

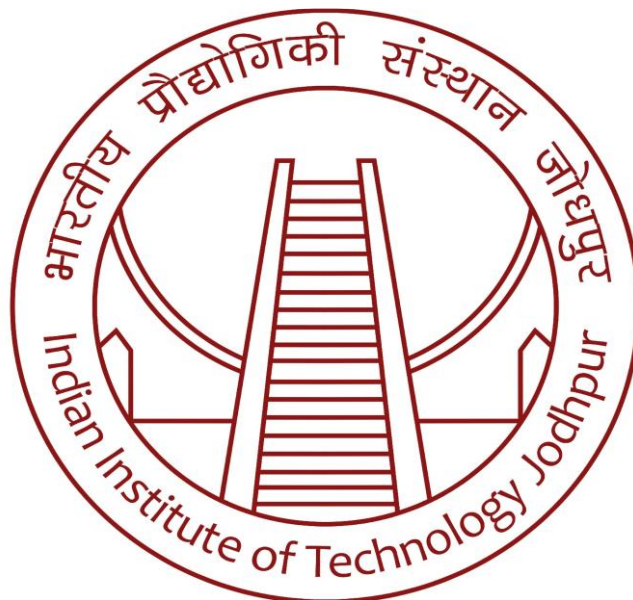
# **VIRTUALIZATION AND CLOUD COMPUTING**

## **ASSIGNMENT -2 REPORT**

Submitted by

NIHAR DAVE

Roll No : G23AI2097



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PG DIPLOMA – DATA ENGINEERING

in

DEPARTMENT OF AIDE

INDIAN INSTITUTE OF TECHNOLOGY JODHPUR

AUG, 2024

# VM CREATION ON GCP

The screenshot displays the Google Cloud Platform interface for VM instances. The left sidebar shows the navigation menu with 'VM instances' selected. The main content area shows a table of VM instances and a section for related actions.

Status	Name	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>	vm-g23ai2097-1	us-central1-b			10.128.0.2 (nic0)	34.133.5.12 (nic0)	SSH
<input type="checkbox"/>	vm-g23ai2097-2	us-central1-f			10.128.0.3 (nic0)	34.45.247.38 (nic0)	SSH
<input type="checkbox"/>	vm-g23ai2097-3	us-central1-c			10.128.0.4 (nic0)	34.46.169.192 (nic0)	SSH

**Related actions** (PREVIEW)

- Install Ops Agent (Logging)**: Analyze usage patterns to identify bottlenecks. [LEARN MORE](#) [GO TO OPS AGENT](#)
- Enable Security Command Center**: Secure your cloud with the same technology that Google uses. [LEARN MORE](#) [GO TO SECURITY](#)
- Connect with Cloud SQL**: Reduce your costs and deploy faster with a managed database. [LEARN MORE](#) [GO TO CLOUD SQL](#)
- Manage backup and DR**: Manage your backups and protect Compute Engine VMs all in one place. [LEARN MORE](#) [GO TO BACKUP & DR](#)
- Install Ops Agent (Monitoring)**: Enhance application and infrastructure performance. [LEARN MORE](#) [GO TO OPS AGENT](#)
- View billing report**: View and manage your Compute Engine billing. [GO TO BILLING](#)

- vm-g23ai2097-1

This VM is created in us-central1 region and it's configured with Debian operating system. Its machine type is e2-small and having 10gb boot disk. This vm instance is created to host php web application with apache server installed.

- vm-g23ai2097-2

This VM is created in us-central1 region and it's configured with Ubuntu operating system. Its machine type is e2-small and having 10gb boot disk. This vm instance is created to host the mysql server.

- vm-g23ai2097-3

This VM is created in us-central1 region and it's configured with Ubuntu operating system. Its machine type is e2-micro and having 10gb boot disk. This vm instance is created to test the accessibility of the web application.

# VPC AND FIREWALL SETUP

There are no changes in the VPC setup and it is having the default firewall rules.

The screenshot shows the Google Cloud console interface for Firewall policies. The left sidebar lists various services under 'Network security', with 'Firewall policies' selected. The main content area is titled 'VPC firewall rules' and includes a note about App Engine firewalls. Below this, there is a table of firewall rules. The table has columns for Name, Type, Targets, Filters, Protocols/ports, Action, Priority, Network, Logs, Hit count, Last hit, and Insights. The rules listed are default-allow-http, default-allow-https, default-allow-icmp, default-allow-internal, default-allow-rdp, and default-allow-ssh.

Name	Type	Targets	Filters	Protocols/ports	Action	Priority	Network	Logs	Hit count	Last hit	Insights
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-internal	Ingress	Apply to all	IP ranges:	tcp:0-65535 udp:0-65535 icmp	Allow	65534	default	Off	-	-	
default-allow-rdp	Ingress	Apply to all	IP ranges:	tcp:3389	Allow	65534	default	Off	-	-	
default-allow-ssh	Ingress	Apply to all	IP ranges:	tcp:22	Allow	65534	default	Off	-	-	

During the VM configurations, the http and https traffic was allowed in the firewall policies.

The screenshot shows the Google Cloud console interface for a Compute Engine VM instance. The left sidebar lists various services under 'Virtual machines', with 'VM instances' selected. The main content area is titled 'vm-g23ai2097...' and includes tabs for DETAILS, OBSERVABILITY, OS INFO, and SCREENSHOT. The 'DETAILS' tab is active, showing network settings. The 'Firewalls' section shows that HTTP traffic, HTTPS traffic, and Allow load balancer health checks are all set to 'On'. The 'Network tags' section shows that the 'http-server' and 'https-server' tags are applied. The 'Network interfaces' section shows a table with columns for Name, Network, Subnetwork, Primary internal IP address, Alias IP ranges, IP stack type, External IP address, and Network. The interface shows a single network interface named 'nic0' with a primary internal IP address of 10.128.0.2 and an external IP address of 34.133.5.12 (Ephemeral).

Name	Network	Subnetwork	Primary internal IP address	Alias IP ranges	IP stack type	External IP address	Network
nic0	default	default	10.128.0.2		IPv4	34.133.5.12 (Ephemeral)	Premi...

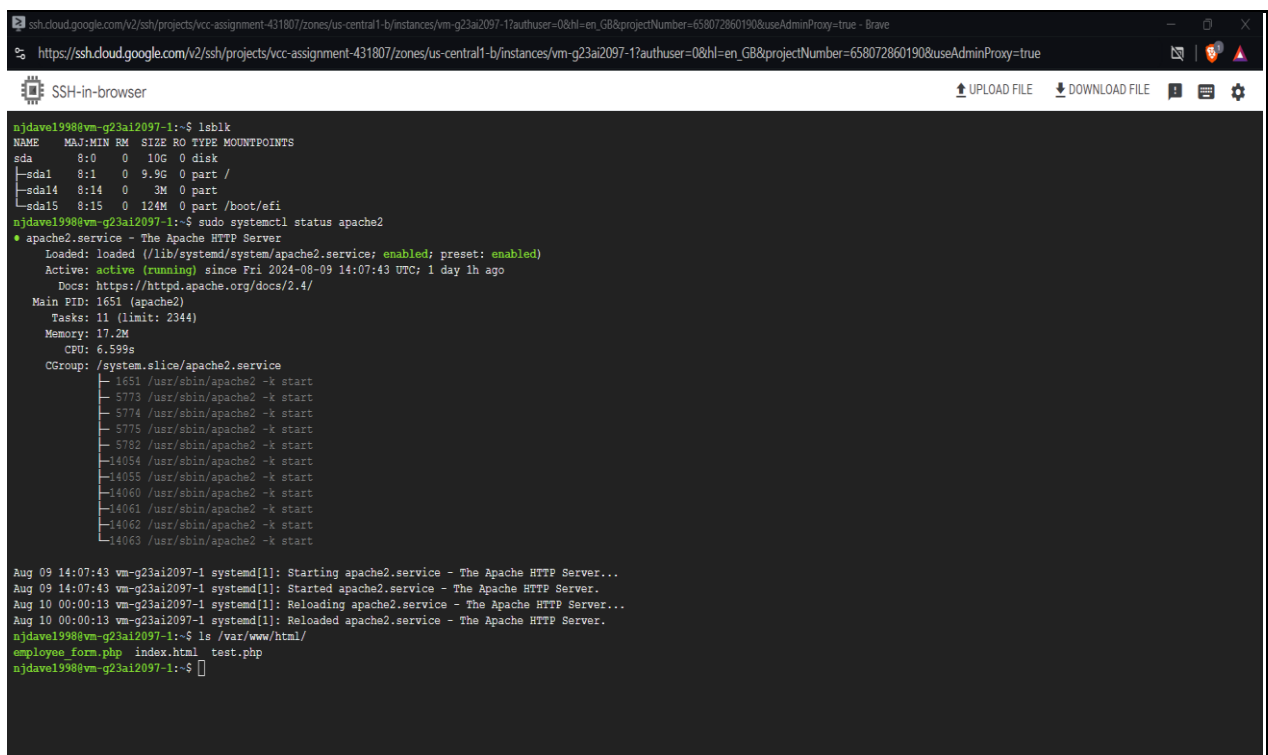
# PHP WEB APPLICATION SETUP ON VM-1

The php web application is a basic web-app where an employee needs to enter their details which would then get captured in the database.

We connected via SSH to VM-1 i.e. vm-g23ai2097-1 and then activities were performed. Apache server was installed and the php code file created at /var/www/html/ path.

The php code can be found on the github repository link below :

[https://github.com/nihardave19/GCP\\_App\\_Deployment](https://github.com/nihardave19/GCP_App_Deployment)



```
ssh.cloud.google.com/v2/ssh/projects/vcc-assignment-431807/zones/us-central1-b/instances/vm-g23ai2097-1?authuser=0&hl=en_GB&projectNumber=658072860190&useAdminProxy=true - Brave
https://ssh.cloud.google.com/v2/ssh/projects/vcc-assignment-431807/zones/us-central1-b/instances/vm-g23ai2097-1?authuser=0&hl=en_GB&projectNumber=658072860190&useAdminProxy=true
SSH-in-browser
UPLOAD FILE DOWNLOAD FILE

njdave1998@vm-g23ai2097-1:~$ lsblk
NAME        MAJ:MIN RM  SIZE RO TYPE MOUNTPOINTS
sda          8:0    0   10G  0 disk 
├─sda1       8:1    0    9.9G  0 part /
├─sda14      8:14   0     3M  0 part 
└─sda15      8:15   0    124M  0 part /boot/efi

njdave1998@vm-g23ai2097-1:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; preset: enabled)
   Active: active (running) since Fri 2024-08-09 14:07:43 UTC; 1 day 1h ago
     Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 1651 (apache2)
    Tasks: 11 (limit: 2344)
   Memory: 17.2M
      CPU: 6.599s
   CGroup: /system.slice/apache2.service
           └─ 1651 /usr/sbin/apache2 -k start
             5773 /usr/sbin/apache2 -k start
             5774 /usr/sbin/apache2 -k start
             5775 /usr/sbin/apache2 -k start
             5782 /usr/sbin/apache2 -k start
            14054 /usr/sbin/apache2 -k start
            14055 /usr/sbin/apache2 -k start
            14060 /usr/sbin/apache2 -k start
            14061 /usr/sbin/apache2 -k start
            14062 /usr/sbin/apache2 -k start
            14063 /usr/sbin/apache2 -k start

Aug 09 14:07:43 vm-g23ai2097-1 systemd[1]: Starting apache2.service - The Apache HTTP Server...
Aug 09 14:07:43 vm-g23ai2097-1 systemd[1]: Started apache2.service - The Apache HTTP Server.
Aug 10 00:00:13 vm-g23ai2097-1 systemd[1]: Reloading apache2.service - The Apache HTTP Server...
Aug 10 00:00:13 vm-g23ai2097-1 systemd[1]: Reloaded apache2.service - The Apache HTTP Server.
njdave1998@vm-g23ai2097-1:~$ ls /var/www/html/
employee_form.php  index.html  test.php
njdave1998@vm-g23ai2097-1:~$
```

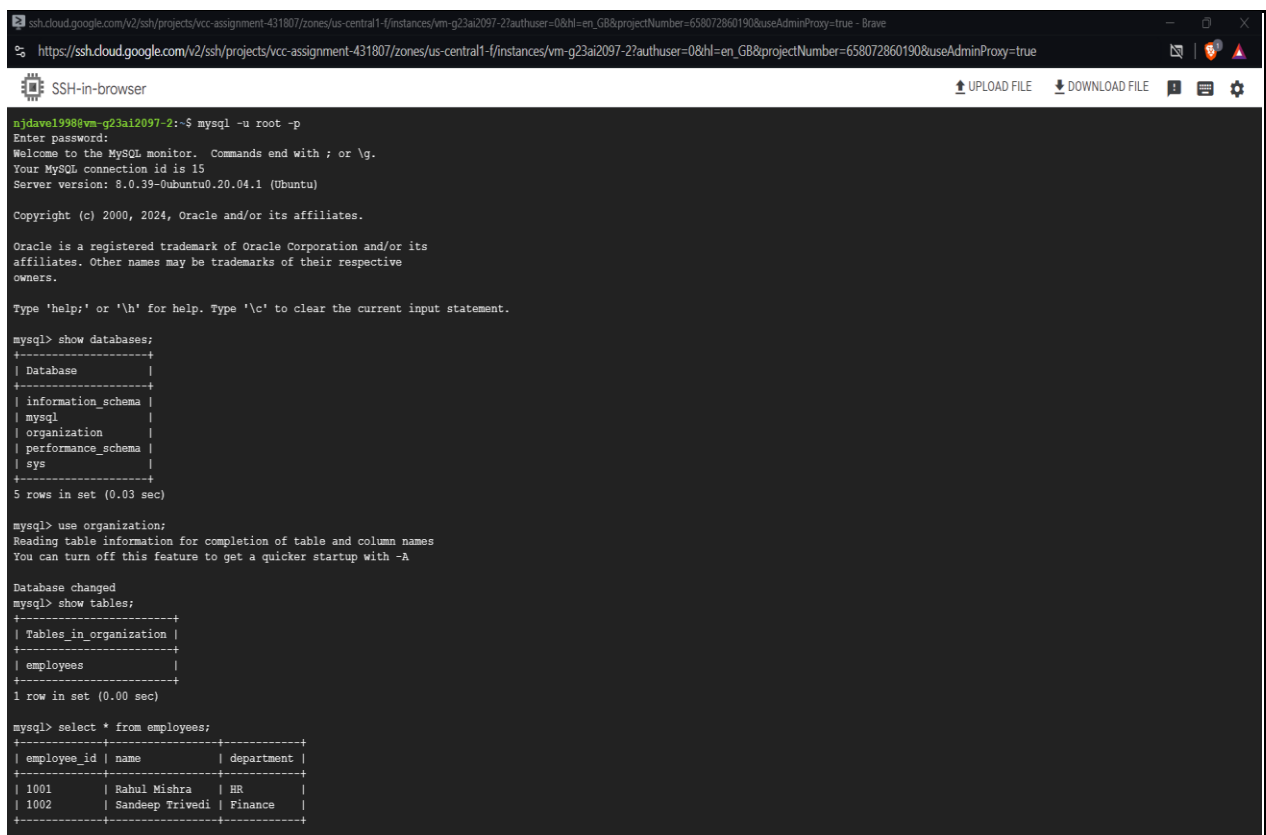
## MYSQL SERVER INSTALLATION AND SETUP ON VM-2

MySQL server was installed on VM-2 i.e. vm-g23ai2097-2. Thereafter a new database was created name 'organization' and inside that database, a table named 'employees' was created.

The table has 3 attributes, employee\_id, name and department. A sample record was created.

```
njdave1998@vm-g23ai2097-2:~$ sudo systemctl status mysql
● mysql.service - MySQL Community Server
   Loaded: loaded (/lib/systemd/system/mysql.service; enabled; vendor preset: enabled)
   Active: active (running) since Fri 2024-08-09 14:05:02 UTC; 1 day 1h ago
   Process: 505 ExecStartPre=/usr/share/mysql/mysql-systemd-start pre (code=exited, status=0/SUCCESS)
   Main PID: 752 (mysqld)
   Status: "Server is operational"
   Tasks: 38 (limit: 2342)
   Memory: 412.8M
   CGroup: /system.slice/mysql.service
           └─752 /usr/sbin/mysqld

Aug 09 14:04:58 vm-g23ai2097-2 systemd[1]: Starting MySQL Community Server...
Aug 09 14:05:02 vm-g23ai2097-2 systemd[1]: Started MySQL Community Server.
```



```
njdave1998@vm-g23ai2097-2:~$ mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 15
Server version: 8.0.39-0ubuntu0.20.04.1 (Ubuntu)

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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> show databases;
+-----+
| Database |
+-----+
| information_schema |
| mysql |
| organization |
| performance_schema |
| sys |
+-----+
5 rows in set (0.03 sec)

mysql> use organization;
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> show tables;
+-----+
| Tables_in_organization |
+-----+
| employees |
+-----+
1 row in set (0.00 sec)

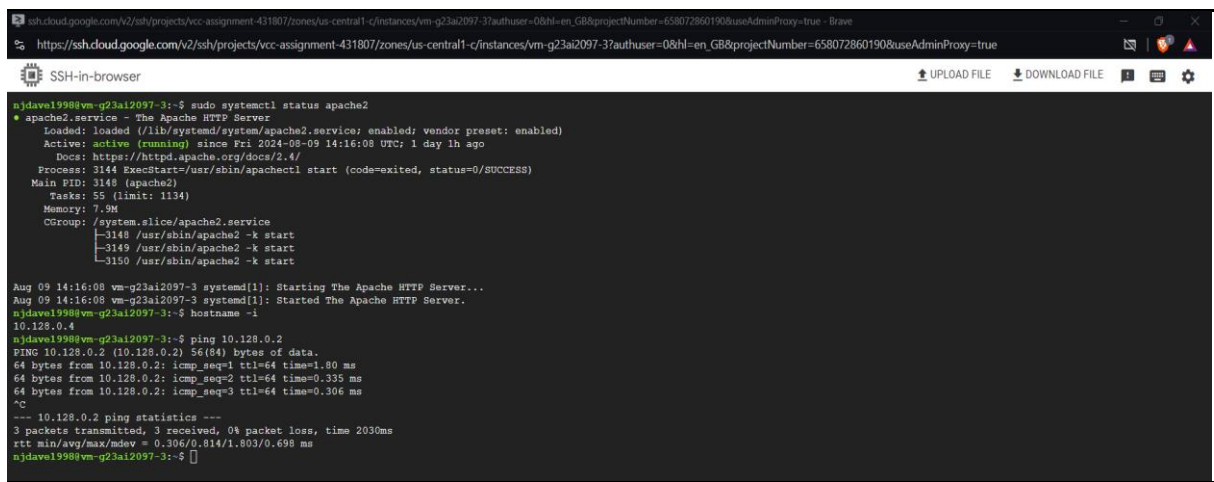
mysql> select * from employees;
+-----+-----+-----+
| employee_id | name | department |
+-----+-----+-----+
| 1001 | Rahul Mishra | HR |
| 1002 | Sandeep Trivedi | Finance |
+-----+-----+-----+
```

## VM-3 CREATION AND WEB APP ACCESS

This vm-3 i.e. vm-g23ai2097-3 was created to showcase the accessibility of the web application hosted on vm-1.

As it is an Ubuntu system, reverse proxy was configured so that the external ip of vm-3 redirects to vm-1 internal ip and shows us the web-app.

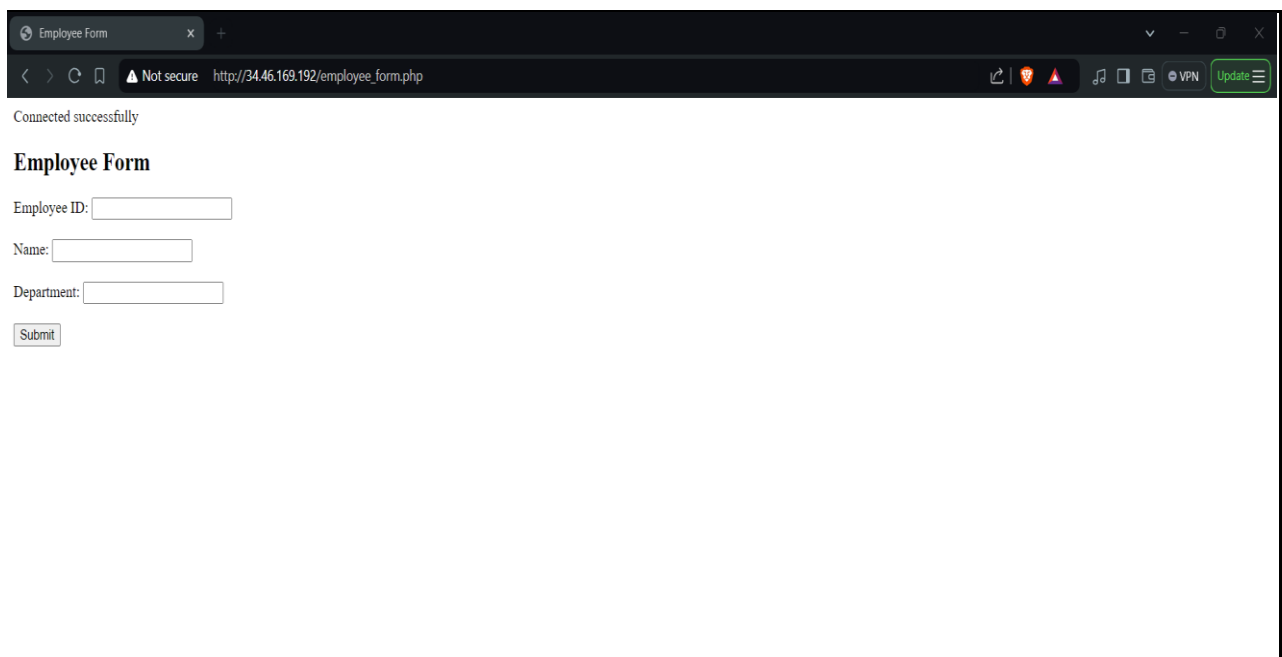
For that purpose, apache web server was installed and reverse proxy was configured and enabled.



```
njdave1998@vm-g23ai2097-3:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
   Active: active (running) since Fri 2024-08-09 14:16:08 UTC; 1 day 1h ago
     Docs: https://httpd.apache.org/docs/2.4/
   Process: 3144 ExecStart=/usr/sbin/apachectl start (code=exited, status=0/SUCCESS)
   Main PID: 3148 (apache2)
     Tasks: 55 (limit: 1134)
    Memory: 7.9M
      CGroup: /system.slice/apache2.service
              └─3148 /usr/sbin/apache2 -k start
                └─3149 /usr/sbin/apache2 -k start
                  └─3150 /usr/sbin/apache2 -k start

Aug 09 14:16:08 vm-g23ai2097-3 systemd[1]: Starting The Apache HTTP Server...
Aug 09 14:16:08 vm-g23ai2097-3 systemd[1]: Started The Apache HTTP Server.
njdave1998@vm-g23ai2097-3:~$ hostname -i
10.128.0.4
njdave1998@vm-g23ai2097-3:~$ 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=1.80 ms
 64 bytes from 10.128.0.2: icmp_seq=2 ttl=64 time=0.335 ms
 64 bytes from 10.128.0.2: icmp_seq=3 ttl=64 time=0.306 ms
--- 10.128.0.2 ping statistics ---
 3 packets transmitted, 3 received, 0% packet loss, time 2030ms
 rtt min/avg/max/mdev = 0.306/0.814/1.803/0.698 ms
njdave1998@vm-g23ai2097-3:~$
```

The below screenshot shows the web-app when we open the external ip of vm-3 in browser.



Employee Form

Connected successfully

Employee ID:

Name:

Department:

# WEB-APP ACCESS ON LOCAL MACHINE

We can access the web application hosted on vm-1 using its external ip.

Below we can see the web app and after entering details, the mysql database also gets updated.

Employee Form

Employee ID:

Name:

Department:

```
ssh.cloud.google.com/v2/ssh/projects/vcc-assignment-431807/zones/us-central1-f/instances/vm-g23ai2097-2?authuser=0&hl=en_GB&projectNumber=658072860190&useAdminProxy=true - Brave
https://ssh.cloud.google.com/v2/ssh/projects/vcc-assignment-431807/zones/us-central1-f/instances/vm-g23ai2097-2?authuser=0&hl=en_GB&projectNumber=658072860190&useAdminProxy=true

SSH-in-browser
UPLOAD FILE DOWNLOAD FILE

ajdave1990@vm-g23ai2097-2:~$ mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 18
Server version: 8.0.39-0ubuntu0.20.04.1 (Ubuntu)

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owners.

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

mysql> use organization;
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 | name           | department |
+-----+-----+-----+
| 1001        | Rahul Mishra   | HR         |
| 1002        | Sandeep Trivedi | Finance    |
+-----+-----+-----+
2 rows in set (0.00 sec)

mysql> select * from employees;
+-----+-----+-----+
| employee_id | name           | department |
+-----+-----+-----+
| 1001        | Rahul Mishra   | HR         |
| 1002        | Sandeep Trivedi | Finance    |
| 1003        | Nihar Dave     | IT         |
+-----+-----+-----+
3 rows in set (0.00 sec)

mysql>
```

**\*\*END OF REPORT\*\***