->getElementsByTagName('description')->item(0)->nodeValue,
        'link'=>$node->getElementsByTagName('link')->item(0)->nodeValue, 'date'=>$node->getElementsByTagName('pubDate')->item(0)->nodeValue);
        array_push($feed,$item);
    }

    $limit=5;
    for($x=0;$x<$limit;$x++)
    {
        $title=str_replace('&','&amp;',$feed[$x]['title']);
        $link=$feed[$x]['link'];
        $description=$feed[$x]['desc'];
        $date=date('I F d, Y',strtotime($feed[$x]['date']));
        echo '<p> <strong><a href="'.$link.'" title="'.$title.'">'.$title.'</a></strong><br>';
        echo '<p>'. $description . '</p>';
        echo '<small><em>Posted on ' . $date . '</em></small>';
    }
}
?>
```

Output:



Choose category :

Select

Search Result for RSS url: <http://timesofindia.indiatimes.com/rssfeeds/-2128672765.cms>

[Tamil Nadu, at clinic hospital in Mumbai holding ray of hope for poor families desiring children](#)



A healthy clinic at a corner hospital in Mumbai has emerged as a ray of hope for poor families desiring children. The clinic, which has a waiting area, provides a place for families to wait for their children's health check-ups and other medical services.

Choose category :

Select

Search Result for RSS url: <https://timesofindia.indiatimes.com/rssfeeds/65857041.cms>

[Weekly Horoscope March 18 to March 24, 2024: Read your astrological predictions for all zodiac signs](#)

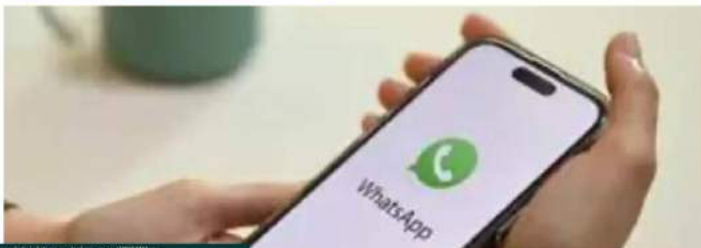


Choose category :

Select

Search Result for RSS url: <http://timesofindia.indiatimes.com/rssfeeds/66949542.cms>

[Why a 22-year-old student in Pakistan has been sentenced to death over WhatsApp post](#)



A Pakistani court has sentenced a 22-year-old student to death over a WhatsApp post. The student was accused of spreading false information about the government.

Practical 8

Aim : Case study on Amazon EC2/Microsoft Azure/Google Cloud Platform (Research paper analysis)

Choosing the right cloud platform is crucial for businesses.

Here's how to approach research papers analyzing Amazon EC2, Microsoft Azure, and Google Cloud Platform (GCP).

Finding Research Papers:

Search Engines:

Use keywords like "cloud platform comparison," "EC2 vs Azure vs GCP," or specific areas of interest (e.g., "cloud security Azure").

Academic Databases:

Explore databases like ScienceDirect, IEEE Xplore, or ACM Digital Library for peer-reviewed research.

Cloud Vendor Websites:

Each cloud provider offers white papers and case studies on their platform's strengths. Be mindful of potential bias.

Analyzing Research Papers:

Introduction:

Identify the research paper's focus - is it a general comparison or specific (e.g., cloud for Machine Learning)?

Methodology:

Understand how the study was conducted. Did it involve benchmark testing, user surveys, or case studies?

Evaluation Criteria:

Identify the factors the research compared (e.g., pricing, security, scalability, specific services).

Results and Discussion:

Analyze the findings on each platform's strengths and weaknesses based on the chosen criteria.

Conclusion:

See if the paper offers recommendations for choosing a cloud platform based on specific needs.

Case Study Analysis:**Industry and Application:**

Identify the case study's industry and the specific application the cloud platform supported.

Challenges Addressed:

Understand the challenges the organization faced before adopting the cloud platform.

Cloud Platform Choice:

Analyze why the organization chose a specific platform (EC2, Azure, GCP) and the benefits it delivered.

Outcomes and Metrics:

Evaluate the impact of the cloud platform on the organization. Did it improve performance, reduce costs, or achieve other goals?