

## TASK - Implement a Client Server Architecture using MySQL Database Management System (DBMS)

1. On mysql server Linux Server install MySQL Server software.

```
ubuntu@ip-172-31-47-126:~$ sudo apt install mysql-server
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libcgi-fast-perl libcgi-pm-perl libencode-locale-perl libevent-core-2.1-7 libfcgi-perl libhtml-parser-perl
  libhtml-tagset-perl libhtml-template-perl libhttp-date-perl libhttp-message-perl libio-html-perl
  liblwp-mediatypes-perl libmecab2 libtimedate-perl liburi-perl mecab-ipadic mecab-ipadic-utf8 mecab-utils
  mysql-client-8.0 mysql-client-core-8.0 mysql-common mysql-server-8.0 mysql-server-core-8.0
Suggested packages:
  libdata-dump-perl libipc-sharedcache-perl libwww-perl mailx tinyca
The following NEW packages will be installed:
  libcgi-fast-perl libcgi-pm-perl libencode-locale-perl libevent-core-2.1-7 libfcgi-perl libhtml-parser-perl
  libhtml-tagset-perl libhtml-template-perl libhttp-date-perl libhttp-message-perl libio-html-perl
  liblwp-mediatypes-perl libmecab2 libtimedate-perl liburi-perl mecab-ipadic mecab-ipadic-utf8 mecab-utils
  mysql-client-8.0 mysql-client-core-8.0 mysql-common mysql-server mysql-server-8.0 mysql-server-core-8.0
0 upgraded, 24 newly installed, 0 to remove and 0 not upgraded.
Need to get 30.6 MB of archives.
After this operation, 248 MB of additional disk space will be used.
Do you want to continue? [Y/n] yes
Get:1 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 mysql-common all 5.8+1.0.5ubuntu2 [7496 B]
Ign:2 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 mysql-client-core-8.0 amd64 8.0.21-0ubuntu0.20.04.4
Ign:3 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 mysql-client-8.0 amd64 8.0.21-0ubuntu0.20.04.4
Get:4 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libevent-core-2.1-7 amd64 2.1.11-stable-1 [89.1 kB]
Get:5 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libmecab2 amd64 0.996-10build1 [233 kB]
Ign:6 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 mysql-server-core-8.0 amd64 8.0.21-0ubuntu0.20.04.4
Ign:7 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 mysql-server-8.0 amd64 8.0.21-0ubuntu0.20.04.4
Get:8 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libhtml-tagset-perl all 3.20-4 [12.5 kB]
Get:9 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 liburi-perl all 1.76-2 [77.5 kB]
Get:10 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libhtml-parser-perl amd64 3.72-5 [86.3 kB]
Get:11 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libcgi-pm-perl all 4.46-1 [186 kB]
Get:12 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libfcgi-perl amd64 0.79-1 [33.1 kB]
Get:13 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libcgi-fast-perl all 1:2.15-1 [10.5 kB]
Get:14 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libencode-locale-perl all 1.05-1 [12.3 kB]
Get:15 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libhtml-template-perl all 2.97-1 [59.0 kB]
Get:16 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libtimedate-perl all 2.3200-1 [34.0 kB]
Get:17 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libhttp-date-perl all 6.05-1 [9920 B]
Get:18 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 libio-html-perl all 1.001-1 [14.9 kB]
Get:19 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 liblwp-mediatypes-perl all 6.04-1 [19.5 kB]
done!
update-alternatives: using /var/lib/mecab/dic/ipadic-utf8 to provide /var/lib/mecab/dic/debian (mecab-dictionary) in a
uto mode
Setting up libhtml-parser-perl (3.72-5) ...
Setting up libhttp-message-perl (6.22-1) ...
Setting up mysql-server-8.0 (8.0.23-0ubuntu0.20.04.1) ...
update-alternatives: using /etc/mysql/mysql.cnf to provide /etc/mysql/my.cnf (my.cnf) in auto mode
Renaming removed key_buffer and myisam-recover options (if present)
mysqld will log errors to /var/log/mysql/error.log
mysqld is running as pid 2822
Created symlink /etc/systemd/system/multi-user.target.wants/mysql.service → /lib/systemd/system/mysql.service.
Setting up libcgi-pm-perl (4.46-1) ...
Setting up libhtml-template-perl (2.97-1) ...
Setting up mysql-server (8.0.23-0ubuntu0.20.04.1) ...
Setting up libcgi-fast-perl (1:2.15-1) ...
Processing triggers for systemd (245.4-4ubuntu3.2) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for libc-bin (2.31-0ubuntu9.1) ...
ubuntu@ip-172-31-47-126:~$ echo $?
0
ubuntu@ip-172-31-47-126:~$
```

## 2. On mysql client Linux Server install MySQL Client software.

```
ubuntu@ip-172-31-45-235:~$ sudo apt install mysql-client
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  mysql-client-8.0 mysql-client-core-8.0 mysql-common
The following NEW packages will be installed:
  mysql-client mysql-client-8.0 mysql-client-core-8.0 mysql-common
0 upgraded, 4 newly installed, 0 to remove and 59 not upgraded.
Need to get 4254 kB of archives.
After this operation, 65.1 MB of additional disk space will be used.
Do you want to continue? [Y/n] yes
Get:1 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 mysql-client-core-8.0 amd64 8.0.23-0ubuntu0.20.04.1 [4215 kB]
Get:2 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal/main amd64 mysql-common all 5.8+1.0.5ubuntu2 [7496 B]
Get:3 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 mysql-client-8.0 amd64 8.0.23-0ubuntu0.20.04.1 [22.0 kB]
Get:4 http://us-east-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 mysql-client all 8.0.23-0ubuntu0.20.04.1 [9420 B]
Fetched 4254 kB in 0s (43.7 MB/s)
Selecting previously unselected package mysql-client-core-8.0.
(Reading database ... 59939 files and directories currently installed.)
Preparing to unpack .../mysql-client-core-8.0_8.0.23-0ubuntu0.20.04.1_amd64.deb ...
Unpacking mysql-client-core-8.0 (8.0.23-0ubuntu0.20.04.1) ...
Selecting previously unselected package mysql-common.
Preparing to unpack .../mysql-common_5.8+1.0.5ubuntu2_all.deb ...
Unpacking mysql-common (5.8+1.0.5ubuntu2) ...
Selecting previously unselected package mysql-client-8.0.
Preparing to unpack .../mysql-client-8.0_8.0.23-0ubuntu0.20.04.1_amd64.deb ...
Unpacking mysql-client-8.0 (8.0.23-0ubuntu0.20.04.1) ...
Selecting previously unselected package mysql-client.
Preparing to unpack .../mysql-client_8.0.23-0ubuntu0.20.04.1_all.deb ...
Unpacking mysql-client (8.0.23-0ubuntu0.20.04.1) ...
Setting up mysql-common (5.8+1.0.5ubuntu2) ...
update-alternatives: using /etc/mysql/my.cnf.fallback to provide /etc/mysql/my.cnf (my.cnf) in auto mode
Setting up mysql-client-core-8.0 (8.0.23-0ubuntu0.20.04.1) ...
Setting up mysql-client-8.0 (8.0.23-0ubuntu0.20.04.1) ...
Setting up mysql-client (8.0.23-0ubuntu0.20.04.1) ...
Processing triggers for man-db (2.9.1-1) ...
ubuntu@ip-172-31-45-235:~$
```

2. create a new entry in 'Inbound rules' in 'mysql server' Security Groups allowing access only to the specific local IP address of your 'mysql client'.

[EC2](#) > [Security Groups](#) > [sg-f618a885 - default](#)

## sg-f618a885 - default

Actions ▼

### Details

Security group name default	Security group ID sg-f618a885	Description default VPC security group	VPC ID vpc-bccf4bd7
Owner 528404267030	Inbound rules count 2 Permission entries	Outbound rules count 1 Permission entry	

Inbound rules

Outbound rules

Tags

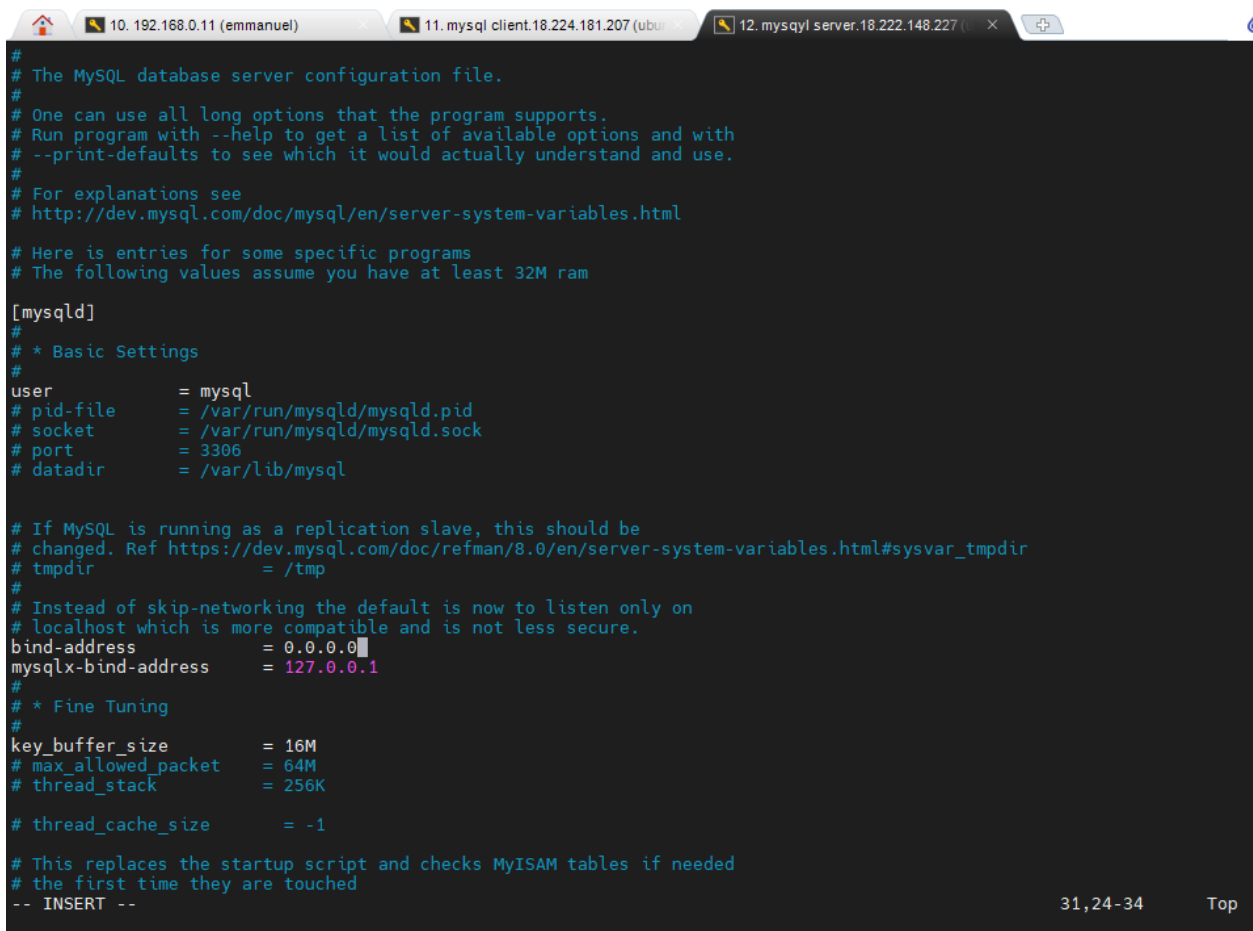
### Inbound rules

Edit inbound rules

Type	Protocol	Port range	Source	Description - optional
SSH	TCP	22	0.0.0.0/0	-
MYSQL/Aurora	TCP	3306	172.31.45.235/32	-

### 3. Configure MySQL server to allow connections from remote hosts.

```
ubuntu@ip-172-31-47-126:~$ sudo vi /etc/mysql/mysql.conf.d/mysqld.cnf
ubuntu@ip-172-31-47-126:~$
```

A screenshot of a web browser window with three tabs. The first tab is titled '10. 192.168.0.11 (emmanuel)'. The second tab is titled '11. mysql client:18.224.181.207 (ubuntu)'. The third tab is titled '12. mysql server:18.222.148.227 (ubuntu)'. The browser's address bar shows 'https://dev.mysql.com/doc/mysql/en/server-system-variables.html'. The main content area of the browser displays the text of the MySQL configuration file, which includes comments about using long options, a link to the documentation, and specific settings for the mysqld service. The settings include user, pid-file, socket, port, datadir, tmpdir, bind-address, and various tuning parameters like key\_buffer\_size, max\_allowed\_packet, thread\_stack, and thread\_cache\_size. The configuration ends with a comment about replacing the startup script and a line with '-- INSERT --'.

```
#
# The MySQL database server configuration file.
#
# One can use all long options that the program supports.
# Run program with --help to get a list of available options and with
# --print-defaults to see which it would actually understand and use.
#
# For explanations see
# http://dev.mysql.com/doc/mysql/en/server-system-variables.html
#
# Here is entries for some specific programs
# The following values assume you have at least 32M ram

[mysqld]
#
# * Basic Settings
#
user                = mysql
# pid-file           = /var/run/mysqld/mysqld.pid
# socket             = /var/run/mysqld/mysqld.sock
# port               = 3306
# datadir            = /var/lib/mysql

# If MySQL is running as a replication slave, this should be
# changed. Ref https://dev.mysql.com/doc/refman/8.0/en/server-system-variables.html#sysvar_tmpdir
# tmpdir             = /tmp
#
# Instead of skip-networking the default is now to listen only on
# localhost which is more compatible and is not less secure.
bind-address         = 0.0.0.0
mysqlx-bind-address  = 127.0.0.1
#
# * Fine Tuning
#
key_buffer_size      = 16M
# max_allowed_packet = 64M
# thread_stack        = 256K
#
# thread_cache_size   = -1

# This replaces the startup script and checks MyISAM tables if needed
# the first time they are touched
-- INSERT --
```

#### 4. Securing mysql installation

```
10. 192.168.0.11 (emmanuel) 16. mysql server.18.222.148.227 ( 11. mysql client.18.224.181.207 (ubun
ubuntu@ip-172-31-47-126:~$ sudo mysql_secure_installation

Securing the MySQL server deployment.

Connecting to MySQL using a blank password.

VALIDATE PASSWORD COMPONENT can be used to test passwords
and improve security. It checks the strength of password
and allows the users to set only those passwords which are
secure enough. Would you like to setup VALIDATE PASSWORD component?

Press y|Y for Yes, any other key for No: y

There are three levels of password validation policy:

LOW      Length >= 8
MEDIUM  Length >= 8, numeric, mixed case, and special characters
STRONG Length >= 8, numeric, mixed case, special characters and dictionary      file

Please enter 0 = LOW, 1 = MEDIUM and 2 = STRONG: 0
Please set the password for root here.

New password:

Re-enter new password:

Estimated strength of the password: 50
Do you wish to continue with the password provided?(Press y|Y for Yes, any other key for No) : y
By default, a MySQL installation has an anonymous user,
allowing anyone to log into MySQL without having to have
a user account created for them. This is intended only for
testing, and to make the installation go a bit smoother.
You should remove them before moving into a production
environment.

Remove anonymous users? (Press y|Y for Yes, any other key for No) : y
Success.

Normally, root should only be allowed to connect from
'localhost'. This ensures that someone cannot guess at
the root password from the network.

Disallow root login remotely? (Press y|Y for Yes, any other key for No) : y
```

## 5. Starting mysql

```
ubuntu@ip-172-31-25-28:~$ sudo mysql
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 12
Server version: 8.0.23-0ubuntu0.20.04.1 (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> CREATE USER 'emmanuel'@'%' IDENTIFIED BY 'sql12345';
Query OK, 0 rows affected (0.02 sec)

mysql> GRANT ALL ON *.* TO 'emmanuel'@'%';
Query OK, 0 rows affected (0.00 sec)

mysql> CREATE DATABASE project5'
      ^
      ^
^C
mysql> CREATE DATABASE project5;
Query OK, 1 row affected (0.03 sec)

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| mysql |
| performance_schema |
| project5 |
| sys |
+-----+
5 rows in set (0.01 sec)

mysql> quit
Bye
ubuntu@ip-172-31-25-28:~$
```

## 6. Connecting to mysql server from mysql client

```
Last login: Mon Feb 22 18:39:43 2021 from 73.152.119.181
ubuntu@ip-172-31-45-235:~$ sudo mysql -u 172.31.45.235 -p -h 172.31.47.126
Enter password:
ERROR 1130 (HY000): Host 'ip-172-31-45-235.us-east-2.compute.internal' is not allowed to connect to this MySQL server
ubuntu@ip-172-31-45-235:~$ sudo mysql -u 172.31.45.235 -p -h 172.31.47.126
Enter password:
ERROR 1130 (HY000): Host 'ip-172-31-45-235.us-east-2.compute.internal' is not allowed to connect to this MySQL server
ubuntu@ip-172-31-45-235:~$ mysql -u 172.31.45.235 -p -h 172.31.47.126
Enter password:
ERROR 1130 (HY000): Host 'ip-172-31-45-235.us-east-2.compute.internal' is not allowed to connect to this MySQL server
ubuntu@ip-172-31-45-235:~$
```

Further actions to solve the issue above

### 6a. Enabling firewalls on both server and client

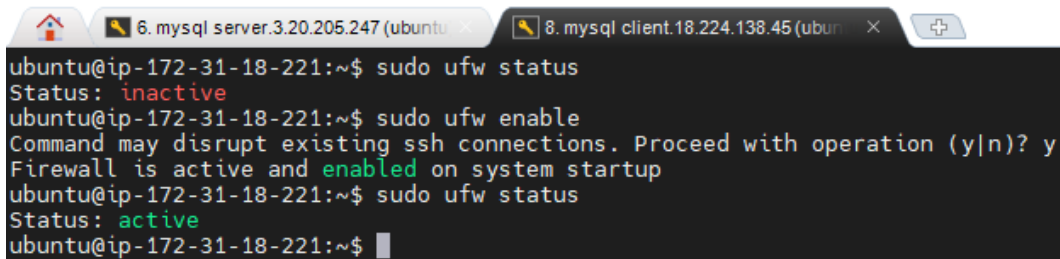
```

ubuntu@ip-172-31-25-28:~$ sudo ufw enable
Command may disrupt existing ssh connections. Proceed with operation (y|n)? y
Firewall is active and enabled on system startup
ubuntu@ip-172-31-25-28:~$ sudo ufw status
Status: active
ubuntu@ip-172-31-25-28:~$ sudo ufw allow 3306
Rule added
Rule added (v6)
ubuntu@ip-172-31-25-28:~$ sudo ufw status
Status: active

To Action From
--
3306 ALLOW Anywhere
3306 (v6) ALLOW Anywhere (v6)

ubuntu@ip-172-31-25-28:~$ █

```



```

ubuntu@ip-172-31-18-221:~$ sudo ufw status
Status: inactive
ubuntu@ip-172-31-18-221:~$ sudo ufw enable
Command may disrupt existing ssh connections. Proceed with operation (y|n)? y
Firewall is active and enabled on system startup
ubuntu@ip-172-31-18-221:~$ sudo ufw status
Status: active
ubuntu@ip-172-31-18-221:~$ █

```

#### 6b. Restarting mysql service

```

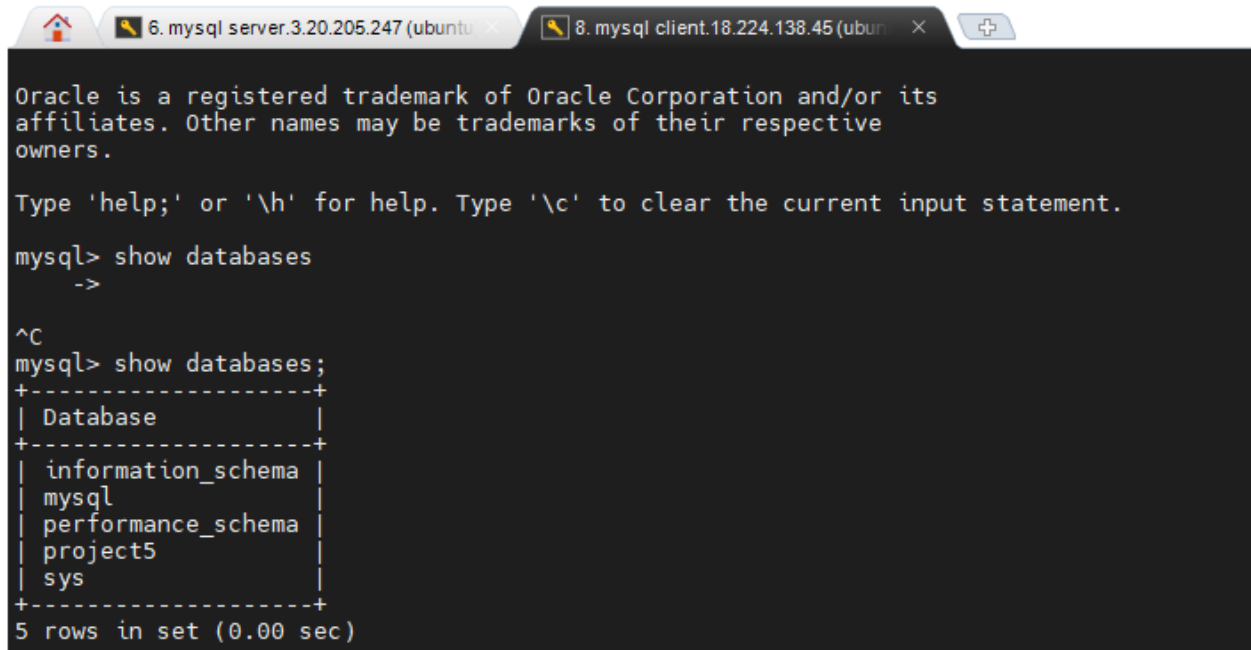
ubuntu@ip-172-31-25-28:~$ sudo service mysql restart

```

#### 6c. Setting security group on mysql server to allow access from anywhere

#### 6d. Connecting to mysql server from mysql client after allowing access from anywhere

```
$ Mysql -h 172.31.25.28 -u emmanuel -p
```



The screenshot shows a terminal window with two tabs: '6. mysql server.3.20.205.247 (ubuntu)' and '8. mysql client.18.224.138.45 (ubuntu)'. The terminal output is as follows:

```
Oracle is a registered trademark of Oracle Corporation and/or its
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
->

^C
mysql> show databases;
+-----+
| Database                |
+-----+
| information_schema      |
| mysql                   |
| performance_schema      |
| project5                |
| sys                     |
+-----+
5 rows in set (0.00 sec)
```

The connection was successful as shown above, however, after I went back to revert the security groups from all traffic, I lost connection to my terminals for both client and server sides. I will research further.

## Summary

This project further broadened my scope and understanding of client-server architecture using mysql RDBMS.

## Resources

[https://linuxize.com/post/how-to-create-mysql-user-accounts-and-grant-privileges/#:~:text=A%20user%20account%20in%20MySQL,user\\_password%20with%20the%20user%20password.](https://linuxize.com/post/how-to-create-mysql-user-accounts-and-grant-privileges/#:~:text=A%20user%20account%20in%20MySQL,user_password%20with%20the%20user%20password.)

<https://cloud.google.com/solutions/mysql-remote-access>

<https://linuxconfig.org/error-2003-hy000-can-t-connect-to-mysql-server-on-111-solution>

<https://www.digitalocean.com/community/tutorials/how-to-allow-remote-access-to-mysql>

In **computing**, **tracert** and **tracert** are **computer network** diagnostic **commands** for displaying possible routes (paths) and measuring transit delays of **packets** across an **Internet Protocol** (IP) network.



**Ping** is a [computer network](#) administration [software utility](#) used to test the reachability of a [host](#) on an [Internet Protocol](#) (IP) network. It is available for virtually all operating systems that have networking capability, including most embedded network administration software.

Ping measures the [round-trip time](#) for messages sent from the originating host to a destination computer that are echoed back to the source. The name comes from [active sonar](#) terminology that sends a [pulse](#) of sound and listens for the echo to detect objects under water.<sup>[1]</sup>