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Virtual Cloud Computing Assignment - 2 Report

Completed By

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Git URL: “https://github.com/GeetikaVijay/VCC_Assignment-2_GCP.git”

Assignment Details:

Q.1 Virtual Machine Configuration and Application Deployment [30 Marks]

Create 3 virtual machines using any Linux version with any hypervisor and name them VM_RollNumber_1, VM_RollNumber_2, and VM_RollNumber_3 respectively.

VM_RollNumber_1: Install any web-server.

VM_RollNumber_2: Install any database.

Create a dummy web application to insert a data record in the database and display it. Demonstrate that the web application is accessible from VM_RollNumber_3 and the host system web browser.

A screen-recording of

- a. Showing the network configuration of all the VMs. [15 Marks]
- b. Accessing web-application from VM_RollNumber_3 [5 Marks]
- c. Accessing web-application from the host application [10 Marks]

Upload your video on youtube.

Submission: Youtube video link

Part a) Creating 3 VMs and showing their network configurations and connectivity:

VPC Setup

❖ **Logged in Google Cloud account and created three virtual machines:**

The screenshot shows the Google Cloud Platform Compute Engine VM instances page. On the left, there's a sidebar with options like Compute Engine, Virtual machines, Instance templates, Sole-tenant nodes, Machine images, TPUs, Committed use discounts, Reservations, Migrate to Virtual Machines, Marketplace, and Release Notes. The main area has tabs for VM instances, Observability, and Instance Schedules. Under VM instances, there's a message about using global DNS by default and a button to switch to zonal DNS. Below that is a table of VM instances:

Status	Name	Zone	Internal IP	External IP	Connect
<input type="checkbox"/>	g23ai2098-vm2	us-central1-a	10.128.0.3 (nic0)	104.154.70.15 (nic0)	SSH
<input type="checkbox"/>	g23ai2098-vm3	us-central1-a	10.128.0.4 (nic0)	104.154.68.0 (nic0)	SSH
<input type="checkbox"/>	g23ai2098vm-1	us-central1-a	10.128.0.2 (nic0)	35.239.132.108 (nic0)	SSH

Below the table, there are 'Related actions' buttons for 'Install Ops Agent (Logging)' and 'Enable Security Command Center'.

⊕ Network configurations & Other details for 3 machines created on Google cloud :

⊕ [g23ai2098vm-1](#), [g23ai2098-vm2](#), [g23ai2098-vm3](#)

❖ Network Configuration of VM-1 i.e. g23ai2098vm-1 –

The screenshot shows the Google Cloud Compute Engine interface for a VM instance named "g23ai2098vm-1". The left sidebar is collapsed, showing options like Compute Engine, Virtual machines, VM instances, Instance templates, Sole-tenant nodes, Machine images, TPUs, Committed use discounts, Reservations, Migrate to Virtual Machines, Marketplace, and Release Notes. The main panel has tabs for DETAILS, OBSERVABILITY, OS INFO, and SCREENSHOT. The DETAILS tab is selected, displaying basic information about the instance. Key details include:

Attribute	Value
Name	g23ai2098vm-1
Instance Id	7379442653061825311
Description	None
Type	Instance
Status	Running
Creation time	Aug 5, 2024, 12:53:30 PM UTC+05:30
Zone	us-central1-a
Instance template	None
In use by	None
Reservations	Automatically choose
Labels	None
Tags	–

At the bottom right of the main panel, there are several small icons for actions like edit, reset, operations, equivalent code, learn, and more.

This screenshot shows the same Google Cloud Compute Engine interface for the same VM instance. The left sidebar is collapsed. The main panel shows the DETAILS tab selected, with a specific focus on the "Machine configuration" section. The configuration details are as follows:

Attribute	Value
Machine type	e2-micro
CPU platform	Intel Broadwell
Minimum CPU platform	None
Architecture	x86/64
vCPUs to core ratio	–
Custom visible cores	–
Display device	Disabled Enable to use screen capturing and recording tools

At the bottom right of the main panel, there are several small icons for actions like edit, reset, operations, equivalent code, learn, and more.

The screenshot shows the Google Cloud Compute Engine interface for an instance named `g23ai2098vm-1`. The left sidebar is collapsed, showing options like Virtual machines, VM instances, Instance templates, Sole-tenant nodes, Machine images, TPUs, Committed use discounts, Reservations, Migrate to Virtual Machines, Marketplace, and Release Notes. The main content area has tabs for DETAILS, OBSERVABILITY, OS INFO, and Screenshot. Under DETAILS, there's a section for Firewalls (HTTP traffic On, HTTPS traffic On, Allow Load Balancer Health checks Off), Network tags (http-server, https-server), and Network interfaces (nic0, default network, default subnetwork, IP address 10.128.0.2, IPv4 stack type). A 'VIEW IN NETWORK TOPOLOGY' button is also present.

This screenshot shows the same instance details page, but the main content is focused on Storage. It includes sections for Boot disk, Local disks, and Additional disks. The Boot disk table lists one entry:

Name	Image	Interface type	Size (GB)	Device name	Type	Architecture
g23ai2098vm-1	debian-12-bookworm-v20240709	SCSI	10	g23ai2098vm-1	Balanced persistent disk	x86/64

The Local disks and Additional disks sections both show 'None'.

The screenshot shows the 'Network interface details' page for a VM instance. On the left sidebar, under 'VPC Network', several options are listed: VPC networks, IP addresses, Internal ranges, Bring your own IP, Firewall, Routes, VPC network peering, Shared VPC, Serverless VPC access, and Packet mirroring. The main content area displays 'Network interface details' for interface 'nic0' in 'default' subnetwork. It shows the primary internal IP address as 10.128.0.2, alias IP ranges as '—', IP stack type as IPv4, external IP address as 35.239.132.108, and network service as Premium. Below this, 'VM instance details' are shown for instance 'g23ai2098vm-1'. The instance is in 'us-central1-a' zone, has network tags 'http-server, https', and a service account '718771306777-compute@developer.gserviceaccount.com'. IP forwarding is set to 'Off'. Under 'Firewall and routes details', there is a 'FIREWALLS' tab showing a single rule named 'vpc-firewall-rules' with enforcement order 1, type VPC firewall, and deployment scope Global.

❖ Network Configuration of VM-2:

❖ g23ai2098-vm2

The screenshot shows the 'compute' section of the Google Cloud console, specifically the 'Virtual machines' page. The left sidebar lists options: VM instances (selected), Instance templates, Sole-tenant nodes, Machine images, TPUs, Committed use discounts, Reservations, Migrate to Virtual Machines, Marketplace, and Release Notes. The main content area shows the 'DETAILS' tab for VM instance 'g23ai2098-vm2'. The 'Basic information' section contains the following details:

Name	g23ai2098-vm2
Instance Id	294415355485208594
Description	None
Type	Instance
Status	Running
Creation time	Aug 5, 2024, 12:57:58 PM UTC+05:30
Zone	us-central1-a
Instance template	None
In use by	None
Reservations	Automatically choose
Labels	None
Tags	—

The screenshot shows the Google Cloud Platform Compute Engine interface. On the left, a sidebar lists options like Virtual machines, VM instances, Instance templates, Sole-tenant nodes, Machine images, TPUs, Committed use discounts, Reservations, Migrate to Virtual Machines, Marketplace, and Release Notes. The main panel displays details for the instance 'g23ai2098-vm2'. It includes tabs for DETAILS, OBSERVABILITY, OS INFO, and SCREENSHOT. Under DETAILS, there are sections for Network tags (http-server, https-server), Network interfaces (nic0, default, default, 10.128.0.3, IPv4), Storage (Boot disk: g23ai2098-, debian-12, SCSI, 10 GB, g23ai2098-vm2, Balanced, x86/64), and EQUIVALENT CODE. A 'Search' bar at the top right is set to 'compute'.

The screenshot shows the Google Cloud Platform VPC Network interface details page for the network interface 'nic0'. The sidebar on the left lists VPC Network options such as VPC networks, IP addresses, Internal ranges, Bring your own IP, Firewall, Routes, VPC network peering, Shared VPC, Serverless VPC access, and Packet mirroring. The main panel shows Network interface details (Name: nic0, Network: default, Subnetwork: default, Primary internal IP address: 10.128.0.3, Alias IP ranges: -, IP stack type: IPv4, External IP address: 104.154.70.15, Network Service: Premium) and VM instance details (Name: g23ai2098-vm2, Zone: us-central1-a, Network tags: http-server, https-server, Service account: 718771306777-compute@developer.gserviceaccount.com, IP forwarding: Off). Below this is a section for Firewall and routes details, showing a table for FIREWALLS (Name: 'vpc-firewall-rules', Enforcement order: 1, Type: VPC firewall rules, Deployment scope: Global) and ROUTES.

❖ Network Configuration of VM-3:

Virtual machines

- VM instances
- Instance templates
- Sole-tenant nodes
- Machine images
- TPUs
- Committed use discounts
- Reservations
- Marketplace
- Release Notes

	DETAILS	OBSERVABILITY	OS INFO	SCREENSHOT
Name	g23ai2098-vm3			
Instance Id	5139964778426253660			
Description	None			
Type	Instance			
Status	Running			
Creation time	Aug 5, 2024, 1:00:59 PM UTC+05:30			
Zone	us-central1-a			
Instance template	None			
In use by	None			
Reservations	Automatically choose			
Labels	None			
Tags	—			

CLOUD SHELL Terminal (optical-loop-431604-f4) + Open Editor

Virtual machines

- VM instances
- Instance templates
- Sole-tenant nodes
- Machine images
- TPUs
- Committed use discounts
- Reservations
- Marketplace
- Release Notes

	DETAILS	OBSERVABILITY	OS INFO	SCREENSHOT
Networking				
Public DNS PTR Record	None			
Total egress bandwidth tier	—			
NIC type	—			
→ VIEW IN NETWORK TOPOLOGY				
Firewalls				
HTTP traffic	On			
HTTPS traffic	On			
Allow Load Balancer Health checks	Off			

CLOUD SHELL Terminal (optical-loop-431604-f4) + Open Editor

The screenshot shows the Google Cloud VPC Network interface details page. On the left, there's a sidebar with various networking options like VPC networks, IP addresses, and Firewall. The main area displays 'Network interface details' for 'nic0' with an external IP of 104.154.68.0 and 'VM instance details' for 'g23ai2098-vm3' running in 'us-central1-a' zone with an external IP of 104.154.68.0. Below that is a section for 'Firewall and routes details' under the 'FIREWALLS' tab, showing a single rule named 'vpc-firewall-rules'.

❖ **Connectivity of all 3 virtual machines with each other and with Host Machine:**

- ✚ [g23ai2098vm-1 : 35.239.132.108](#)
- ✚ [g23ai2098-vm2 : 104.154.70.15](#)
- ✚ [g23ai2098-vm3 : 104.154.68.0](#)
- ✚ [Host Machine : 192.168.0.105](#)

[g23ai2098vm-1 : 35.239.132.108](#)

This virtual machine (VM) is configured with default networking and utilizes the '*e2-micro*' machine type, running Debian GNU/Linux 12 as the operating system. It hosts a Python web server capable of connecting to a MySQL database, allowing users to view and insert data through a provided graphical user interface (GUI).

[g23ai2098-vm2 : 104.154.70.15](#)

This Virtual Machine (VM) is configured with default networking and utilizes the '*e2- micro*' machine type, running Debian GNU/Linux 12 as the operating system. It is designated to host the MySQL server.

[g23ai2098-vm3 : 104.154.68.0](#)

This virtual machine (VM) is configured with default networking and utilizes the '*e2-micro*' machine type, running Debian GNU/Linux 12 as the operating system. It is used to demonstrating VM to VM accessibility.

❖ Firewall Rules Creation

There are two firewall rules created to enable access to Mysql server and Web server hosted in the Virtual Machine

The screenshot shows the Google Cloud Firewall policies interface. The left sidebar navigation includes Secure Web Proxy, Cloud Armor, Cloud Armor policies, Adaptive Protection, Cloud Armor Service Tier, Cloud IDS (IDS Dashboard, IDS Endpoints, IDS Threats), Cloud NGFW (Dashboard, Firewall policies, Threats, Firewall endpoints), and Secure Access Connect. The main panel displays the 'Firewall policies' section with two entries:

Name	Type	Targets	Filters	Protocols / ports	Action	Priority	Network	Logs	Hit count
allow-mysql-3306	Ingress	Apply to all	IP ranges:	tcp:3306	Allow	1000	default	Off	-
allow-streamt-8501	Ingress	Apply to all	IP ranges:	tcp:8501	Allow	1000	default	Off	-
default-allow-http	Ingress	http-server	IP ranges:	tcp:80	Allow	1000	default	Off	-
default-allow-https	Ingress	https-	IP ranges:	tcp:443	Allow	1000	default	Off	-
default-allow-icmp	Ingress	Apply to all	IP ranges:	icmp	Allow	65534	default	Off	-
default-allow-ssh	Ingress	Apply to all	IP ranges:	tcp:0-65535	Allow	65534	default	Off	-

❖ allow-mysql-3306

This firewall is created to enable the tcp:3306 port which enables the python web server to connect to MySQL server.

allow-mysql-3306

Description: allow-mysql-3306

Logs: Off

Network: default

Priority: 1000

Direction: Ingress

Action on match: Allow

Source filters: IP ranges 0.0.0.0/0

Protocols and ports: tcp:3306

Enforcement: Enabled

❖ allow-streamlit-8501

This firewall is created to enable the tcp:8501 port which enables the web server to be accessible from external ip as well from other VM.

allow-streamlit-8501

Description: allow-streamlit-8501

Logs: Off

Network: default

Priority: 1000

Direction: Ingress

Action on match: Allow

Source filters: IP ranges 0.0.0.0/0

Protocols and ports: tcp:8501

Enforcement: Enabled

❖ **g23ai2098vm-1 successfully pinged all 3 Virtual Machines:**

```

ssh.cloud.google.com/v2/ssh/projects/optical-loop-431604-f4/zones/us-central1-a/instances/g23ai2098vm-1
ping 35.239.132.108 (35.239.132.108) 56(84) bytes of data.
64 bytes from 35.239.132.108: icmp_seq=1 ttl=61 time=3.30 ms
64 bytes from 35.239.132.108: icmp_seq=2 ttl=61 time=0.413 ms
64 bytes from 35.239.132.108: icmp_seq=3 ttl=61 time=0.479 ms
^C
-- 35.239.132.108 ping statistics --
3 packets transmitted, 3 received, 0% packet loss, time 2011ms
rtt min/avg/max/mdev = 0.413/1.397/3.299/1.345 ms
ssh.cloud.google.com/v2/ssh/projects/optical-loop-431604-f4/zones/us-central1-a/instances/g23ai2098vm-1
ping 104.154.70.15 (104.154.70.15) 56(84) bytes of data.
64 bytes from 104.154.70.15: icmp_seq=1 ttl=61 time=5.71 ms
64 bytes from 104.154.70.15: icmp_seq=2 ttl=61 time=0.598 ms
64 bytes from 104.154.70.15: icmp_seq=3 ttl=61 time=0.692 ms
^C
-- 104.154.70.15 ping statistics --
3 packets transmitted, 3 received, 0% packet loss, time 2024ms
rtt min/avg/max/mdev = 0.598/2.332/5.708/2.387 ms
ssh.cloud.google.com/v2/ssh/projects/optical-loop-431604-f4/zones/us-central1-a/instances/g23ai2098vm-1
ping 104.154.68.0 (104.154.68.0) 56(84) bytes of data.
64 bytes from 104.154.68.0: icmp_seq=1 ttl=61 time=6.85 ms
64 bytes from 104.154.68.0: icmp_seq=2 ttl=61 time=0.561 ms
^C
-- 104.154.68.0 ping statistics --
3 packets transmitted, 3 received, 0% packet loss, time 2007ms
rtt min/avg/max/mdev = 0.263/0.601/1.246/0.455 ms

```

VM	Name	Zone	Internal IP	External IP	Connect
<input type="checkbox"/>	g23ai2098vm2	us-central1-a	10.128.0.3 (nic0)	104.154.70.15 (nic0)	SSH
<input type="checkbox"/>	g23ai2098vm3	us-central1-a	10.128.0.4 (nic0)	104.154.68.0 (nic0)	SSH
<input type="checkbox"/>	g23ai2098vm-1	us-central1-a	10.128.0.2 (nic0)	35.239.132.108 (nic0)	SSH

Related actions

- [Explore Backup and DR](#) NEW
- [View billing report](#)
- [Monitor VMs](#)

```

ssh.cloud.google.com/v2/ssh/projects/optical-loop-431604-f4/zones/us-central1-a/instances/g23ai2098vm-1
ping 10.128.0.2
PING 10.128.0.2 (10.128.0.2) 56(84) bytes of data.
64 bytes from 10.128.0.2: icmp_seq=1 ttl=64 time=0.030 ms
64 bytes from 10.128.0.2: icmp_seq=2 ttl=64 time=0.036 ms
^C
-- 10.128.0.2 ping statistics --
2 packets transmitted, 2 received, 0% packet loss, time 1014ms
rtt min/avg/max/mdev = 0.030/0.033/0.036/0.003 ms
ssh.cloud.google.com/v2/ssh/projects/optical-loop-431604-f4/zones/us-central1-a/instances/g23ai2098vm-1
ping 10.128.0.4
PING 10.128.0.4 (10.128.0.4) 56(84) bytes of data.
64 bytes from 10.128.0.4: icmp_seq=1 ttl=64 time=1.25 ms
64 bytes from 10.128.0.4: icmp_seq=2 ttl=64 time=0.263 ms
64 bytes from 10.128.0.4: icmp_seq=3 ttl=64 time=0.296 ms
^C
-- 10.128.0.4 ping statistics --
3 packets transmitted, 3 received, 0% packet loss, time 2007ms
rtt min/avg/max/mdev = 0.263/0.601/1.246/0.455 ms
ssh.cloud.google.com/v2/ssh/projects/optical-loop-431604-f4/zones/us-central1-a/instances/g23ai2098vm-1
ping 10.128.0.3
PING 10.128.0.3 (10.128.0.3) 56(84) bytes of data.
64 bytes from 10.128.0.3: icmp_seq=1 ttl=64 time=0.948 ms
64 bytes from 10.128.0.3: icmp_seq=2 ttl=64 time=0.313 ms
^C
-- 10.128.0.3 ping statistics --

```

VM	Name	Zone	Internal IP	External IP	Connect
<input type="checkbox"/>	g23ai2098vm2	us-central1-a	10.128.0.3 (nic0)	104.154.70.15 (nic0)	SSH
<input type="checkbox"/>	g23ai2098vm3	us-central1-a	10.128.0.4 (nic0)	104.154.68.0 (nic0)	SSH
<input type="checkbox"/>	g23ai2098vm-1	us-central1-a	10.128.0.2 (nic0)	35.239.132.108 (nic0)	SSH

Related actions

- [Explore popular ways to build on your](#)

❖ **g23ai2098-vm2 successfully pinged all 3 VMs:**

```

g23ai2098@g23ai2098-vm2:~$ ping 104.154.70.15
PING 104.154.70.15 (104.154.70.15) 56(84) bytes of data.
64 bytes from 104.154.70.15: icmp_seq=1 ttl=61 time=4.80 ms
64 bytes from 104.154.70.15: icmp_seq=2 ttl=61 time=0.660 ms
64 bytes from 104.154.70.15: icmp_seq=3 ttl=61 time=0.611 ms
64 bytes from 104.154.70.15: icmp_seq=4 ttl=61 time=0.502 ms
^C
--- 104.154.70.15 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3054ms
rtt min/avg/max/mdev = 0.502/1.642/4.795/1.821 ms
g23ai2098@g23ai2098-vm2:~$ ping 104.154.68.0
PING 104.154.68.0 (104.154.68.0) 56(84) bytes of data.
64 bytes from 104.154.68.0: icmp_seq=1 ttl=64 time=5.93 ms
64 bytes from 104.154.68.0: icmp_seq=2 ttl=64 time=0.706 ms
64 bytes from 104.154.68.0: icmp_seq=3 ttl=64 time=0.621 ms
64 bytes from 104.154.68.0: icmp_seq=4 ttl=64 time=0.520 ms
^C
--- 104.154.68.0 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3034ms
rtt min/avg/max/mdev = 0.520/1.944/5.930/2.302 ms
g23ai2098@g23ai2098-vm2:~$ ping 35.239.132.108
PING 35.239.132.108 (35.239.132.108) 56(84) bytes of data.
64 bytes from 35.239.132.108: icmp_seq=1 ttl=61 time=8.57 ms
64 bytes from 35.239.132.108: icmp_seq=2 ttl=61 time=0.595 ms
64 bytes from 35.239.132.108: icmp_seq=3 ttl=61 time=0.600 ms
^C
--- 35.239.132.108 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2021ms
rtt min/avg/max/mdev = 0.595/3.253/8.565/3.755 ms
g23ai2098@g23ai2098-vm2:~$ 
```

Related actions

- Explore Backup and DR NEW
- View billing report
- Monitor VMs

```

Last login: Mon Aug  5 07:40:27 2024 from 35.235.244.32
g23ai2098@g23ai2098-vm2:~$ ping 10.128.0.2
PING 10.128.0.2 (10.128.0.2) 56(84) bytes of data.
64 bytes from 10.128.0.2: icmp_seq=1 ttl=64 time=1.01 ms
64 bytes from 10.128.0.2: icmp_seq=2 ttl=64 time=0.290 ms
64 bytes from 10.128.0.2: icmp_seq=3 ttl=64 time=0.230 ms
^C
--- 10.128.0.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2028ms
rtt min/avg/max/mdev = 0.230/0.511/1.014/0.356 ms
g23ai2098@g23ai2098-vm2:~$ ping 10.128.0.3
PING 10.128.0.3 (10.128.0.3) 56(84) bytes of data.
64 bytes from 10.128.0.3: icmp_seq=1 ttl=64 time=0.026 ms
64 bytes from 10.128.0.3: icmp_seq=2 ttl=64 time=0.054 ms
64 bytes from 10.128.0.3: icmp_seq=3 ttl=64 time=0.043 ms
^C
--- 10.128.0.3 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2053ms
rtt min/avg/max/mdev = 0.026/0.041/0.054/0.011 ms
g23ai2098@g23ai2098-vm2:~$ ping 10.128.0.4
PING 10.128.0.4 (10.128.0.4) 56(84) bytes of data.
64 bytes from 10.128.0.4: icmp_seq=1 ttl=64 time=0.960 ms
64 bytes from 10.128.0.4: icmp_seq=2 ttl=64 time=0.275 ms
^C
--- 10.128.0.4 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2053ms
rtt min/avg/max/mdev = 0.026/0.041/0.054/0.011 ms

```

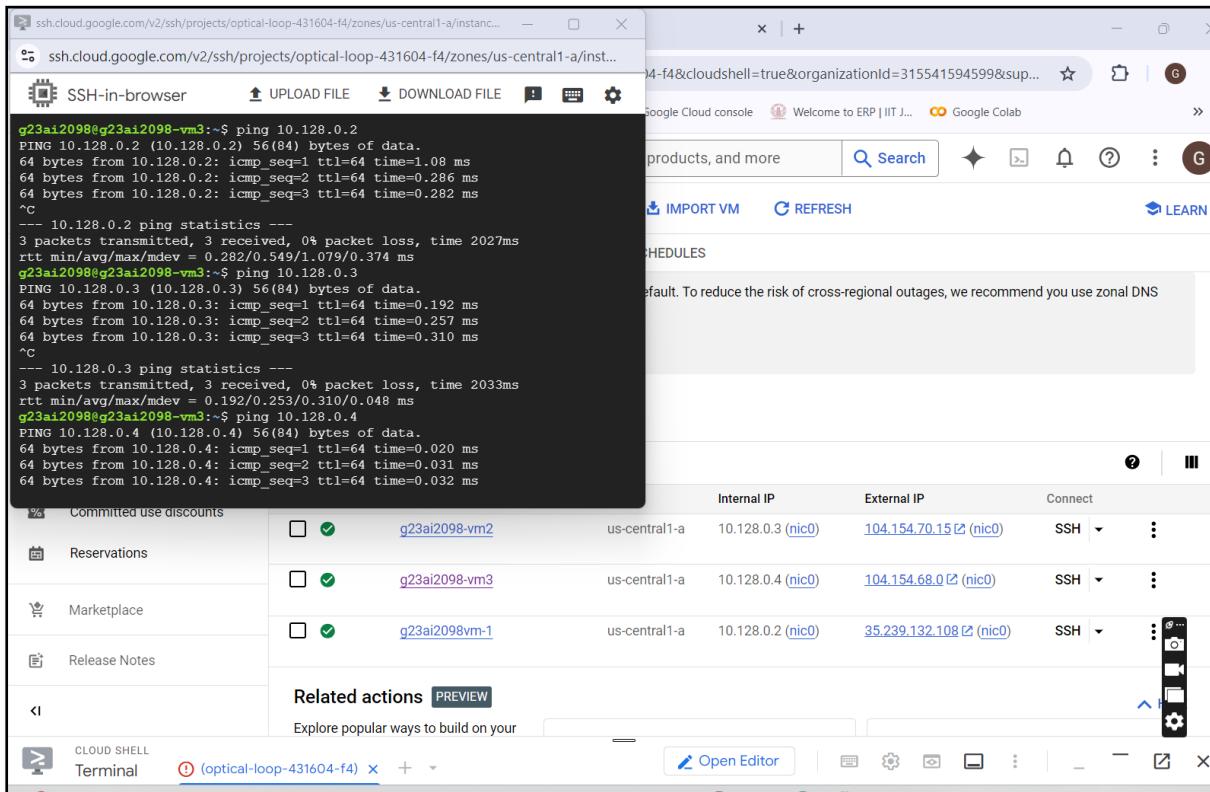
Related actions

- Committed use discounts
- Reservations
- Marketplace
- Release Notes

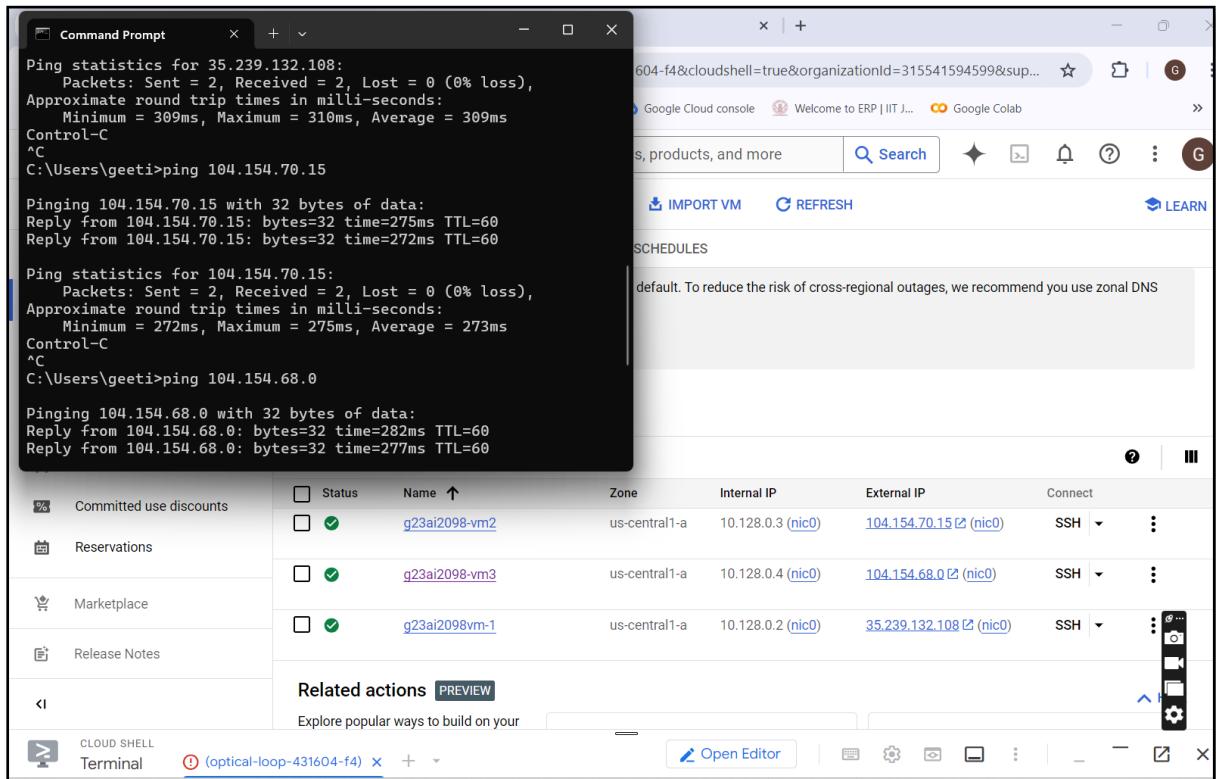
❖ g23ai2098-vm3 successfully pinged all 3 VMs:

The screenshot shows the Google Cloud Compute Engine interface. On the left, there's an SSH terminal window titled "SSH-in-brows" showing the output of a ping command from the VM "g23ai2098-vm3". The terminal output indicates successful pings to three other VMs: 35.239.132.108, 104.154.70.15, and 104.154.68.0. On the right, the main pane displays a list of VM instances. The first instance, "g23ai2098-vm2", has its external IP address (104.154.70.15) highlighted in blue. The second instance, "g23ai2098-vm3", also has its external IP (104.154.68.0) highlighted in blue. The third instance, "g23ai2098vm-1", has its external IP (35.239.132.108) highlighted in blue.

Name	Zone	Internal IP	External IP	Connect
g23ai2098-vm2	us-central1-a	10.128.0.3 (nic0)	104.154.70.15 (nic0)	SSH
g23ai2098-vm3	us-central1-a	10.128.0.4 (nic0)	104.154.68.0 (nic0)	SSH
g23ai2098vm-1	us-central1-a	10.128.0.2 (nic0)	35.239.132.108 (nic0)	SSH



- ❖ **Host machine successfully able to ping all 3 VMs:**



Part2)

- a) Web Server apache2 installed on VM1 - g23ai2098vm-1 : 35.239.132.108
- b) Installation of any database on VM-2 -- g23ai2098-vm2 : 104.154.70.15

❖ Successful Installation of Web Server:

```

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Mon Aug  5 07:46:03 2024 from 35.235.244.33
g23ai2098@g23ai2098vm-1:~$ pwd
/home/g23ai2098
g23ai2098@g23ai2098vm-1:~$ sudo apt 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:7 https://packages.cloud.google.com/apt google-compute-engine-bookworm-stable InRelease [1321 B]
Get:8 https://packages.cloud.google.com/apt cloud-sdk-bookworm InRelease [1652 B]
Get:2 https://deb.debian.org/debian bookworm InRelease [151 kB]
Get:9 https://packages.cloud.google.com/apt google-compute-engine-bookworm-stable/main amd64 Packages [3128 B]
Get:3 https://deb.debian.org/debian bookworm-updates InRelease [55.4 kB]
Get:4 https://deb.debian.org/debian bookworm-backports InRelease [56.6 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 [3192 kB]
Get:11 https://packages.cloud.google.com/apt cloud-sdk-bookworm/main all Packages [1511 kB]
Get:12 https://deb.debian.org/debian bookworm-backports/main Sources.diff/Index [63.3 kB]
Ign:12 https://deb.debian.org/debian bookworm-backports/main Sources.diff/Index
Get:13 https://deb.debian.org/debian bookworm-backports/main amd64 Packages.diff/Index [63.3 kB]
Get:14 https://deb.debian.org/debian bookworm-backports/main Translation-en.diff/Index [63.3 kB]
Get:19 https://deb.debian.org/debian bookworm-backports/main amd64 Packages T-2024-08-04-1414.55-F-2024-07-09-1405.03.pdiff [63.8 kB]
Get:19 https://deb.debian.org/debian bookworm-backports/main amd64 Packages T-2024-08-04-1414.55-F-2024-07-09-1405.03.pdiff [63.8 kB]
Get:20 https://deb.debian.org/debian bookworm-backports/main Translation-en T-2024-08-04-1414.55-F-2024-07-11-1406.29.pdiff [19.9 kB]
Get:20 https://deb.debian.org/debian bookworm-backports/main Translation-en T-2024-08-04-1414.55-F-2024-07-11-1406.29.pdiff [19.9 kB]
Get:15 https://deb.debian.org/debian bookworm-backports/main Sources [243 kB]
Get:16 https://deb.debian.org/debian-security bookworm-security/main Sources [105 kB]
Get:17 https://deb.debian.org/debian-security bookworm-security/main amd64 Packages [169 kB]
Get:18 https://deb.debian.org/debian-security bookworm-security/main Translation-en [102 kB]
Fetched 5912 kB in 1s (4654 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done

```

```

Reading state information... Done
11 packages can be upgraded. Run 'apt list --upgradable' to see them.
g23ai2098@g23ai2098vm-1:~$ sudo apt install apache2
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
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-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 11 not upgraded.
Need to get 2376 kB of archives.
After this operation, 8464 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 file:/etc/apt/mirrors/debian-security.list Mirrorlist [39 B]
Get:3 https://deb.debian.org/debian bookworm/main amd64 libapr1 amd64 1.7.2-3 [102 kB]
Get:4 https://deb.debian.org/debian bookworm/main amd64 libaprutil1 amd64 1.6.3-1 [87.8 kB]
Get:5 https://deb.debian.org/debian bookworm/main amd64 libaprutil1-dbd-sqlite3 amd64 1.6.3-1 [13.6 kB]
Get:6 https://deb.debian.org/debian bookworm/main amd64 libaprutil1-ldap amd64 1.6.3-1 [11.8 kB]
Get:7 https://deb.debian.org/debian bookworm/main amd64 libjansson4 amd64 2.14-2 [40.8 kB]
Get:8 https://deb.debian.org/debian bookworm/main amd64 liblua5.3-0 amd64 5.3.6-2 [123 kB]
Get:9 https://deb.debian.org/debian-security bookworm-security/main amd64 apache2-bin amd64 2.4.61-1-deb12u1 [1384 kB]
Get:10 https://deb.debian.org/debian-security bookworm-security/main amd64 apache2-data all 2.4.61-1-deb12u1 [160 kB]
Get:11 https://deb.debian.org/debian-security bookworm-security/main amd64 apache2-utils amd64 2.4.61-1-deb12u1 [209 kB]
Get:12 https://deb.debian.org/debian-security bookworm-security/main amd64 apache2 amd64 2.4.61-1-deb12u1 [222 kB]
Get:13 https://deb.debian.org/debian bookworm/main amd64 ssl-cert all 1.1.2 [21.1 kB]
Fetched 2376 kB in 0s (559 kB/s)
Preconfiguring packages...
Selecting previously unselected package libapr1:amd64.
(Reading database ... 68822 files and directories currently installed.)
Preparing to unpack .../00-libapr1_1.7.2-3_amd64.deb ...

```

❖ Successful Installation of Database Server: Install any database on VM-2 -- g23ai2098-vm2

sudo apt install mysql-server

```
Hit:5 https://deb.debian.org/debian bookworm-backports InRelease
Hit:6 https://deb.debian.org/debian-security bookworm-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
12 packages can be upgraded. Run 'apt list --upgradable' to see them.
W: An error occurred during the signature verification. The repository is not updated and the previous index files will be used. GPG error: http://repo.mysql.com/apt/ubuntu/lunar/InRelease: The following signatures couldn't be verified because the public key is not available: NO_PUBKEY B7B3B78A8D3785C
W: Failed to fetch http://repo.mysql.com/apt/ubuntu/dists/lunar/InRelease  The following signatures couldn't be verified because the public key is not available: NO_PUBKEY B7B3B78A8D3785C
W: Some index files failed to download. They have been ignored, or old ones used instead.
root@g23ai2098-vm2:~# sudo apt install mysql-server
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
libibail0 libmimal0 libmecab2 libmimal0-mecab-ipadic libmecab2-mecab-ipadic-utf8 libmecab-utils mysql-client mysql-common
mysql-community-client mysql-community-client-core mysql-community-client-plugins mysql-community-server
mysql-community-server-core
The following NEW packages will be installed:
libibail0 libmimal0 libmimal0-mecab-ipadic libmecab2-mecab-ipadic-utf8 libmecab-utils mysql-client mysql-common
mysql-community-client mysql-community-client-core mysql-community-client-plugins mysql-community-server
mysql-community-server-core mysql-server
0 upgraded, 14 newly installed, 0 to remove and 12 not upgraded.
Need to get 37.7 MB of archives.
After this operation, 274 MB 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:8 http://repo.mysql.com/apt/ubuntu/lunar/mysql-8.0 amd64 mysql-common amd64 8.0.35-lubuntu23.04 [66.8 kB]
Get:2 https://deb.debian.org/debian/bookworm/main amd64 libibail0 amd64 0.3.113-4 [13.4 kB]
Get:3 https://deb.debian.org/debian/bookworm/main amd64 libmimal0 amd64 0.996-14+b14 [222 kB]
Get:9 http://repo.mysql.com/apt/ubuntu/lunar/mysql-8.0 amd64 mysql-community-client-plugins amd64 8.0.35-lubuntu23.04 [1408 kB]
Get:4 https://deb.debian.org/debian/bookworm/main amd64 libmimal0 amd64 0.996-14+b14 [6328 B]
Get:5 https://deb.debian.org/debian/bookworm/main amd64 libmecab2 amd64 2.0.16-1 [21.0 kB]
Get:6 https://deb.debian.org/debian/bookworm/main amd64 libmecab-ipadic-all 2.7.0-20070801+main-3 [6718 kB]
Get:1 http://repo.mysql.com/apt/ubuntu/lunar/mysql-8.0 amd64 mysql-community-client-core amd64 8.0.35-lubuntu23.04 [2104 kB]
Get:11 http://repo.mysql.com/apt/ubuntu/lunar/mysql-8.0 amd64 mysql-community-client amd64 8.0.35-lubuntu23.04 [2162 kB]
Get:7 https://deb.debian.org/debian/bookworm/main amd64 libmecab-ipadic-utf8 all 2.7.0-20070801+main-3 [5496 B]
Get:12 http://repo.mysql.com/apt/ubuntu/lunar/mysql-8.0 amd64 mysql-client amd64 8.0.35-lubuntu23.04 [65.5 kB]
Get:13 http://repo.mysql.com/apt/ubuntu/lunar/mysql-8.0 amd64 mysql-community-server-core amd64 8.0.35-lubuntu23.04 [24.7 MB]
```

```
All done!
root@g23ai2098-vm2:~# mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 12
Server version: 8.0.35 MySQL Community Server - GPL

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> status;
-----
mysql Ver 8.0.35 for Linux on x86_64 (MySQL Community Server - GPL)

Connection id:          12
Current database:        root@localhost
Current user:            root@localhost
SSL:                   Not in use
Current pager:          stdout
Using outfile:           ''
Using delimiter:         ;
Server version:          8.0.35 MySQL Community Server - GPL
Protocol version:        10
Connection:              Localhost via UNIX socket
Server characterset:     utf8mb4
Db      characterset:    utf8mb4
Client characterset:     utf8mb4
Conn. characterset:      utf8mb4
UNIX socket:             /var/run/mysqld/mysqld.sock
Binary data as:          Hexadecimal
Uptime:                 8 min 18 sec

Threads: 2  Questions: 12  Slow queries: 0  Opens: 132  Flush tables: 3  Open tables: 51  Queries per second avg: 0.024
```

❖ Database “EMPLOYEES” and table “employees” created in installed database in VM2

```

-> ^C
mysql>
mysql> use EMPLOYEES;
Database changed
mysql> show tables ;
Empty set (0.00 sec)

mysql> CREATE TABLE employees (
->     employee_id VARCHAR(50) PRIMARY KEY,
->     employee_name VARCHAR(100) NOT NULL,
->     employee_company VARCHAR(100) NOT NULL,
->     employee_email VARCHAR(100) NOT NULL
-> );
Query OK, 0 rows affected (0.03 sec)

```

❖ **Data Successfully created in virtual machine 2 in employee table**

```

mysql>
mysql>
mysql>
mysql> desc employees;
+-----+-----+-----+-----+-----+
| Field | Type  | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| employee_id | varchar(50) | NO   | PRI | NULL    |       |
| employee_name | varchar(100) | NO   |     | NULL    |       |
| employee_company | varchar(100) | NO   |     | NULL    |       |
| employee_email | varchar(100) | NO   |     | NULL    |       |
+-----+-----+-----+-----+-----+
4 rows in set (0.01 sec)

mysql> select * from employees ;
+-----+-----+-----+-----+
| employee_id | employee_name | employee_company | employee_email      |
+-----+-----+-----+-----+
| 123        | Geetika Vijay | IBM             | geetika.vijay@ibm.com |
| 124        | Grishma Vijay | EBAY            | geetika.vijay@ebay.com |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql> []

```

❖ **Part 3)**

- ❖ **VM3 is successfully able to access VM1 already shown above through ping**
- ❖ **All 3 Virtual Machines created on Google Cloud are running Successfully**

The screenshot shows the Google Cloud Platform Compute Engine interface. The left sidebar has 'Compute Engine' selected under 'Virtual machines'. The main area shows 'INSTANCES' with three VMs listed:

Status	Name	Zone	Internal IP	External IP	Connect
✓	g23ai2098-vm2	us-central1-a	10.128.0.3 (nic0)	34.122.183.176 (nic0)	SSH
✓	g23ai2098-vm3	us-central1-a	10.128.0.4 (nic0)	34.132.42.188 (nic0)	SSH
✓	g23ai2098vm-1	us-central1-a	10.128.0.2 (nic0)	34.66.181.155 (nic0)	SSH

Below the table are 'Related actions' with links to 'Install Ops Agent (Logging)', 'Enable Security Command Center', 'Connect with Cloud SQL', and 'Manage backup and DR'. A 'Cloud Shell' terminal window is open at the bottom.

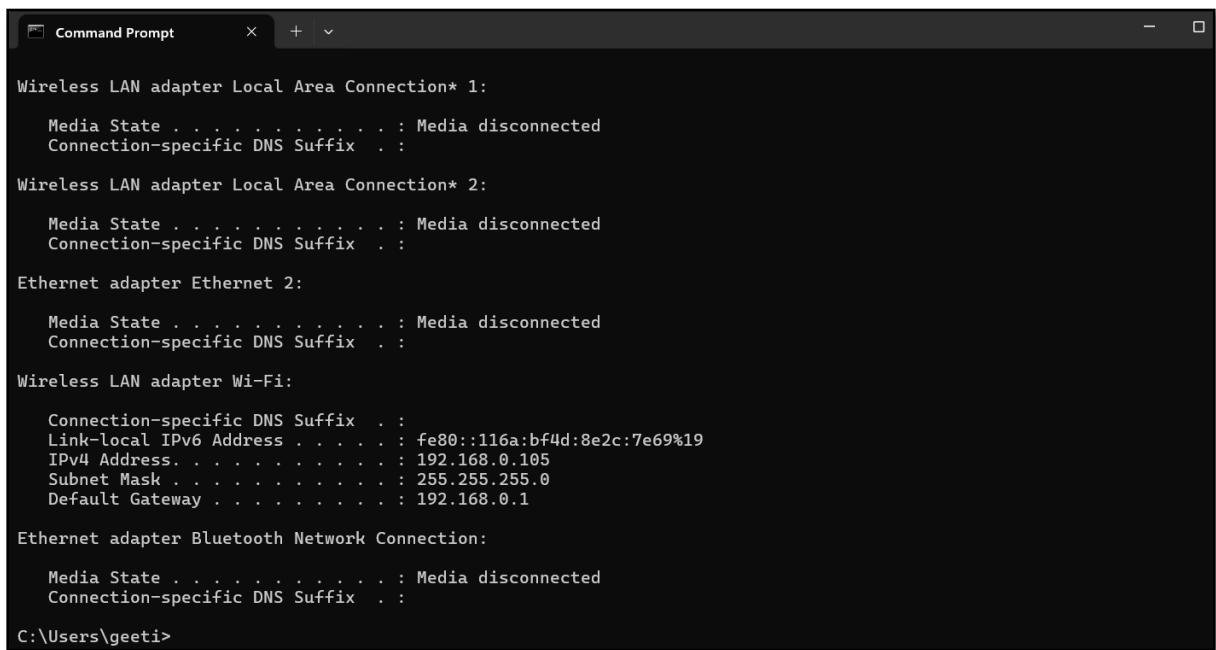
Now access webapp hosted on VM-1 from host machine VM1- g23ai2098vm-1 - IP : 34.66.181.155

Host machine is successfully able to access web server page hosted on VM 1 :

The screenshot shows a web browser displaying the 'Apache2 Debian Default Page'. The page features a red banner with the text 'It works!'. Below it, there is descriptive text about the default welcome page and a 'Configuration Overview' section. At the bottom, there is a diagram of a file tree for the Apache2 configuration directory:

```
/etc/apache2/
|-- apache2.conf
|   '-- ports.conf
|-- mods-enabled
|   '-- *.Load
|       '-- *.conf
|-- conf-enabled
|   '-- *.conf
|-- sites-enabled
|   '-- *.conf
```

❖ Host Machine IP Address:



```
Command Prompt

Wireless LAN adapter Local Area Connection* 1:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . .

Wireless LAN adapter Local Area Connection* 2:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . .

Ethernet adapter Ethernet 2:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . .

Wireless LAN adapter Wi-Fi:
  Connection-specific DNS Suffix . .
  Link-local IPv6 Address . . . . . fe80::116a:bf4d:8e2c:7e69%19
  IPv4 Address . . . . . 192.168.0.105
  Subnet Mask . . . . . 255.255.255.0
  Default Gateway . . . . . 192.168.0.1

Ethernet adapter Bluetooth Network Connection:
  Media State . . . . . : Media disconnected
  Connection-specific DNS Suffix . .

C:\Users\geeti>
```

Web Application is successfully connecting database server installed on

VM2 : [g23ai2098-vm2](#) @ 34.122.183.176

Application code can be referred in "app.py" file on Git Path:

"https://github.com/GeetikaVijay/VCC_Assignment-2_GCP.git"

❖ Database connection established successfully streamlit application

The screenshot shows a web browser window titled "MySQL Database Connector". On the left, there is a sidebar titled "Database Connection Parameters" with fields for Host (34.122.183.176), User (geet), Password (redacted), and Database (EMPLOYEES). A "Connect" button is at the bottom. On the right, the main area has a title "MySQL Database Connector" and a green success message "Connection to MySQL DB successful". Below it is a dropdown menu labeled "Select Table from the below list" with the option "Select an option".

❖ Data Fetched successfully on Host Machine successfully from VM2 –

The screenshot shows a web browser window titled "MySQL Database Connector". The "Database Connection Parameters" sidebar is identical to the previous screenshot. The main area now displays a table titled "employees" under the heading "Select Table from the below list". The table has columns: employee_id, employee_name, employee_company, and employee_email. It contains two rows of data:

	employee_id	employee_name	employee_company	employee_email
0	123	Geetika Vijay	IBM	geetika.vijay@ibm.com
1	124	Grishma Vijay	EBAY	geetika.vijay@ebay.com

❖ Data inserted successfully on VM2 from Host Machines

Database Connection Parameters

Host: 34.122.183.176
User: geet
Password:

Database: EMPLOYEES

Insert New Record

	employee_id	employee_name	employee_company	employee_email
1	124	Grishma Vijay	EBAY	geetika.vijay@ebay.com
0	123	Geetika Vijay	IBM	geetika.vijay@ibm.com

Enter value for employee_id: 124
Enter value for employee_name: Vijay
Enter value for employee_company: TCS
Enter value for employee_email: Vijay@tcs.com

Since data is already present with 124 primary key so system raised duplicate entry.

Validation failed, which is correct. Since 2 records can not be inserted on same primary key.

Database Connection Parameters

Host: 34.122.183.176
User: geet
Password:

Database: EMPLOYEES

Insert New Record

	employee_id	employee_name	employee_company	employee_email
1	124	Grishma Vijay	EBAY	geetika.vijay@ebay.com
0	123	Geetika Vijay	IBM	geetika.vijay@ibm.com

Enter value for employee_name: Vijay
Enter value for employee_company: TCS
Enter value for employee_email: Vijay@tcs.com

Failed to insert the record - 1062 (23000): Duplicate entry '124' for key 'employees.PRIMARY'

❖ **New record entered successfully with unique employee ID**

Database Connection Parameters

Host: 34.122.183.176

User: geet

Password: *****

Database: EMPLOYEES

Connect

Insert New Record

Enter value for employee_id: 125

Enter value for employee_name: Raj

Enter value for employee_company: TCS

Enter value for employee_email: Raj@tcs.com

Insert Record

❖ **Record Inserted Successfully**

Database Connection Parameters

Host: 34.122.183.176

User: geet

Password: *****

Database: EMPLOYEES

Connect

Raj

TCS

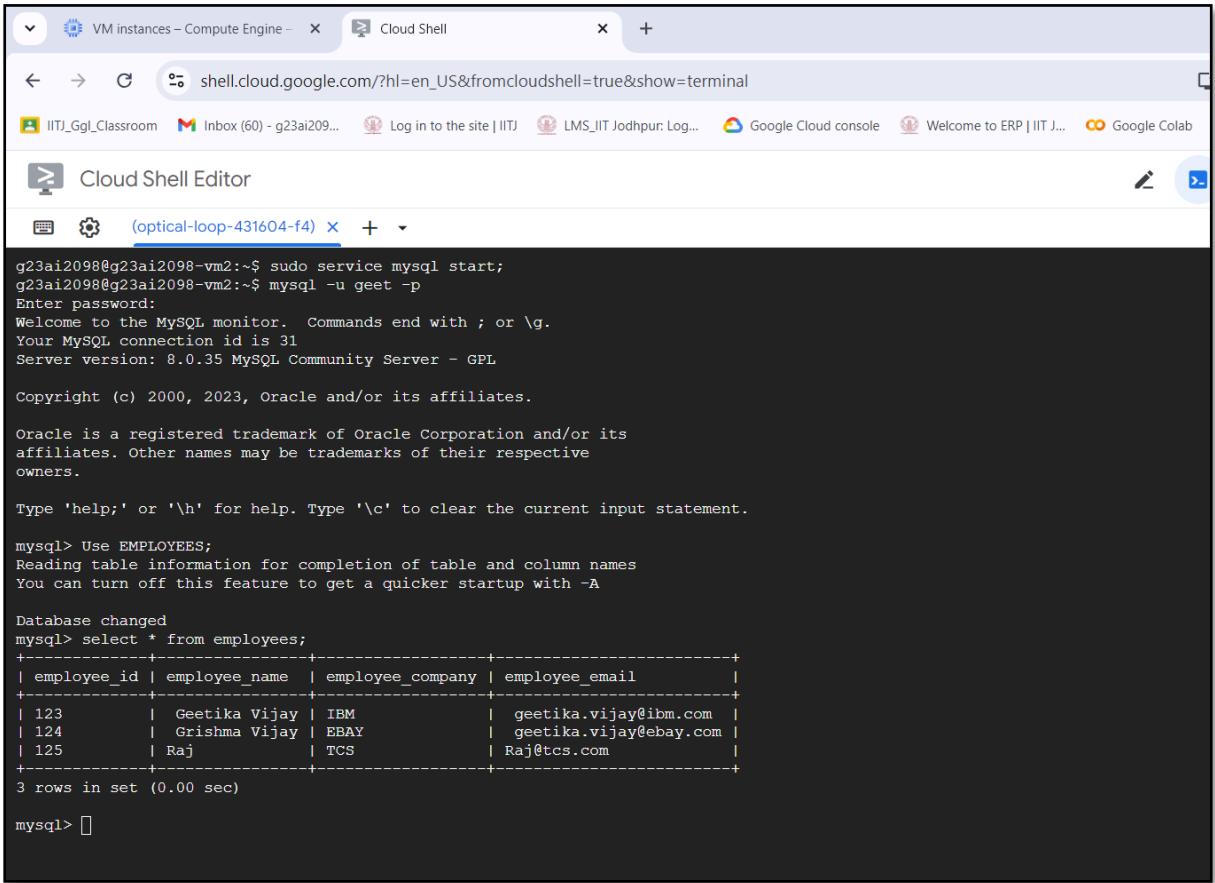
Raj@tcs.com

Insert Record

Record inserted successfully

	employee_id	employee_name	employee_company	employee_email
0	123	Geetika Vijay	IBM	geetika.vijay@ibm.com
1	124	Grishma Vijay	EBAY	geetika.vijay@ebay.com
2	125	Raj	TCS	Raj@tcs.com

- ❖ All the 3 parts mentioned in assignments are achieved successfully.
- ❖ Records can be verified in Database as well.
- ❖ All the 3 records can be seen in VM2 machines installed successfully.



The screenshot shows a terminal window in the Google Cloud Shell interface. The URL in the address bar is shell.cloud.google.com/?hl=en_US&fromcloudshell=true&show=terminal. The terminal session is titled '(optical-loop-431604-f4)'. The user has run the following MySQL commands:

```
g23ai2098@g23ai2098-vm2:~$ sudo service mysql start;
g23ai2098@g23ai2098-vm2:~$ mysql -u geet -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 31
Server version: 8.0.35 MySQL Community Server - GPL

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> Use EMPLOYEES;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> select * from employees;
+-----+-----+-----+-----+
| employee_id | employee_name | employee_company | employee_email |
+-----+-----+-----+-----+
| 123 | Geetika Vijay | IBM | geetika.vijay@ibm.com |
| 124 | Grishma Vijay | EBAY | geetika.vijay@ebay.com |
| 125 | Raj | TCS | Raj@tcs.com |
+-----+-----+-----+-----+
3 rows in set (0.00 sec)

mysql> 
```

App.py Code Snapshots: For reference:

```
app.py 4 X
D: > GitRepositories > VCC_Assignment2-Google Cloud-Virtual Machines > app.py > ...
1 import streamlit as st
2 import mysql.connector
3 from mysql.connector import Error
4 import pandas as pd
5
6 # Function to create a connection to the MySQL database
7 def create_connection(host_name, user_name, user_password, db_name):
8     connection = None
9     try:
10         connection = mysql.connector.connect(
11             host=host_name,
12             user=user_name,
13             passwd=user_password,
14             database=db_name
15         )
16         st.success("Connection to MySQL DB successful")
17     except mysql.connector.Error as err:
18         st.error(f"Error: '{err}'")
19     return connection
20
21 # Function to execute a query and fetch data
22 def run_query(connection, query):
23     cursor = connection.cursor(dictionary=True)
24     try:
25         cursor.execute(query)
26         result = cursor.fetchall()
27         cursor.close()
28         return result
29     except mysql.connector.Error as err:
30         st.error(f"Failed to run the query - {err}")
31     return None
32
```

```

app.py 4 X
D: > GitRepositories > VCC_Assignment2-Google Cloud-Virtual Machines > app.py > ...
22     def run_query(connection, query):
30         st.error(f"Failed to run the query - {err}")
31         return None
32
33     # Function to fetch data from the selected table
34     def fetch_data(connection, table_choice):
35         sql_query = f'SELECT * FROM {table_choice};'
36         tbl_data = run_query(connection, query=sql_query)
37         if tbl_data:
38             df = pd.DataFrame(tbl_data)
39             st.table(df)
40             return df.columns.tolist()
41         else:
42             st.write("No data found or query failed.")
43         return []
44
45     # Function to insert data into the selected table
46     def insert_data(connection, table_choice, columns, values):
47         columns_str = ', '.join(columns)
48         values_str = ', '.join(['%s'] * len(values))
49         sql_query = f'INSERT INTO {table_choice} ({columns_str}) VALUES ({values_str});'
50         print(sql_query);
51
52         cursor = connection.cursor()
53         try:
54             cursor.execute(sql_query, values)
55             connection.commit()
56             cursor.close()
57             st.success("Record inserted successfully")
58         except mysql.connector.Error as err:
59             st.error(f"Failed to insert the record - {err}")
60

```

```

app.py 4 X
D: > GitRepositories > VCC_Assignment2-Google Cloud-Virtual Machines > app.py > ...
60
61     # Streamlit interface
62     st.title('MySQL Database Connector')
63
64     # Database connection parameters
65     st.sidebar.header('Database Connection Parameters')
66     host = st.sidebar.text_input('Host', 'localhost')
67     user = st.sidebar.text_input('User', 'root')
68     password = st.sidebar.text_input('Password', type='password')
69     database = st.sidebar.text_input('Database')
70
71     if 'connection' not in st.session_state:
72         st.session_state.connection = None
73
74     if st.sidebar.button('Connect'):
75         st.session_state.connection = create_connection(host, user, password, database)
76
77     if st.session_state.connection:
78         table_lst_data = run_query(st.session_state.connection, query='SHOW TABLES;')
79         if table_lst_data:
80             df_lst_tbl = pd.DataFrame(table_lst_data)
81             options = ['Select an option'] + df_lst_tbl[df_lst_tbl.columns[0]].tolist()
82             table_choice = st.selectbox(label='Select Table from the below list', options=options)
83
84             if table_choice and table_choice != 'Select an option':
85                 columns = fetch_data(st.session_state.connection, table_choice)
86

```

```
app.py 4 X
D: > GitRepositories > VCC_Assignment2-Google Cloud-Virtual Machines > app.py > ...
83     if table_choice and table_choice != 'Select an option':
84         columns = fetch_data(st.session_state.connection, table_choice)
85
86
87
88     if columns:
89         st.write('### Insert New Record')
90         new_record = {}
91         for column in columns:
92             new_record[column] = st.text_input(f'Enter value for {column}')
93
94
95         if st.button('Insert Record'):
96             values = [new_record[column] for column in columns]
97             if st.session_state.connection:
98                 pass
99             else:
100                 st.session_state.connection = create_connection(host, user, password, database)
101                 insert_data(st.session_state.connection, table_choice, columns, values)
102
103             # Fetch data again to show the new record
104             if st.session_state.connection:
105                 pass
106             else:
107                 st.session_state.connection = create_connection(host, user, password, database)
108                 fetch_data(st.session_state.connection, table_choice)
109
110     else:
111         st.write("Failed to retrieve tables from the database.")
```

----- # FINISH # -----

#Note: Virtual Machine public Ips changed during report creation since virtual machines stopped and started multiple time during report creation. Active Running virtual machine IP has been referred during report creation at multiple instances. Snap shots attached for running machine Ips.