

Project id: cdsds561-project-1

Bucket Name: hw2nirbhgsutil

Bucket-2 Name:hw4nirbhgsutil

Directory Name: test-dir

Github Link:CDS-DS-561-hw2/hw4 at master · nirbhay221/CDS-DS-561-hw2 (github.com)

Topic name : projects/cdsds561-project-1/topics/hw3nirbhgsutil

Topic Id: hw3nirbhgsutil

Subscription Id: hw3nirbhgsutil-sub

Service Account email for pub sub:

pubsubserviceacc-hw3-nirbh@cdsds561-project-1.iam.gserviceaccount.com

Service Account for pub sub: pubsubServiceAcc-hw3-nirbh

Service Account for SQL:

cloud-sql-authorize-vm@cdsds561-project-1.iam.gserviceaccount.com

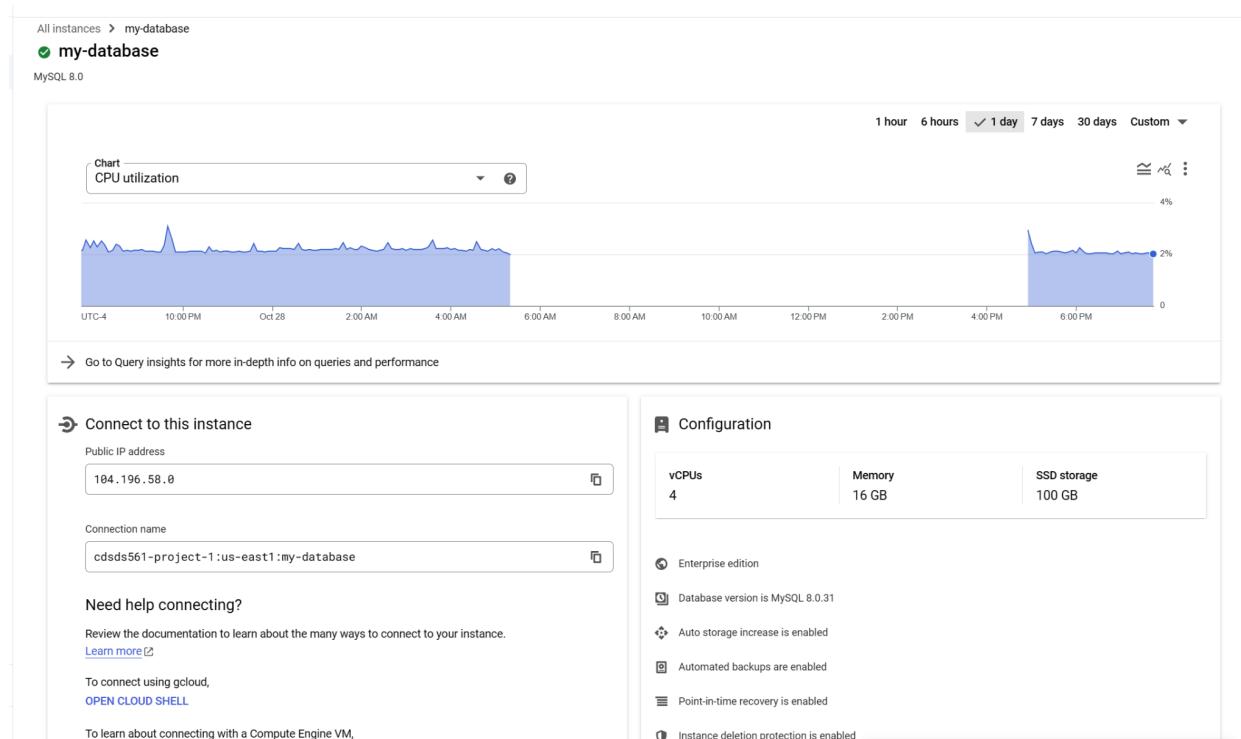
Reserved IP : 34.75.102.252

Sql database instance: my-database

Sql database: First-Trial , Second-Trial

Sql Tables : Clients, main_table, error_logs.

For the following SQL Database, we first create the sql instance, in my case, I create “my-database” as the sql instance in which I will create the databases and connect the web server to the following database. The database instance “my-database” which has a public ip :



Once the following instance is created we can head to the user section and then change the password of the root (Username) to our liking, in my case the password is “admin” that’s what I have mentioned in the web server python flask application code.

Now we can navigate to the databases section and then generate a new database “First-Trial” in my case. Following Database will be used by our web server to create and update tables like “main_table”, “error_log” and “Clients”.

First-Trial database looks like this :

Name	Collation	Character set	Type
First-Trial	utf8mb3_general_ci	utf8mb3	User
information_schema	utf8mb3_general_ci	utf8mb3	System
mysql	utf8mb3_general_ci	utf8mb3	System
performance_schema	utf8mb4_0900_ai_ci	utf8mb4	System
sys	utf8mb4_0900_ai_ci	utf8mb4	System

Now, once the following database is created, we can make the service account with the following privileges: Cloud SQL Client and Cloud SQL Admin. I used the following service account (cloud-sql-authorize-vm@cdsds561-project-1.iam.gserviceaccount.com) and gave it the above mentioned privileges.

Email	Status	Name	Description	Key ID	Key creation date	OAuth 2 Client ID	Actions
cdsds561-project-1@appspot.gserviceaccount.com	Enabled	App Engine default service account	No keys		1082762302616453565		⋮
cloud-sql-authorization@cdsds561-project-1.iam.gserviceaccount.com	Enabled	cloud-sql-authorization	No keys		1131861919173605458		⋮
cloud-sql-authorized-vm@cdsds561-project-1.iam.gserviceaccount.com	Enabled	cloud-sql-authorized-vm	No keys		1150739515222051293		⋮
49455990174-compute@developer.gserviceaccount.com	Enabled	Compute Engine default service account	No keys		1123753236049772351		⋮
nirbhbwbucketpermission@cdsds561-project-1.iam.gserviceaccount.com	Enabled	nirbhbwbucketpermission	3185d9128a0f660311fb49e754af8f5dd4bee8ad		Sep 22, 2023	1049630247415253672	⋮
pubsubserviceacc-hw3-nirbh@cdsds561-project-1.iam.gserviceaccount.com	Enabled	pubsubServiceAcc-hw3-nirbh	577dc490edcd8748daff0d346c1bd51707470fe		Oct 10, 2023	1153350400962486837	⋮

For the following first application, I created the python flask application that is the webserver running on the instance-1 based on the startup script and I also stored the key for the topic (key.json) , startup script (bash-script.sh) and the check_main.py file in the “hw4nirbhgsutil” bucket:

Bucket details

hw4nirbhgsutil

Location: us-east1 (South Carolina) **Storage class**: Standard **Public access**: Public to internet **Protection**: None

EDIT ACCESS **DISMISSED**

OBJECTS **CONFIGURATION** **PERMISSIONS** **PROTECTION** **LIFECYCLE** **OBSERVABILITY** **INVENTORY REPORTS**

Buckets > hw4nirbhgsutil

UPLOAD FILES **UPLOAD FOLDER** **CREATE FOLDER** **TRANSFER DATA** **MANAGE HOLDS** **DOWNLOAD** **DELETE**

Filter by name prefix only ▾ **Filter** Filter objects and folders

Name	Size	Type	Created	Storage class	Last modified	Public access	Version history	Enc.
bash-script.sh	1.6 KB	application/x-sh	Oct 28, 2023, 5:23:48 PM	Standard	Oct 28, 2023, 5:23:48 PM	Public to internet	Copy URL	—
check_main.py	12.9 KB	text/x-python	Oct 28, 2023, 5:48:52 PM	Standard	Oct 28, 2023, 5:48:52 PM	Public to internet	Copy URL	—
key.json	2.3 KB	application/json	Oct 17, 2023, 1:58:27 AM	Standard	Oct 17, 2023, 1:58:27 AM	Public to internet	Copy URL	—
main.py	4.3 KB	text/x-python	Oct 18, 2023, 8:01:00 PM	Standard	Oct 18, 2023, 8:01:00 PM	Public to internet	Copy URL	—
startup-script.sh	1 KB	application/x-sh	Oct 18, 2023, 12:47:54 PM	Standard	Oct 18, 2023, 12:47:54 PM	Public to internet	Copy URL	—

The following vm instance 1 is created with the following service account : [cloud-sql-authorize-vm@cdsds561-project-1.iam.gserviceaccount.com](#) and with the startup script as bash-script and the bash script being the startup script installs the following:

```
/usr/bin/wget
https://dev.mysql.com/get/Downloads/MySQL-8.2/mysql-server_8.2.0-1debian11_amd64.deb-bundle.tar
/bin/tar -xvf /path/to/mysql-server_8.2.0-1debian11_amd64.deb-bundle.tar
sudo apt-get install libaiol
sudo dpkg-preconfigure mysql-community-server_*.deb
sudo dpkg -i mysql*.deb
sudo apt-get -f install
python3 -m pip install pymysql
python3 -m pip install sqlalchemy
python3 -m pip install "cloud-sql-python-connector[pymysql]"
```

My bash-script looks like the following:

```

C:\Users\nirbh\AppData\Local\Google\Cloud SDK>cat bash-script.sh
#!/bin/bash
mkdir -p ./tmp
cd ./tmp/
echo "Updating package list..."
sudo apt update -y
echo "Installing Python 3..."
sudo apt install -y python3
echo "Installing Python 3 pip..."
sudo apt install -y python3-distutils python3-lib2to3
curl https://bootstrap.pypa.io/get-pip.py -o get-pip.py
python3 get-pip.py
echo "Installing Google Cloud Python libraries..."
python3 -m pip install google-cloud-storage
python3 -m pip install google-cloud-logging
python3 -m pip install google-cloud-pubsub
python3 -m pip install google-auth
python3 -m pip install google-auth-oauthlib
python3 -m pip install google-cloud-storage

python3 -m pip install flask
echo "Installing Google Cloud SDK..."
sudo apt-get install -y google-cloud-sdk

echo "Installing Google Cloud SQL..."

sleep 30
/usr/bin/wget https://dev.mysql.com/get/Downloads/MySQL-8.2/mysql-server_8.2.0-1debian11_amd64.deb-bundle.tar
/bin/tar -xvf /path/to/mysql-server_8.2.0-1debian11_amd64.deb-bundle.tar

sudo apt-get install libaio1

echo "Check - 1"
sudo dpkg-preconfigure mysql-community-server_*.deb
echo "Check - 2"
sudo dpkg -i mysql*.deb
echo "Check - 3"
sudo apt-get -f install

echo "Check - 4"
python3 -m pip install pymysql
python3 -m pip install sqlalchemy
python3 -m pip install "cloud-sql-python-connector[pymysql]"

GCS_BUCKET="hw4nirbhgsutil"
OBJECT_NAME="key.json"
gsutil cp gs://$GCS_BUCKET/$OBJECT_NAME .
GCS_BUCKET="hw4nirbhgsutil"
OBJECT_NAME="check_main.py"
echo "Copying $OBJECT_NAME from Google Cloud Storage..."
gsutil cp gs://$GCS_BUCKET/$OBJECT_NAME .
echo "Executing check_main.py..."

python3 check_main.py

```

And then we create the vm (f1-micro) using the startup script and using the following command on gcloud cli:

```

gcloud compute instances create instance-1 ^
--project=cdss561-project-1 ^
--zone=us-east1-b ^
--machine-type=f1-micro ^
--network-interface=network-tier:PREMIUM,stack-type:IPV4_ONLY,subnet=default ^
--maintenance-policy:MIGRATE ^
--provisioning-model:STANDARD ^
--service-account=cloud-sql-authorize-vm@cdss561-project-1.iam.gserviceaccount.com ^
--scope=https://www.googleapis.com/auth/cloud-platform ^
--tags=http-server,https-server,lb-health-check ^
--create-disk=auto-delete=yes,boot=yes,device-name=instance-6,image=projects/debian-cloud/global/images/debian-11-bullseye-v20231010,mode=rw,size=10,type=projects/cdss561-project-1/zones/us-central1-a/diskTypes/pd-balanced ^
--no-shielded-secure-boot ^
--shielded-vtpm ^
--shielded-integrity-monitoring ^
--labels=goog-ec-src=vm_add-gcloud ^
--reservation-affinity:any ^
--metadata startup-script-url=gs://hw4nirbhgsutil/bash-script.sh

```

Similar to previous homeworks, I created the bat file for storing the generating vm command and I executed the .bat file in order to generate the vm instance 1 with the service account with sql admin and client privileges. The following generate command also contains the startup script (bash-script) extracted from the bucket to get the server running at the vm generation.

Or you can use an e2-small machine to make it work faster, you can use the following bat file for that :

```

C:\Users\nirbh\AppData\Local\Google\Cloud SDK>gcloud compute instances create instance-1 --project=cdss561-project-1 --zone=us-east1-b --machine-type=e2-small --network-interface=network-tier:PREMIUM,stack-type:IPV4_ONLY,subnet=default --maintenance-policy:MIGRATE --provisioning-model:STANDARD --service-account=cloud-sql-authorize-vm@cdss561-project-1.iam.gserviceaccount.com --scopes=https://www.googleapis.com/auth/cloud-platform --tags=http-server,https-server,lb-health-check --create-disk=auto-delete=yes,boot=yes,device-name=instance-6,image=projects/debian-cloud/global/images/debian-11-bullseye-v20231010,mode=rw,size=10,type=projects/cdss561-project-1/zones/us-central1-a/diskTypes/pd-balanced --no-shielded-secure-boot --shielded-vtpm --shielded-integrity-monitoring --labels=goog-ec-src=vm_add-gcloud --reservation-affinity:any --metadata startup-script-url=gs://hw4nirbhgsutil/bash-script.sh
Created [https://www.googleapis.com/compute/v1/projects/cdss561-project-1/zones/us-east1-b/instances/instance-1].
NAME          ZONE      MACHINE_TYPE  PREEMPTIBLE  INTERNAL_IP  EXTERNAL_IP   STATUS
instance-1    us-east1-b  e2-small        10.142.15.228 34.23.87.262  RUNNING

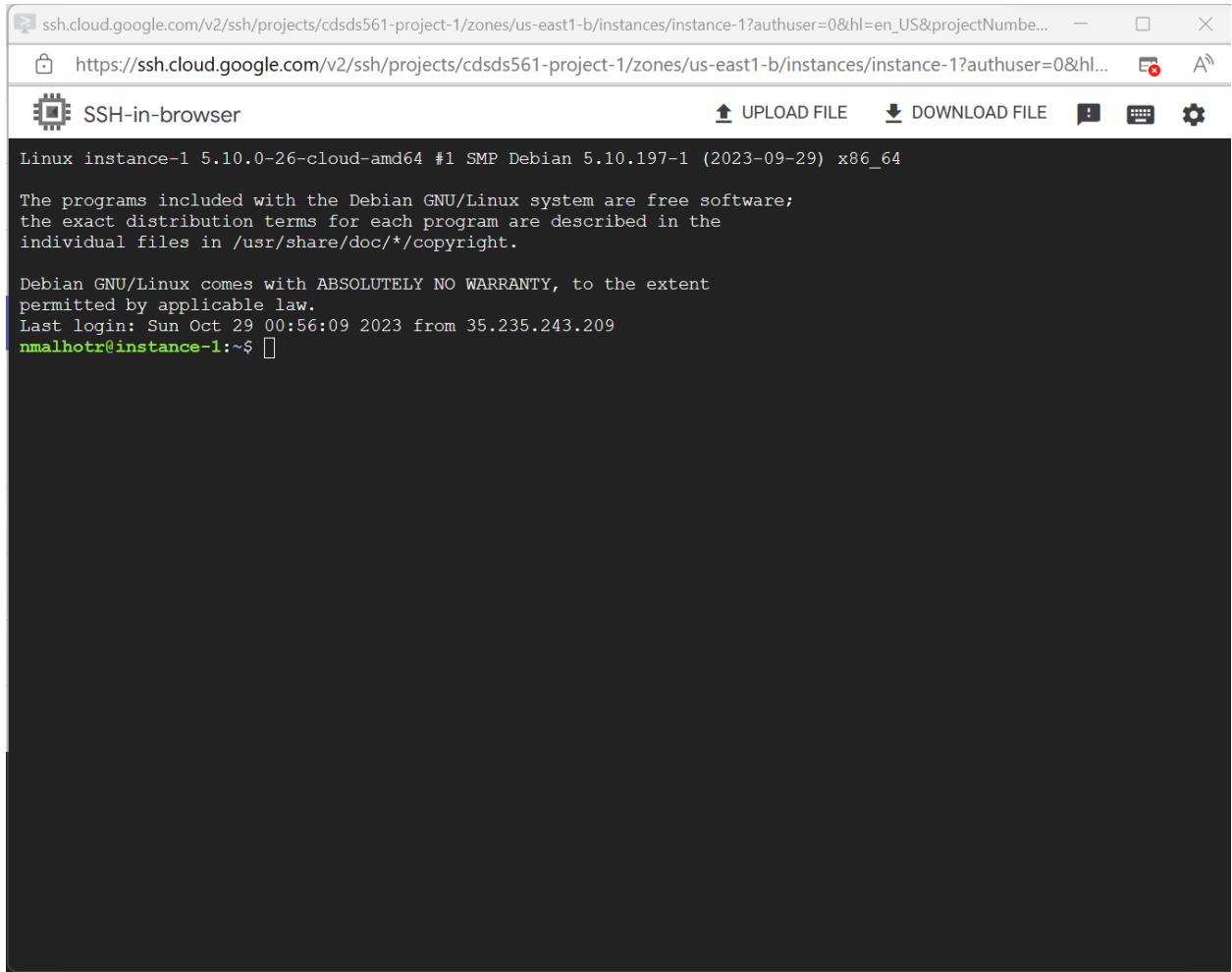
Updates are available for some Google Cloud CLI components. To install them,
please run:
$ gcloud components update

```

Once the vm instance 1 is created, we can ssh the vm instance from the vm instances page:

VM instances		CREATE INSTANCE	IMPORT VM	REFRESH	LEARN				
VM instances									
<input type="checkbox"/> Filter Enter property name or value									
Status	Name	Zone	Recommendations	In use by	Internal IP	External IP	Connect		
<input checked="" type="checkbox"/>	instance-1	us-east1-b			10.142.15.227 (nic0)	34.75.102.252 (nic0)	SSH		
<input checked="" type="checkbox"/>	instance-3	us-east1-b			10.142.15.224 (nic0)	34.139.235.53 (nic0)	SSH		
<input checked="" type="checkbox"/>	instance-4	us-east1-b			10.142.15.223 (nic0)	35.237.166.180 (nic0)	SSH		
<input checked="" type="checkbox"/>	instance-5	us-east1-b			10.142.0.59 (nic0)	34.138.76.201 (nic0)	SSH		

Using SSH for the instance-1:



```
ssh.cloud.google.com/v2/ssh/projects/cdsds561-project-1/zones/us-east1-b/instances/instance-1?authuser=0&hl=en_US&projectNumbe... — □ ×  
https://ssh.cloud.google.com/v2/ssh/projects/cdsds561-project-1/zones/us-east1-b/instances/instance-1?authuser=0&hl... 🔍 A⚙️  
SSH-in-browser UPLOAD FILE DOWNLOAD FILE ⚡ 📄 ⚙️ ⚙️  
Linux instance-1 5.10.0-26-cloud-amd64 #1 SMP Debian 5.10.197-1 (2023-09-29) x86_64  
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.  
Last login: Sun Oct 29 00:56:09 2023 from 35.235.243.209  
nmalhotra@instance-1:~$
```

Once we ssh into the vm, we can check the database ('my-database') to check if the tables gets created in them. So we first use the database using the sql command "USE First-Trial;" and then we can execute the following sql command "SHOW TABLES;" once running this we see the following results:

```

mysql> USE First-Trial
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_First-Trial |
+-----+
| Clients
| error_log
| main_table
+-----+
3 rows in set (0.00 sec)

```

Once these tables are created , you can see the architecture of the following tables as the main_table is the one that stores the request's information. The main table follows the Second Normal Form Schema where I disintegrated the main_table into two tables main_table and the Clients to make the main_table follow the 2 NF schema. The main table architecture looks as follows:

```

mysql> desc main_table;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| id | int | NO | PRI | NULL | auto_increment |
| client_id | int | NO | MUL | 1 | |
| country | varchar(255) | NO | | NULL | |
| client_ip | varchar(255) | NO | | NULL | |
| is_banned | tinyint(1) | NO | | NULL | |
| time_of_day | timestamp | NO | | NULL | |
| requested_file | varchar(255) | NO | | NULL | |
+-----+-----+-----+-----+-----+-----+
7 rows in set (0.00 sec)

```

Client table architecture looks as follows:

```

mysql> desc Clients;
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| client_id | int | NO | PRI | NULL | auto_increment |
| gender | varchar(255) | NO | | NULL | |
| age | varchar(255) | NO | | NULL | |
| income | varchar(255) | NO | | NULL | |
+-----+-----+-----+-----+-----+
4 rows in set (0.01 sec)

```

First Normal Form (1NF):

Atomicity:

The columns in the main_table appear to contain atomic values as they are single data elements like integers, strings, and boolean values, so all columns contain atomic values. The single cell of the main_table doesn't hold more than one value as all the columns in the following table contain single indivisible values. So the atomicity condition is met.

Unique Column Names:

The column names in the main_table are unique so this condition is also met.

Order of Data:

In SQL, the order of data in a table does not matter, so this condition is met.

Primary Key:

Main table has "id" as an auto-incremented primary key which allows for identification for each row in the table so the condition of having a primary key for identification is met.

No Duplicated Rows or Columns:

Main table doesn't have duplicated rows as id is an auto incremented primary key and it ensures that each row has a unique identifier. Therefore, there are no duplicated rows and columns.

Each column must have only one value for each row:

Each column in the main_table contains a single value for each row. For example, the country column holds a single country value for each row and the same is true for other columns. Therefore, this condition is also met.

Hence, the main_table satisfies the criteria for 1NF.

Second Normal Form (2 NF):

It's already in 1NF:

The main_table meets the criteria for the First Normal Form schema as it contains atomic values, has a primary key for identification, doesn't have duplicated rows, and each column holds only one value for each row. Therefore, it is in 1 NF.

No Partial Dependency:

The second criteria for 2NF is that there should be no partial dependencies, which means all non-key attributes should be fully dependent on the entire primary key and not just a part of it. In the main_table, the primary key consists of the id and client id is a foreign key that references the client id in the Clients table.

Non-key attributes in the main_table like country, client_ip , is_banned, time_of__day and the request_file are fully dependent on the entire primary key which is the combination of id and

client id which means that each record in the main_table is uniquely identified by this composite key and all other columns are dependent on it and there are no partial dependencies because all non-key attributes are fully dependent on the primary key. This adherence to 2NF ensure that the main_table does not suffer from the partial dependencies and has been properly normalized.

And the error_log table architecture looks as follows:

```
mysql> desc error_log;
+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| id | bigint unsigned | NO | PRI | NULL | auto_increment |
| time_of_request | timestamp | NO | | NULL | |
| requested_file | varchar(255) | NO | | NULL | |
| error_code | int | NO | | NULL | |
+-----+-----+-----+-----+-----+
4 rows in set (0.01 sec)
```

The error_log is following 1 NF:

Atomicity:

Each column in the error_log table contains atomic or indivisible values as id is a primary key , time of request is a timestamp, request file is a string and error_code is an integer. These all columns are atomic data types so the atomicity condition is met.

Primary Key:

The table has a primary key, which is the “id” column which allows for identification of each record, meeting the requirements of having a primary key.

No Duplicated Rows or Columns:

The table should not have duplicated rows and columns. All the column names in the tables are distinct and assuming the “id” column is an auto incremented primary key, each row will have a unique identifier which avoids duplicate rows.

Each column must have only one value for each row:

Each column in the error_log table contains a single value for each row. For instance, the time_of_request column holds a timestamp and the request_file column holds a single file for each row. Therefore, this condition is met.

Therefore, the error_log table is in the First Normal Form (1 NF) as it contains atomic values, has a primary key for identification, doesn't have duplicated rows and each column holds only one value for each row.

Second Normal Form (2 NF):

Already in 1 NF:

The following error_log table is in 1 NF (First Normal Form) as discussed above as it has atomicity, a primary key , no duplicated rows or columns and each column has only one value for each row.

No Partial Dependencies:

The second normal form (2 NF) criteria requires that there should be no partial dependencies which means that all non-key attributes must be fully dependent on the entire primary key. In the error_log table. “Id” is the primary key and the non key attributes such as “time_of_request” , “requested_file” , and “ error_code” are fully dependent on the entire primary key, which is “id”. This is because each record in the “error_log” table is uniquely identified by the “id” and all other attributes are dependent on the specific value of the “id” for that record. There are no partial dependencies. As a result, the error_log table complies with the Second Normal Form criteria and it is already in 1NF and doesn’t have any partial dependencies as all non key attributes are fully dependent on the primary key “id”.

Once the following tables are created, we can then use the http client to check for the request and the responses. We can use the instance-5 for executing the http client for making the request from the instance-5 and once the request is made, we can check the response as follows:

Now we can check the sql tables for the entry created for the following request:

Main Table Entry:

```
mysql> SELECT * FROM main_table;
+---+---+---+---+---+---+
| id | client_id | country      | client_ip      | is_banned | time_of_day      | requested_file |
+---+---+---+---+---+---+
| 1  | 1          | Dominican Republic | 134.210.37.218 | 0          | 2023-10-29 00:00:00 | 892.html       |
+---+---+---+---+---+---+
1 row in set (0.00 sec)
```

Clients Table Entry:

```
mysql> SELECT * FROM Clients;
+-----+-----+-----+-----+
| client_id | gender | age   | income  |
+-----+-----+-----+-----+
| 1          | Male   | 56-65 | 10k-20k |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

Error_log Entry:

```
mysql> SELECT * FROM error_log;
Empty set (0.00 sec)
```

Error_log table is empty because there was no error here.

Now, we can reserve the ip address of the vm instance 1, for the following we can navigate to the VPC network and then head to the IP addresses where you can head to the reserve external static IP address and then provide a name of the following and then choose the vm instance as instance -1. Reserved External IP address will look as follows:

IP addresses											RESERVE EXTERNAL STATIC IP ADDRESS	RESERVE INTERNAL STATIC IP ADDRESS	REFRESH	RELEASE STATIC ADDRESS	SHOW INFO PANEL
ALL		INTERNAL IP ADDRESSES		EXTERNAL IP ADDRESSES		IPv4 ADDRESSES		IPv6 ADDRESSES							
<input type="text"/> Filter Enter property name or value															
<input type="checkbox"/>	Name	IP address	Access type	Region	Type	Version	In use by	Subnetwork	VPC Network	Network Tier	Labels				
<input type="checkbox"/>	hw5nirbhgsutilipstatic	34.23.87.202	External	us-east1	Static	IPv4	None			Premium					
<input type="checkbox"/>	-	10.142.0.59	Internal	us-east1	Ephemeral	IPv4	VM instance instance-5 (Zone us-east1-b)	default	default						
<input type="checkbox"/>	-	10.142.15.223	Internal	us-east1	Ephemeral	IPv4	VM instance instance-4 (Zone us-east1-b)	default	default						
<input type="checkbox"/>	-	10.142.15.224	Internal	us-east1	Ephemeral	IPv4	VM instance instance-3 (Zone us-east1-b)	default	default						
<input type="checkbox"/>	-	10.142.15.227	Internal	us-east1	Ephemeral	IPv4	VM instance instance-1 (Zone us-east1-b)	default	default						
<input type="checkbox"/>	-	34.75.102.252	External	us-east1	Ephemeral	IPv4	VM instance instance-1 (Zone us-east1-b)	default	default	Premium					

Once, the external ip address of the vm instance 1 is reserved then we can check for the curl commands and the erroneous requests.

Curl Commands:

Before the following curl get request, the tables were empty.

CURL GET REQUEST:

```

ERROR 1146 (42S02) : Table 'third-third.clients' doesn't exist
mysql> select * from Clients;
Empty set (0.00 sec)

mysql> Select * from error_log;
Empty set (0.00 sec)

mysql> select * from main_table;
Empty set (0.01 sec)

```

We can use instance 5 for the curl get request and get the response as follows:

```

detected not implemented mechanism instance 5: v 5
malhotr@instance-5:~$ curl -X GET http://34.75.102.252/hw2nirbhgsutil/test-dir/102.html
<!DOCTYPE html>
<html>
<body>


Lore ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.


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<a href="5096.html"> This is a link </a>
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<a href="523.html"> This is a link </a>
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<a href="4045.html"> This is a link </a>
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</p>
<a href="8559.html"> This is a link </a>
</p>


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```

SQL Tables after Following Actions:

Main_Table:

```

mysql> SELECT * FROM main_table;
+----+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day           | requested_file |
+----+-----+-----+-----+-----+-----+
| 1 | 1         | Unknown | Unknown  | 0          | 2023-10-29 03:13:03 | 102.html      |
+----+-----+-----+-----+-----+-----+
1 row in set (0.01 sec)

```

Clients Table:

```

mysql> SELECT * FROM Clients;
+-----+-----+-----+-----+
| client_id | gender | age   | income |
+-----+-----+-----+-----+
| 1         | Unknown | Unknown | Unknown |
+-----+-----+-----+-----+
1 row in set (0.01 sec)

```

Error_log Table:

```
mysql>
mysql> SELECT * FROM error_log;
Empty set (0.00 sec)

mysql> □
```

CURL FILE NOT FOUND REQUEST:

Now we can use curl for sending a get request for the file that is not available in the bucket. We will get the following result for the following curl command:

```
</html>
nmalhotr@instance-5:~$ curl -X GET http://34.75.102.252/hw2nirbhgsutil/test-dir/100002.html
File Not Foundnmalhotr@instance-5:~$ □
```

We will get the File Not Found error for the following file request.

SQL Tables after Following Actions:

Main_Table:

```
mysql> SELECT * FROM main_table;
+----+-----+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day | requested_file |
+----+-----+-----+-----+-----+-----+-----+
| 1 | 1 | Unknown | Unknown | 0 | 2023-10-29 03:13:03 | 102.html |
+----+-----+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

Clients Table:

```
mysql> SELECT * FROM Clients;
+-----+-----+-----+-----+
| client_id | gender | age | income |
+-----+-----+-----+-----+
| 1 | Unknown | Unknown | Unknown |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

Error_log Table:

```
mysql> SELECT * FROM error_log;
+----+-----+-----+-----+
| id | time_of_request | requested_file | error_code |
+----+-----+-----+-----+
| 1 | 2023-10-29 03:17:52 | 100002.html | 404 |
+----+-----+-----+-----+
1 row in set (0.00 sec)
```

CURL Method Not Implemented Request:

Now we can use curl for sending a delete request for the file available in the bucket. We will get the following result for the following curl command:

```
nmalhotra@instance-5:~$ curl -X GET http://34.75.102.252/hw2nirbhgsutil/test-dir/100002.html
File Not Foundnmalhotra@curl -X DELETE http://34.75.102.252/hw2nirbhgsutil/test-dir/102.html
Method Not Implementednmalhotra@instance-5:~$ []
```

We will get the Method Not Implemented error for the following file request.

SQL Tables after Following Actions:

Main_Table:

```
mysql> SELECT * FROM main_table;
+----+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day | requested_file |
+----+-----+-----+-----+-----+-----+
| 1 | 1 | Unknown | Unknown | 0 | 2023-10-29 03:13:03 | 102.html |
+----+-----+-----+-----+-----+-----+
1 row in set (0.01 sec)
```

Clients Table:

```
mysql> SELECT * FROM Clients;
+-----+-----+-----+-----+
| client_id | gender | age | income |
+-----+-----+-----+-----+
| 1 | Unknown | Unknown | Unknown |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

Error_log Table:

```
mysql> SELECT * FROM error_log;
+----+-----+-----+-----+
| id | time_of_request | requested_file | error_code |
+----+-----+-----+-----+
| 1 | 2023-10-29 03:17:52 | 100002.html | 404 |
| 2 | 2023-10-29 03:24:26 | 102.html | 501 |
+----+-----+-----+-----+
2 rows in set (0.00 sec)
```

BROWSER GET REQUEST:

We can browse for the file name from the bucket using the browser using the external ip of the vm instance-1. The browser get request will look as follows:

The screenshot shows a browser window with the URL `http://34.75.102.252/hw2nirbhgsutil/test-dir/102.html`. The page content includes a link labeled "This is a link". The browser's developer tools Network tab is open, showing a list of requests. One request for `/favicon.ico` has failed with a status code of 500 OK. The Headers section shows the following details:

- Request URL: `http://34.75.102.252/hw2nirbhgsutil/test-dir/102.html`
- Request Method: GET
- Status Code: 200 OK
- Remote Address: 34.75.102.252:80
- Referer Policy: strict-origin-when-cross-origin

The Response Headers section shows:

- Connection: close
- Content-Length: 86706
- Content-Type: text/html; charset=utf-8
- Date: Sun, 29 Oct 2023 02:56:57 GMT
- Server: Werkzeug/3.0.1 Python/3.9.2

The Request Headers section shows:

- Accept: text/html,application/xhtml+xml,application/xml;q=0.9,image/webp,image/apng,*/*;q=0.8,application/x-sionev=b3;q=0.7

The Issues panel at the bottom shows one error message: "GET http://34.75.102.252/favicon.ico 500 (INTERNAL SERVER ERROR)".

SQL Tables after Following Actions:

Main_Table:

```
mysql> SELECT * FROM main_table;
+---+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day      | requested_file |
+---+-----+-----+-----+-----+-----+
| 1 | 1 | Unknown | Unknown | 0 | 2023-10-29 03:13:03 | 102.html |
| 2 | 2 | Unknown | Unknown | 0 | 2023-10-29 03:30:45 | 102.html |
+---+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

Clients Table:

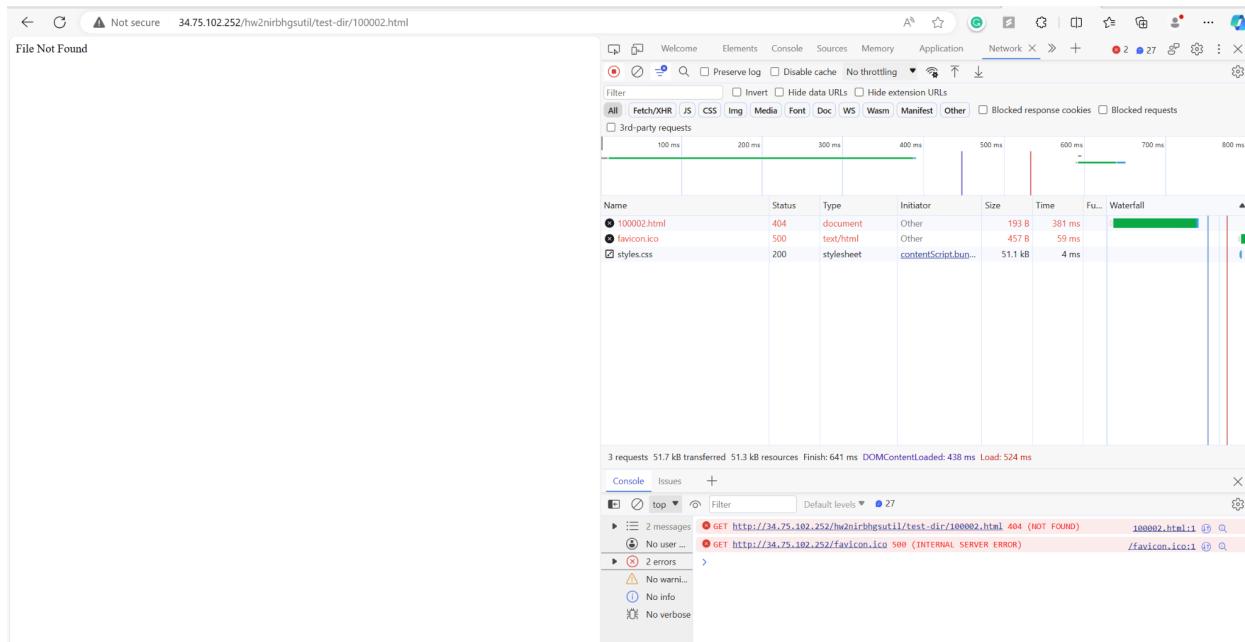
```
mysql> SELECT * FROM Clients;
+-----+-----+-----+-----+
| client_id | gender | age | income |
+-----+-----+-----+-----+
| 1 | Unknown | Unknown | Unknown |
| 2 | Unknown | Unknown | Unknown |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

Error_log Table:

```
mysql> SELECT * FROM error_log;
+---+-----+-----+-----+
| id | time_of_request | requested_file | error_code |
+---+-----+-----+-----+
| 1 | 2023-10-29 03:17:52 | 100002.html | 404 |
| 2 | 2023-10-29 03:24:26 | 102.html | 501 |
+---+-----+-----+-----+
2 rows in set (0.00 sec)
```

BROWSER FILE NOT FOUND REQUEST:

We can browse for the file name not available in the bucket using the browser using the external ip of the vm instance-1. The browser get request will look as follows:



SQL Tables after Following Actions:

Main_Table:

```
mysql> SELECT * FROM main_table;
+----+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day           | requested_file |
+----+-----+-----+-----+-----+-----+
| 1  | 1        | Unknown | Unknown | 0          | 2023-10-29 03:13:03 | 102.html       |
| 2  | 2        | Unknown | Unknown | 0          | 2023-10-29 03:30:45 | 102.html       |
+----+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

Clients Table:

```
mysql> SELECT * FROM Clients;
+-----+-----+-----+-----+
| client_id | gender | age    | income |
+-----+-----+-----+-----+
| 1         | Unknown | Unknown | Unknown |
| 2         | Unknown | Unknown | Unknown |
+-----+-----+-----+-----+
2 rows in set (0.01 sec)
```

Error_log Table:

```
mysql> SELECT * FROM error_log;
+----+-----+-----+-----+
| id | time_of_request | requested_file | error_code |
+----+-----+-----+-----+
| 1 | 2023-10-29 03:17:52 | 100002.html | 404 |
| 2 | 2023-10-29 03:24:26 | 102.html | 501 |
| 3 | 2023-10-29 03:39:17 | 100002.html | 404 |
+----+-----+-----+-----+
3 rows in set (0.00 sec)
```

BROWSER METHOD NOT IMPLEMENTED REQUEST:

We can browse for the file name available in the bucket using the browser using the external ip of the vm instance-1. The browser PUT request will look as follows:

Status	501 NOT IMPLEMENTED
Version	HTTP/1.1
Transfered	207 B (22 B size)
DNS Resolution	System

Response Headers (185 B)

- Connection: close
- Content-Length: 22
- Content-Type: text/html; charset=utf-8
- Date: Sun, 29 Oct 2023 03:01:52 GMT
- Server: Werkzeug/3.0.1 Python/3.9.2

Request Headers (359 B)

- Accept: */*
- Accept-Encoding: gzip, deflate
- Accept-Language: en-US,en;q=0.5
- Cache-Control: no-cache
- Connection: keep-alive
- Content-Length: 0
- Host: 34.75.102.252
- Origin: http://34.75.102.252
- Pragma: no-cache
- User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64; rv:109.0) Gecko/20100101 Firefox/119.0

SQL Tables after Following Actions:

Main_Table:

```
mysql> SELECT * FROM main_table;
+----+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day | requested_file |
+----+-----+-----+-----+-----+-----+
| 1 | 1 | Unknown | Unknown | 0 | 2023-10-29 03:13:03 | 102.html |
| 2 | 2 | Unknown | Unknown | 0 | 2023-10-29 03:30:45 | 102.html |
+----+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

Clients Table:

```

mysql> SELECT * FROM Clients;
+-----+-----+-----+-----+
| client_id | gender | age | income |
+-----+-----+-----+-----+
| 1 | Unknown | Unknown | Unknown |
| 2 | Unknown | Unknown | Unknown |
+-----+-----+-----+
2 rows in set (0.00 sec)

```

Error_log Table:

```

mysql> SELECT * FROM error_log;
+-----+-----+-----+-----+
| id | time_of_request | requested_file | error_code |
+-----+-----+-----+-----+
| 1 | 2023-10-29 03:17:52 | 100002.html | 404 |
| 2 | 2023-10-29 03:24:26 | 102.html | 501 |
| 3 | 2023-10-29 03:39:17 | 100002.html | 404 |
| 4 | 2023-10-29 03:49:24 | 102.html | 501 |
+-----+-----+-----+
4 rows in set (0.00 sec)

```

We can browse for the file name available in the bucket using the browser using the external ip of the vm instance-1. The browser POST request will look as follows:

The screenshot shows the Network tab in the Firefox Developer Tools. A POST request is selected, targeting the URL `http://34.75.102.252/tw2irbhgutl/test-dir/102.html`. The response status is `501 NOT IMPLEMENTED`. The Headers section displays the raw request headers:

```

Status: 501 NOT IMPLEMENTED
Version: HTTP/1.1
Transferred: 207 B (22 B size)
DNS Resolution: System

```

The Response Headers section shows the raw response headers:

```

Connection: close
Content-Length: 23
Content-Type: text/html; charset=utf-8
Date: Sun, 29 Oct 2023 03:54:43 GMT
Server: Werkzeug/3.0.1 Python/3.9.2

```

SQL Tables after Following Actions:

Main_Table:

```
mysql> SELECT * FROM main_table;
+---+-----+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day | requested_file |
+---+-----+-----+-----+-----+-----+-----+
| 1 | 1 | Unknown | Unknown | 0 | 2023-10-29 03:13:03 | 102.html |
| 2 | 2 | Unknown | Unknown | 0 | 2023-10-29 03:30:45 | 102.html |
+---+-----+-----+-----+-----+-----+-----+
2 rows in set (0.01 sec)
```

Client Table:

```
mysql> SELECT * FROM Clients;
+-----+-----+-----+-----+
| client_id | gender | age | income |
+-----+-----+-----+-----+
| 1 | Unknown | Unknown | Unknown |
| 2 | Unknown | Unknown | Unknown |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

Error_Log Table:

```
mysql> SELECT * FROM error_log;
+---+-----+-----+-----+
| id | time_of_request | requested_file | error_code |
+---+-----+-----+-----+
| 1 | 2023-10-29 03:17:52 | 100002.html | 404 |
| 2 | 2023-10-29 03:24:26 | 102.html | 501 |
| 3 | 2023-10-29 03:39:17 | 100002.html | 404 |
| 4 | 2023-10-29 03:49:24 | 102.html | 501 |
| 5 | 2023-10-29 03:54:43 | 102.html | 501 |
+---+-----+-----+-----+
5 rows in set (0.00 sec)
```

CURL Method Not Implemented Request:

Now we can use curl for sending a TRACE request for the file available in the bucket. We will get the following result for the following curl command:

```
</ncm1>
nmalhotr@instance-5:~$ curl -X GET http://34.75.102.252/hw2nirbhgsutil/test-dir/100002.html
File Not Foundnmalhotr@curl -X DELETE http://34.75.102.252/hw2nirbhgsutil/test-dir/102.html
nmalhotr@instance-5:~$ curl -X TRACE http://34.75.102.252/hw2nirbhgsutil/test-dir/102.html
Method Not Implementednmalhotr@instance-5:~$ 
```

We will get the Method Not Implemented error for the following file request.

SQL Tables after Following Actions:

Main_Table:

```
mysql> SELECT * FROM main_table;
+----+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day      | requested_file |
+----+-----+-----+-----+-----+-----+
| 1  | 1        | Unknown | Unknown  | 0          | 2023-10-29 03:13:03 | 102.html       |
| 2  | 2        | Unknown | Unknown  | 0          | 2023-10-29 03:30:45 | 102.html       |
+----+-----+-----+-----+-----+-----+
2 rows in set (0.01 sec)
```

Client Table:

```
mysql> SELECT * FROM Clients;
+-----+-----+-----+-----+
| client_id | gender | age   | income |
+-----+-----+-----+-----+
| 1          | Unknown | Unknown | Unknown |
| 2          | Unknown | Unknown | Unknown |
+-----+-----+-----+-----+
2 rows in set (0.01 sec)
```

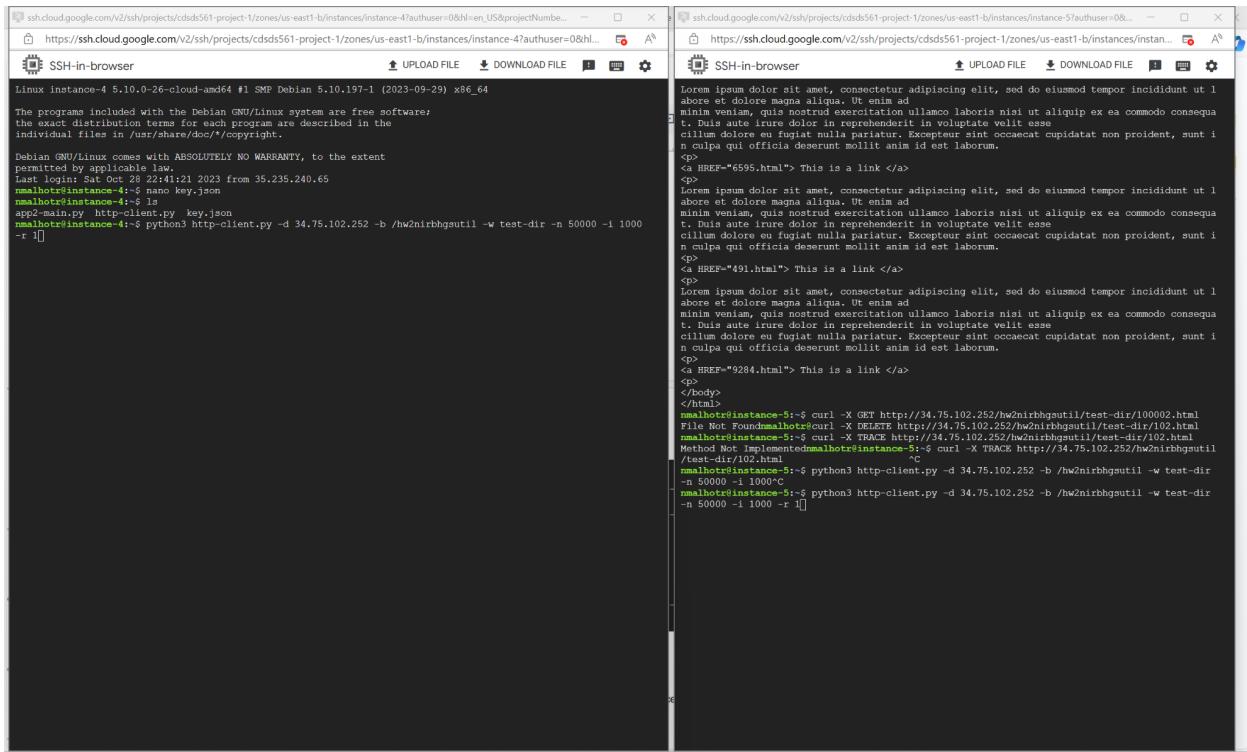
Error_Log Table:

```

mysql> SELECT * FROM error_log;
+----+-----+-----+-----+
| id | time_of_request | requested_file | error_code |
+----+-----+-----+-----+
| 1 | 2023-10-29 03:17:52 | 100002.html | 404 |
| 2 | 2023-10-29 03:24:26 | 102.html | 501 |
| 3 | 2023-10-29 03:39:17 | 100002.html | 404 |
| 4 | 2023-10-29 03:49:24 | 102.html | 501 |
| 5 | 2023-10-29 03:54:43 | 102.html | 501 |
| 6 | 2023-10-29 03:57:36 | 102.html | 501 |
+----+-----+-----+-----+
6 rows in set (0.00 sec)

```

For the concurrent client requests, I used instance 4 and instance 5 for executing the http client and sending the 50,000 requests from both of the instances.



Using the '-r' arguments for the random seed to be the same for both of the http client requests.

Once the following http-client requests are made, we can check the sql database tables for verifying if 100,000 requests were made:

We can first check the total entries in the main_table:

```

mysql> USE First-Trial
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 COUNT(*) FROM main_table;
+-----+
| COUNT(*) |
+-----+
|      95376 |
+-----+
1 row in set (0.01 sec)

```

The total entries for the main_table is 95376 files requested.

And then we can check the total entries in the error_log table:

```

mysql> SELECT COUNT(*) FROM error_log WHERE requested_file LIKE '%.html';
+-----+
| COUNT(*) |
+-----+
|      4624 |
+-----+
1 row in set (0.00 sec)

```

The total entries for the error_log table is 4624 files requested.

Now the total files requested will be entries from main_table + entries from error_log table which will be $95376 + 4624 = 100,000$ files.

Now we can check the following statistics from my requests:

Total Requests that were made successfully vs unsuccessfully:

We can use SQL queries for querying the database to get the following statistics as follows:

```

mysql> SELECT 'Successful' AS request_type, COUNT(*) AS count
      -> FROM main_table
      -> UNION
      -> SELECT 'Unsuccessful' AS request_type, COUNT(*) AS count
      -> FROM error_log
      -> WHERE requested_file LIKE '%.html';
+-----+-----+
| request_type | count |
+-----+-----+
| Successful   | 95376 |
| Unsuccessful | 4624  |
+-----+-----+
2 rows in set (0.01 sec)

```

Total Requests that came from banned countries:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql> SELECT COUNT(*) AS request_count
-> FROM error_log
-> WHERE error_code = 403
-> AND requested_file LIKE '%.html'
-> ORDER BY request_count;
+-----+
| request_count |
+-----+
|          4624 |
+-----+
1 row in set (0.00 sec)
```

We got the following number as I made a new database for the concurrent http client requests. So we won't see any 501 method not implemented for the following case.

Total Requests made by Male and Female Users:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql> SELECT gender, COUNT(*) as request_count
-> FROM Clients
-> GROUP BY gender;
+-----+-----+
| gender | request_count |
+-----+-----+
| Male   |        47762 |
| Female |        47614 |
+-----+-----+
2 rows in set (0.08 sec)
```

For the following query result, we can see that since the gender column is in the Clients table, we query the Clients table for the following, and then we can add the male and female entries to determine the total entries of the client table which will be equal to the main_table entries.

Male Entries + Female Entries = Clients Table Entries = Main_Table Entries = $47762 + 47614 = 95376$.

Top 5 countries that sent requests to your server:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql>
mysql> SELECT country
-> FROM main_table
-> GROUP BY country
-> ORDER BY COUNT(*) DESC
-> LIMIT 5;
+-----+
| country      |
+-----+
| Paraguay     |
| Zambia       |
| Oman         |
| Cyprus        |
| Micronesia   |
+-----+
5 rows in set (0.08 sec)
```

Querying the main_table provides the top 5 countries and then we get Paraguay with the highest number of requests to the web server. We can also display the request count with another column as follows:

```
mysql> SELECT country,COUNT(*) as request_count FROM main_table GROUP BY country ORDER BY request_count DESC LIMIT 5;
+-----+-----+
| country | request_count |
+-----+
| Paraguay |          576 |
| Zambia   |          576 |
| Oman     |          572 |
| Cyprus    |          566 |
| Micronesia |          566 |
+-----+
5 rows in set (0.09 sec)
```

Age Group that issued the most requests to the server:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql> SELECT age
-> FROM Clients
-> GROUP BY age
-> ORDER BY COUNT(*) DESC
-> LIMIT 1;
+----+
| age |
+----+
| 76+ |
+----+
1 row in set (0.08 sec)
```

We can also check the request count made by the following age group as follows:

```
mysql> SELECT age,COUNT(*) AS request_count FROM Clients GROUP BY age ORDER BY COUNT(*) DESC LIMIT 1;
+-----+-----+
| age | request_count |
+-----+-----+
| 76+ |      12180 |
+-----+-----+
1 row in set (0.07 sec)
```

We can also check the request count of other age groups too as follows:

```
mysql> SELECT age,COUNT(*) AS request_count FROM Clients GROUP BY age ORDER BY COUNT(*) DESC LIMIT 5;
+-----+-----+
| age | request_count |
+-----+-----+
| 76+ |      12180 |
| 36-45 |     12092 |
| 26-35 |     11964 |
| 46-55 |     11956 |
| 0-16 |     11920 |
+-----+-----+
5 rows in set (0.08 sec)
```

Income Group that issued the most requests to the web server :

We can use SQL queries for querying the database to get the following statistics as follows:

```

mysql> SELECT income
    -> FROM Clients
    -> GROUP BY income
    -> ORDER BY COUNT(*) DESC
    -> LIMIT 1;
+-----+
| income |
+-----+
| 20k-40k |
+-----+
1 row in set (0.08 sec)

```

We can also check the request count made by the following income group as follows:

```

mysql> SELECT income, COUNT(*) AS request_count FROM Clients GROUP BY income ORDER BY COUNT(*) DESC LIMIT 1;
+-----+-----+
| income | request_count |
+-----+-----+
| 20k-40k |      12062 |
+-----+-----+
1 row in set (0.08 sec)

```

We can also check the request count of other income groups too as follows:

```

mysql> SELECT income, COUNT(*) AS request_count FROM Clients GROUP BY income ORDER BY COUNT(*) DESC LIMIT 5;
+-----+-----+
| income | request_count |
+-----+-----+
| 20k-40k |      12062 |
| 150k-250k |     12058 |
| 0-10k |     12038 |
| 10k-20k |     12014 |
| 40k-60k |     11904 |
+-----+-----+
5 rows in set (0.08 sec)

```

For checking the functionality of the vm you can restart the vm instance-1 which means the web server will be running. Then you can run your http client on instance 4, 5 , or 3 and can run app 2 on instance - 4 for checking the banned countries.

Other than this I also added tried for the i being 10,000 the above one was just for 1000. Now using the following I get this:

For the concurrent client requests, I used instance 4 and instance 5 for executing the http client and sending the 50,000 requests from both of the instances.

```

ssh.cloud.google.com/v2/ssh/projects/cdsds561-project-1/zones/us-east1-b/instances/instance-3?authuser=0&hl=en_US&projectNumber=12345678901234567890
https://ssh.cloud.google.com/v2/ssh/projects/cdsds561-project-1/zones/us-east1-b/instances/instance-3?authuser=0&hl=en_US&projectNumber=12345678901234567890
SSH-in-browser
SSH-in-browser
Linux instance-3 5.10.0-26-cloud-amd64 #1 SMP Debian 5.10.197-1 (2023-09-29) x86_64
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.
Last login: Sat Oct 28 22:41:11 2023 from 35.235.240.65
malhotra@instance-3:~$ python3 http-client.py -d 34.75.102.252 -b /hw2nirbbhgutil -w test-dir -n 50000 -i 10000 -r 123
usage: http-client.py [-h] [-d DOMAIN] [-b BUCKET] [-w WEBDIR] [-n NUM_REQUESTS] [-i INDEX] [-p PORT] [-f]
[-s] [-v] [-r RANDOM]
http-client.py: error: argument '-i/-index': invalid int value: '10000-r'
malhotra@instance-3:~$ python3 http-client.py -d 34.75.102.252 -b /hw2nirbbhgutil -w test-dir -n 50000 -i 10000 -r 123
malhotra@instance-3:~$ 

Linux instance-5 5.10.0-26-cloud-amd64 #1 SMP Debian 5.10.197-1 (2023-09-29) x86_64
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.
Last login: Mon Oct 30 01:42:04 2023 from 35.235.243.209
malhotra@instance-5:~$ python3 http-client.py -d 34.75.102.252 -b /hw2nirbbhgutil -w test-dir -n 100 -i 1000 -r 123
malhotra@instance-5:~$ python3 http-client.py -d 34.75.102.252 -b /hw2nirbbhgutil -w test-dir -n 50000 -i 10000-r 123
usage: http-client.py [-h] [-d DOMAIN] [-b BUCKET] [-w WEBDIR] [-n NUM_REQUESTS] [-i INDEX] [-p PORT] [-f]
[-s] [-v] [-r RANDOM]
http-client.py: error: argument '-i/-index': invalid int value: '10000-r'
malhotra@instance-5:~$ python3 http-client.py -d 34.75.102.252 -b /hw2nirbbhgutil -w test-dir -n 50000 -i 10000 -r 123
malhotra@instance-5:~$ 

```

Using the ‘-r’ arguments for the random seed to be the same for both of the http client requests. I used the r as 123 for both instances.

Once the following http-client requests are made, we can check the sql database tables for verifying if 100,000 requests were made:

We can first check the total entries in the main_table:

```

mysql> SELECT COUNT(*) from main_table where requested_file like '%.html';
+-----+
| COUNT(*) |
+-----+
|      95520 |
+-----+
1 row in set (0.04 sec)

```

The total entries for the main_table is 95520 files requested.

And then we can check the total entries in the error_log table:

```

mysql> SELECT COUNT(*) as requested_file FROM error_log WHERE requested_file LIKE '%.html';
+-----+
| requested_file |
+-----+
|        4480 |
+-----+
1 row in set (0.00 sec)

```

The total entries for the error_log table is 4480 files requested.

Now the total files requested will be entries from main_table + entries from error_log table which will be $95520 + 4480 = 100,000$ files.

Now we can check the following statistics from my requests:

Total Requests that were made successfully vs unsuccessfully:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql> SELECT 'Successful' AS request_type, COUNT(*) AS count
-> FROM main_table
-> UNION
-> SELECT 'Unsuccessful' AS request_type, COUNT(*) AS count
-> FROM error_log
-> WHERE requested_file LIKE '%.html';
+-----+-----+
| request_type | count |
+-----+-----+
| Successful   | 95520 |
| Unsuccessful |  4480 |
+-----+-----+
2 rows in set (0.01 sec)
```

Total Requests that came from banned countries:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql> SELECT COUNT(*) AS request_count
-> FROM error_log
-> WHERE error_code = 403
-> AND requested_file LIKE '%.html'
-> ORDER BY request_count;
+-----+
| request_count |
+-----+
|          4480 |
+-----+
1 row in set (0.01 sec)
```

We got the following number as I made a new database for the concurrent http client requests. So we won't see any 501 method not implemented for the following case.

Total Requests made by Male and Female Users:

We can use SQL queries for querying the database to get the following statistics as follows:

```
1 row in set (0.01 sec)

mysql> SELECT gender, COUNT(*) as request_count
-> FROM Clients
-> GROUP BY gender;
+-----+-----+
| gender | request_count |
+-----+-----+
| Male   |        47972 |
| Female |        47548 |
+-----+-----+
2 rows in set (0.07 sec)
```

For the following query result, we can see that since the gender column is in the Clients table, we query the Clients table for the following, and then we can add the male and female entries to determine the total entries of the client table which will be equal to the main_table entries.

Male Entries + Female Entries = Clients Table Entries = Main_Table Entries = $47972 + 47548 = 95520$.

Top 5 countries that sent requests to your server:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql> SELECT country
-> FROM main_table
-> GROUP BY country
-> ORDER BY COUNT(*) DESC
-> LIMIT 5;
+-----+
| country |
+-----+
| Austria |
| Mongolia |
| Armenia |
| Andorra |
| Ukraine |
+-----+
5 rows in set (0.08 sec)
```

Querying the main_table provides the top 5 countries and then we get Paraguay with the highest number of requests to the web server. We can also display the request count with another column as follows:

```
mysql> SELECT country, COUNT(*) AS request_count FROM main_table GROUP BY country ORDER BY request_count DESC LIMIT 5;
+-----+-----+
| country | request_count |
+-----+-----+
| Austria |      580 |
| Mongolia |     576 |
| Armenia |     576 |
| Andorra |     576 |
| Ukraine |     576 |
+-----+-----+
5 rows in set (0.08 sec)
```

Instance reset

Age Group that issued the most requests to the server:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql> SELECT age
    -> FROM Clients
    -> GROUP BY age
    -> ORDER BY COUNT(*) DESC
    -> LIMIT 1;
+---+
| age |
+---+
| 76+ |
+---+
1 row in set (0.07 sec)
```

```
mysql> □
```

We can also check the request count made by the following age group as follows:

```
mysql> SELECT age, count(*) as request_count FROM Clients GROUP BY age ORDER BY request_count DESC LIMIT 1;
+-----+-----+
| age | request_count |
+-----+-----+
| 76+ |      12196 |
+-----+-----+
1 row in set (0.07 sec)
```

We can also check the request count of other age groups too as follows:

```

mysql> SELECT age, count(*) as request_count FROM Clients GROUP BY age ORDER BY request_count DESC LIMIT 5;
+-----+-----+
| age   | request_count |
+-----+-----+
| 76+   |      12196 |
| 0-16  |      12166 |
| 17-25 |      11976 |
| 46-55 |      11900 |
| 26-35 |      11892 |
+-----+-----+
5 rows in set (0.07 sec)

```

Income Group that issued the most requests to the web server :

We can use SQL queries for querying the database to get the following statistics as follows:

```

mysql>
mysql> SELECT income
      -> FROM Clients
      -> GROUP BY income
      -> ORDER BY COUNT(*) DESC
      -> LIMIT 1;
+-----+
| income |
+-----+
| 10k-20k |
+-----+
1 row in set (0.08 sec)

```

We can also check the request count made by the following income group as follows:

```

mysql> SELECT income, count(*) as request_count FROM Clients GROUP BY income ORDER BY request_count DESC LIMIT 1;
+-----+-----+
| income | request_count |
+-----+-----+
| 10k-20k |      12122 |
+-----+-----+
1 row in set (0.08 sec)

```

We can also check the request count of other income groups too as follows:

```

mysql> SELECT income,count(*) as request_count FROM Clients GROUP BY income ORDER BY request_count DESC LIMIT 5;
+-----+-----+
| income | request_count |
+-----+-----+
| 10k-20k |      12122 |
| 20k-40k |      12116 |
| 150k-250k |     12032 |
| 100k-150k |     11986 |
| 40k-60k |     11956 |
+-----+-----+
5 rows in set (0.08 sec)

```

For checking the functionality of the vm you can restart the vm instance-1 which means the web server will be running. Then you can run your http client on instance 4, 5 , or 3 and can run app I also started app - 2 just to check if it is running fine with the following web server so I checked the last rows of file requests from banned countries from error_logs table, and the files are as follows:

```

| 4462 | 2023-10-30 07:22:17 | 9784.html | 403 |
| 4463 | 2023-10-30 07:22:20 | 4164.html | 403 |
| 4464 | 2023-10-30 07:22:20 | 4164.html | 403 |
| 4465 | 2023-10-30 07:22:24 | 6871.html | 403 |
| 4466 | 2023-10-30 07:22:24 | 6871.html | 403 |
| 4467 | 2023-10-30 07:22:25 | 7332.html | 403 |
| 4468 | 2023-10-30 07:22:25 | 7332.html | 403 |
| 4469 | 2023-10-30 07:22:28 | 628.html | 403 |
| 4470 | 2023-10-30 07:22:28 | 628.html | 403 |
| 4471 | 2023-10-30 07:22:44 | 1482.html | 403 |
| 4472 | 2023-10-30 07:22:45 | 1482.html | 403 |
| 4473 | 2023-10-30 07:23:22 | 3238.html | 403 |
| 4474 | 2023-10-30 07:23:23 | 3238.html | 403 |
| 4475 | 2023-10-30 07:23:26 | 5017.html | 403 |
| 4476 | 2023-10-30 07:23:27 | 4994.html | 403 |
| 4477 | 2023-10-30 07:23:28 | 5017.html | 403 |
| 4478 | 2023-10-30 07:23:28 | 4994.html | 403 |
| 4479 | 2023-10-30 07:23:37 | 5960.html | 403 |
| 4480 | 2023-10-30 07:23:38 | 5960.html | 403 |
| 4481 | 2023-10-30 07:23:48 | 5260.html | 403 |
| 4482 | 2023-10-30 07:23:48 | 5260.html | 403 |
+-----+-----+-----+
4480 rows in set (0.01 sec)

```

2 on instance - 4 for checking the banned countries.

Now I started the app-2 to check for the same :

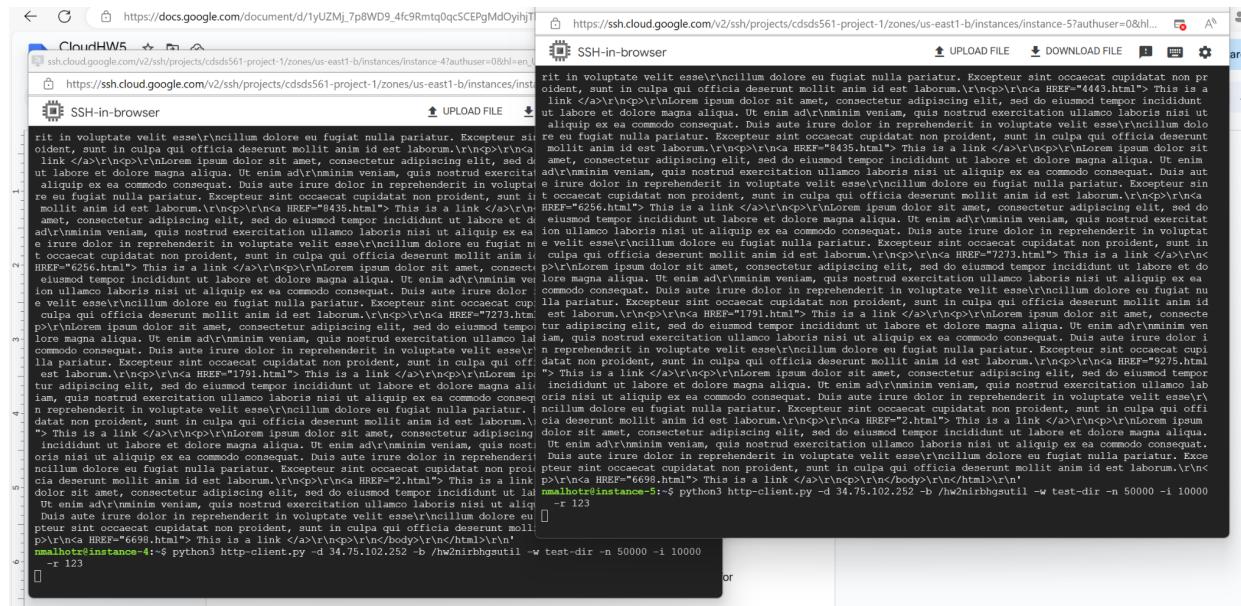
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Cuba
Error: Access is prohibited. Error 403
Received forbidden request from country: Cuba
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Zimbabwe
Error: Access is prohibited. Error 403
Received forbidden request from country: Zimbabwe
Error: Access is prohibited. Error 403
Received forbidden request from country: Libya
Error: Access is prohibited. Error 403
Received forbidden request from country: Libya
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Sudan
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Sudan
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Zimbabwe
Error: Access is prohibited. Error 403
Received forbidden request from country: Zimbabwe
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403



Also for running the app2-main.py you can use the key.json as previously mentioned in other assignments too.

Also, as it was not clear if to include the erroneous request in the main_table or not i created the Second-Trial database with the same architecture and added the erroneous requests in the main table too and they will be logged into the error_log table too.

For the concurrent client requests, I used instance 4 and instance 5 for executing the http client and sending the 50,000 requests from both of the instances.



Using the '-r' arguments for the random seed to be the same for both of the http client requests. I used the r as 123 for both instances.

Once the following http-client requests are made, we can check the sql database tables for verifying if 100,000 requests were made:

We can first check the total entries in the main_table:

```
mysql> SELECT COUNT(*) FROM main_table where requested_file like '%.html';
+-----+
| COUNT(*) |
+-----+
|    100000 |
+-----+
1 row in set (0.05 sec)
```

The total entries for the main_table is 100000 files requested.

Now we can check the following statistics from my requests:

Total Requests that were made successfully vs unsuccessfully:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql> SELECT
    ->     (SELECT COUNT(*) FROM main_table WHERE requested_file LIKE '%.html') -
    ->     (SELECT COUNT(*) FROM error_log WHERE requested_file LIKE '%.html') AS successful_requests_count,
    ->     (SELECT COUNT(*) FROM error_log WHERE requested_file LIKE '%.html') AS unsuccessful_requests_count;
+-----+-----+
| successful_requests_count | unsuccessful_requests_count |
+-----+-----+
|           95520            |                 4480          |
+-----+-----+
1 row in set (0.04 sec)
```

Where we can see $95520 + 4480 = 100,000$

Total Requests that came from banned countries:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql> SELECT COUNT(*) AS request_count
    -> FROM error_log
    -> WHERE error_code = 403
    -> AND requested_file LIKE '%.html'
    -> ORDER BY request_count;
+-----+
| request_count |
+-----+
|           4480 |
+-----+
1 row in set (0.01 sec)
```

We got the following number as I made a new database for the concurrent http client requests. So we won't see any 501 method not implemented for the following case.

Total Requests made by Male and Female Users:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql>
mysql> SELECT gender, COUNT(*) AS request_count
-> FROM Clients
-> WHERE client_id IN (
->     SELECT client_id
->     FROM main_table
->     WHERE requested_file LIKE '%.html'
-> )
-> GROUP BY gender;
+-----+-----+
| gender | request_count |
+-----+-----+
| Female |        49794 |
| Male   |        50206 |
+-----+-----+
2 rows in set (0.30 sec)
```

For the following query result, we can see that since the gender column is in the Clients table, we query the Clients table for the following, and then we can add the male and female entries to determine the total entries of the client table which will be equal to the main_table entries.

Male Entries + Female Entries = Clients Table Entries = Main_Table Entries = $49794 + 50206 = 100,000$.

Top 5 countries that sent requests to your server:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql>
mysql> SELECT country
      -> FROM main_table
      -> WHERE requested_file LIKE '%.html'
      -> GROUP BY country
      -> ORDER BY COUNT(*) DESC
      -> LIMIT 5;
+-----+
| country |
+-----+
| Austria |
| Armenia |
| Mongolia |
| Andorra |
| Ukraine |
+-----+
5 rows in set (0.12 sec)
```

Querying the main_table provides the top 5 countries and then we get Paraguay with the highest number of requests to the web server. We can also display the request count with another column as follows:

```
mysql>
mysql> SELECT country, COUNT(*) AS request_count
-> FROM main_table
-> WHERE requested_file LIKE '%.html'
-> GROUP BY country
-> ORDER BY request_count DESC
-> LIMIT 5;
+-----+-----+
| country | request_count |
+-----+-----+
| Austria |      580 |
| Armenia |      576 |
| Mongolia |      576 |
| Andorra |      576 |
| Ukraine |      576 |
+-----+-----+
5 rows in set (0.11 sec)
```

Age Group that issued the most requests to the server:

We can use SQL queries for querying the database to get the following statistics as follows:

```
mysql>
mysql> SELECT age
-> FROM Clients
-> WHERE client_id IN (
->     SELECT client_id
->     FROM main_table
->     WHERE requested_file LIKE '%.html'
-> )
-> GROUP BY age
-> ORDER BY COUNT(*) DESC
-> LIMIT 1;
+----+
| age |
+----+
| 76+ |
+----+
1 row in set (0.30 sec)
```

We can also check the request count made by the following age group as follows:

```

1 row in set (0.50 sec)

mysql> SELECT age, COUNT(*) AS request_count
-> FROM Clients
-> WHERE client_id IN (
->     SELECT client_id
->         FROM main_table
->         WHERE requested_file LIKE '%.html'
->     )
-> GROUP BY age
-> ORDER BY request_count DESC
-> LIMIT 1;
+-----+
| age | request_count |
+-----+
| 76+ |          12786 |
+-----+
1 row in set (0.29 sec)

```

We can also check the request count of other age groups too as follows:

```

mysql> SELECT age, COUNT(*) AS request_count FROM Clients WHERE client_id IN (      SELECT client_id      FROM main_table      WHERE requested_file LIKE '%.html' ) GROUP BY age ORDER BY request_count DESC LIMIT 5;
+-----+
| age | request_count |
+-----+
| 76+ |          12786 |
| 0-16 |           12786 |
| 17-25 |           12544 |
| 26-35 |           12472 |
| 66-75 |           12384 |
+-----+
5 rows in set (0.29 sec)

```

Here in this we can see 76+ and 0-16 are at the highest position.

Income Group that issued the most requests to the web server :

We can use SQL queries for querying the database to get the following statistics as follows:

```

mysql>
mysql> SELECT c.income
->   FROM Clients c
-> WHERE c.client_id IN (
->     SELECT m.client_id
->       FROM main_table m
->      WHERE m.requested_file LIKE '%.html'
->    )
-> GROUP BY c.income
-> ORDER BY COUNT(*) DESC
-> LIMIT 1;
+-----+
| income |
+-----+
| 20k-40k |
+-----+
1 row in set (0.30 sec)

```

We can also check the request count made by the following income group as follows:

```

mysql> SELECT c.income, COUNT(*) AS request_count FROM Clients c WHERE c.client_id IN (      SELECT m.client_id      FROM main_table m      WHERE m.requested_file LIKE '%.html' ) GROUP BY c.income ORDER BY request_co
unt DESC LIMIT 1;
+-----+-----+
| income | request_count |
+-----+-----+
| 20k-40k |        12718 |
+-----+-----+
1 row in set (0.30 sec)

```

We can also check the request count of other income groups too as follows:

```

mysql> SELECT c.income, COUNT(*) AS request_count FROM Clients c WHERE c.client_id IN (      SELECT m.client_id      FROM main_table m      WHERE m.requested_file LIKE '%.html' ) GROUP BY c.income ORDER BY request_co
unt DESC LIMIT 5;
+-----+-----+
| income | request_count |
+-----+-----+
| 20k-40k |        12718 |
| 10k-20k |        12500 |
| 150k-250k |      12590 |
| 100k-150k |      12520 |
| 40k-60k |        12478 |
+-----+-----+
5 rows in set (0.30 sec)

```

For checking the functionality of the vm you can restart the vm instance-1 which means the web server will be running. Then you can run your http client on instance 4, 5 , or 3 and can run app I also started app - 2 just to check if it is running fine with the following web server so I checked the last rows of file requests from banned countries from error_logs table, and the files are as follows:

4462 2023-10-30 07:22:17 9784.html	403
4463 2023-10-30 07:22:20 4164.html	403
4464 2023-10-30 07:22:20 4164.html	403
4465 2023-10-30 07:22:24 6871.html	403
4466 2023-10-30 07:22:24 6871.html	403
4467 2023-10-30 07:22:25 7332.html	403
4468 2023-10-30 07:22:25 7332.html	403
4469 2023-10-30 07:22:28 628.html	403
4470 2023-10-30 07:22:28 628.html	403
4471 2023-10-30 07:22:44 1482.html	403
4472 2023-10-30 07:22:45 1482.html	403
4473 2023-10-30 07:23:22 3238.html	403
4474 2023-10-30 07:23:23 3238.html	403
4475 2023-10-30 07:23:26 5017.html	403
4476 2023-10-30 07:23:27 4994.html	403
4477 2023-10-30 07:23:28 5017.html	403
4478 2023-10-30 07:23:28 4994.html	403
4479 2023-10-30 07:23:37 5960.html	403
4480 2023-10-30 07:23:38 5960.html	403
4481 2023-10-30 07:23:48 5260.html	403
4482 2023-10-30 07:23:48 5260.html	403
+-----+-----+-----+-----+	
4480 rows in set (0.01 sec)	

2 on instance - 4 for checking the banned countries.

Now I started the app-2 to check for the same :

The screenshot shows a browser window with the URL https://ssh.cloud.google.com/v2/ssh/projects/cdsds561-project-1/zones/us-east1-b/instances/instance-4?authuser=0&hl=en_US&projectNumbe.... The title bar of the browser says "SSH-in-browser". The main content area displays a log of errors from an application running on a Google Cloud instance. The errors are as follows:

```
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Libya
Error: Access is prohibited. Error 403
Received forbidden request from country: Zimbabwe
Error: Access is prohibited. Error 403
Received forbidden request from country: Zimbabwe
Error: Access is prohibited. Error 403
Received forbidden request from country: Iraq
Error: Access is prohibited. Error 403
Received forbidden request from country: Iraq
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Cuba
Error: Access is prohibited. Error 403
Received forbidden request from country: Cuba
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Syria
Error: Access is prohibited. Error 403
Received forbidden request from country: Myanmar
Error: Access is prohibited. Error 403
Received forbidden request from country: Myanmar
Error: Access is prohibited. Error 403
Received forbidden request from country: Myanmar
Error: Access is prohibited. Error 403
Received forbidden request from country: Myanmar
Error: Access is prohibited. Error 403
Received forbidden request from country: Myanmar
Error: Access is prohibited. Error 403
Received forbidden request from country: Myanmar
```

Also for running the app2-main.py you can use the key.json as previously mentioned in other assignments too.

Curl Commands:

CURL GET REQUEST:

```

ERROR 1146 (42S02): Table 'mira-mirai.clients'
mysql> select * from Clients;
Empty set (0.00 sec)

mysql> Select * from error_log;
Empty set (0.00 sec)

mysql> select * from main_table;
Empty set (0.01 sec)

```

We can use instance 5 for the curl get request and get the response as follows:

```

nmalhotr@instance-5:~$ curl -X GET http://34.75.102.252/hw2nirbhgsutil/test-dir/102.html
<!DOCTYPE html>
<html>
<body>


Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.


<p>
<a href="2729.html"> This is a link </a>
<p>


Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irur


```

SQL Tables after Following Actions:

Main_Table:

```

mysql> select * from main_table;
+----+-----+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day | requested_file |
+----+-----+-----+-----+-----+-----+-----+
| 1 | 1 | Unknown | Unknown | 0 | 2023-10-31 02:03:19 | 102.html |
+----+-----+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)

```

Clients Table:

```
mysql> select * from Clients;
+-----+-----+-----+-----+
| client_id | gender | age | income |
+-----+-----+-----+-----+
| 1 | Unknown | Unknown | Unknown |
+-----+-----+-----+
1 row in set (0.00 sec)
```

Error_log Table:

```
mysql> Select * from error_log;
Empty set (0.00 sec)
```

CURL FILE NOT FOUND REQUEST:

Now we can use curl for sending a get request for the file that is not available in the bucket. We will get the following result for the following curl command:

```
</html>
nmalhotr@instance-5:~$ curl -X GET http://34.75.102.252/hw2nirbhgsutil/test-dir/100002.html
File Not Foundnmalhotr@instance-5:~$
```

We will get the File Not Found error for the following file request.

SQL Tables after Following Actions:

Main_Table:

```
mysql> select * from main_table;
+-----+-----+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day | requested_file |
+-----+-----+-----+-----+-----+-----+
| 1 | 1 | Unknown | Unknown | 0 | 2023-10-31 02:03:19 | 102.html |
| 2 | 2 | Unknown | Unknown | 0 | 2023-10-31 02:04:55 | 100002.html |
+-----+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

Clients Table:

```
mysql> select * from Clients;
+-----+-----+-----+-----+
| client_id | gender | age | income |
+-----+-----+-----+-----+
| 1 | Unknown | Unknown | Unknown |
| 2 | Unknown | Unknown | Unknown |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

Error_log Table:

```
mysql> Select * from error_log;
+-----+-----+-----+-----+
| id | time_of_request | requested_file | error_code |
+-----+-----+-----+-----+
| 1 | 2023-10-31 02:04:55 | 100002.html | 404 |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

CURL Method Not Implemented Request:

Now we can use curl for sending a delete request for the file available in the bucket. We will get the following result for the following curl command:

```
nmalhotr@instance-5:~$ curl -X DELETE http://34.75.102.252/hw2nirbhgsutil/test-dir/102.html
Method Not Implementednmalhotr@instance-5:~$
```

We will get the Method Not Implemented error for the following file request.

SQL Tables after Following Actions:

Main_Table:

```
mysql> select * from main_table;
+-----+-----+-----+-----+-----+-----+-----+
| id | client_id | country | client_ip | is_banned | time_of_day | requested_file |
+-----+-----+-----+-----+-----+-----+-----+
| 1 | 1 | Unknown | Unknown | 0 | 2023-10-31 02:03:19 | 102.html |
| 2 | 2 | Unknown | Unknown | 0 | 2023-10-31 02:04:55 | 100002.html |
| 3 | 3 | Unknown | Unknown | 0 | 2023-10-31 02:06:40 | 102.html |
+-----+-----+-----+-----+-----+-----+-----+
3 rows in set (0.01 sec)
```

Clients Table:

```
mysql> select * from Clients;
+-----+-----+-----+-----+
| client_id | gender | age | income |
+-----+-----+-----+-----+
| 1 | Unknown | Unknown | Unknown |
| 2 | Unknown | Unknown | Unknown |
| 3 | Unknown | Unknown | Unknown |
+-----+-----+-----+-----+
3 rows in set (0.00 sec)
```

Error_log Table:

```
mysql> Select * from error_log;
+-----+-----+-----+
| id | time_of_request | requested_file | error_code |
+-----+-----+-----+
| 1 | 2023-10-31 02:04:55 | 100002.html | 404 |
| 2 | 2023-10-31 02:06:40 | 102.html | 501 |
+-----+-----+-----+
2 rows in set (0.00 sec)
```

CHECK_MAIN_PART2 is the modified code signifying the last part other than that in the github you can use check_main to check for the first part.