PART 1

1. Download MySQL server for your OS on VM

2. Install MySQL server on VM

sudo apt-get update

sudo apt-get install mysql-server

sudo apt-get install mysql-client

sudo mysql –u root

3. Select a subject area and describe the database schema, (minimum 3 tables)

4. Create a database on the server through the console

CREATE DATABASE osi;

USE osi;

CREATE TABLE osi_level (id INT AUTO_INCREMENT PRIMARY KEY, name VARCHAR(20), information_type VARCHAR(20));

CREATE TABLE protocols (id INT AUTO_INCREMENT PRIMARY KEY, fk_osi int, FOREIGN KEY (fk_osi) REFERENCES osi_level(id), abbreviation VARCHAR(10), name VARCHAR(100));

CREATE TABLE hardware (id INT AUTO_INCREMENT PRIMARY KEY, fk_osi int, FOREIGN KEY (fk_osi) REFERENCES osi_level(id), name VARCHAR(100));

5. Fill in tables

INSERT INTO osi_level VALUES (null, 'physical', 'bit');
INSERT INTO osi_level VALUES (null, 'data-link', 'frame');
INSERT INTO osi_level VALUES (null, 'network', 'packet');
INSERT INTO osi_level VALUES (null, 'transport', 'segment');
INSERT INTO osi_level VALUES (null, 'session', 'data');
INSERT INTO osi_level VALUES (null, 'presentation', 'data');
INSERT INTO osi_level VALUES (null, 'application', 'data');

INSERT INTO protocols VALUES (null, 1, ' Bluetooth ', 'blue — синий и tooth — зуб ');
INSERT INTO protocols VALUES (null, 1, 'IEEE.802.11', 'Wi-Fi');
INSERT INTO protocols VALUES (null, 2, 'Ethernet', 'Ethernet');
INSERT INTO protocols VALUES (null, 2, 'PPPoE', 'Point-to-point protocol over Ethernet');
INSERT INTO protocols VALUES (null, 3, 'IP', 'Internet Protocol');
INSERT INTO protocols VALUES (null, 3, 'ICMP', 'Internet Control Message Protocol');

INSERT INTO protocols VALUES (null, 4, 'TCP', 'Transmission Control Protocol');
INSERT INTO protocols VALUES (null, 4, 'UDP', 'User Datagram Protocol');
INSERT INTO protocols VALUES (null, 5, 'net BIOS', ' Network Basic Input or Output System ');
INSERT INTO protocols VALUES (null, 5, 'PPTP', 'Point-to-Point Tunneling Protocol');
INSERT INTO protocols VALUES (null, 6, 'SSL', 'Secure Sockets Layer');
INSERT INTO protocols VALUES (null, 6, 'TLS', 'Transport Layer Security');
INSERT INTO protocols VALUES (null, 7, 'HTTP', 'HyperText Transfer Protocol');
INSERT INTO protocols VALUES (null, 7, 'FTP', 'File Transfer Protocol');

```
ams@ams-virtual-machine: ~
mysql> select * from protocols;
+----+--------+--------------+-------------------------------------+
| id | fk_osi | abbreviation | name                                |
+----+--------+--------------+-------------------------------------+
|  2 |      1 |  Bluetooth   | blue — синий и tooth — зуб          |
|  3 |      2 | Ethernet     | Ethernet                            |
|  4 |      2 | PPPoE        | Point-to-point protocol over Ethernet |
|  5 |      3 | IP           | Internet Protocol                   |
|  6 |      3 | ICMP         | Internet Control Message Protocol   |
|  7 |      4 | TCP          | Transmission Control Protocol       |
|  8 |      4 | UDP          | User Datagram Protocol              |
|  9 |      5 | net BIOS     |  Network Basic Input or Output System |
| 10 |      5 | PPTP         | Point-to-Point Tunneling Protocol   |
| 11 |      6 | SSL          | Secure Sockets Layer                |
| 12 |      6 | TLS          | Transport Layer Security            |
| 13 |      7 | HTTP         | HyperText Transfer Protocol         |
| 14 |      7 | FTP          | File Transfer Protocol              |
| 15 |      2 | Ethernet     | Ethernet                            |
| 16 |      2 | PPPoE        | Point-to-point protocol over Ethernet |
| 17 |      3 | IP           | Internet Protocol                   |
| 18 |      3 | ICMP         | Internet Control Message Protocol   |
| 19 |      4 | TCP          | Transmission Control Protocol       |
| 20 |      4 | UDP          | User Datagram Protocol              |
| 21 |      5 | net BIOS     |  Network Basic Input or Output System |
| 22 |      5 | PPTP         | Point-to-Point Tunneling Protocol   |
| 23 |      6 | SSL          | Secure Sockets Layer                |
| 24 |      6 | TLS          | Transport Layer Security            |
| 25 |      7 | HTTP         | HyperText Transfer Protocol         |
| 26 |      7 | FTP          | File Transfer Protocol              |
+----+--------+--------------+-------------------------------------+
25 rows in set (0,00 sec)

mysql>
```

INSERT INTO hardware VALUES (null, 1, 'Концентратор');
INSERT INTO hardware VALUES (null, 1, 'Повторитель');
INSERT INTO hardware VALUES (null, 2, 'Сетевой мост');
INSERT INTO hardware VALUES (null, 2, 'Коммутатор');
INSERT INTO hardware VALUES (null, 2, 'Точка доступа');
INSERT INTO hardware VALUES (null, 3, 'Маршрутизатор');
INSERT INTO hardware VALUES (null, 3, 'Сетевой шлюз');
INSERT INTO hardware VALUES (null, 2, 'Межсетевой экран');

```
mysql> select * from hardware;
+----+--------+------------------+
| id | fk_osi | name             |
+----+--------+------------------+
|  1 |      1 | Концентратор     |
|  2 |      1 | Повторитель      |
|  3 |      2 | Сетевой мост     |
|  4 |      2 | Коммутатор       |
|  5 |      2 | Точка доступа    |
|  6 |      3 | Маршрутизатор    |
|  7 |      3 | Сетевой шлюз     |
|  8 |      2 | Межсетевой экран |
+----+--------+------------------+
8 rows in set (0,00 sec)
```

6. Construct and execute SELECT operator with WHERE, GROUP BY and ORDER BY
select * from protocols where fk_osi = 5;

```
mysql> select * from protocols where fk_osi = 5;
+----+--------+--------------+---------------------------------------+
| id | fk_osi | abbreviation | name                                  |
+----+--------+--------------+---------------------------------------+
|  9 |      5 | net BIOS     |  Network Basic Input or Output System |
| 10 |      5 | PPTP         |  Point-to-Point Tunneling Protocol    |
| 21 |      5 | net BIOS     |  Network Basic Input or Output System |
| 22 |      5 | PPTP         |  Point-to-Point Tunneling Protocol    |
+----+--------+--------------+---------------------------------------+
4 rows in set (0,00 sec)
```

select * from osi_level order by information_type;

```
mysql> select * from osi_level order by information_type;
+----+--------------+------------------+
| id | name         | information_type |
+----+--------------+------------------+
|  1 | physical     | bit              |
|  5 | session      | data             |
|  6 | presentation | data             |
|  7 | application  | data             |
|  2 | data-link    | frame            |
|  3 | network      | packet           |
|  4 | transport    | segment          |
+----+--------------+------------------+
7 rows in set (0,00 sec)
```

select count(fk_osi) from hardware group by fk_osi order by count(fk_osi) desc;

```
mysql> select count(fk_osi) from hardware group by fk_osi order by count(fk_osi) desc;
+---------------+
| count(fk_osi) |
+---------------+
|             4 |
|             2 |
|             2 |
+---------------+
3 rows in set (0,00 sec)
```

7. Execute other different SQL queries DDL, DML, DCL

7.1 DDL
ALTER TABLE protocols MODIFY COLUMN name VARCHAR(110);
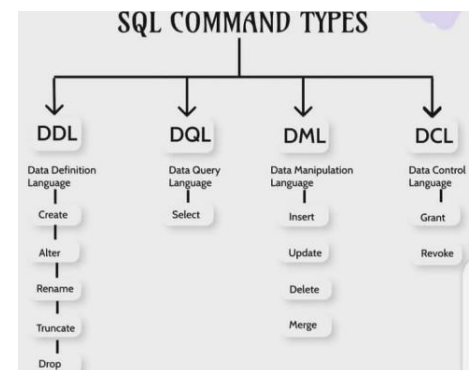### 7.2 DML

DELETE FROM protocols where id = 2;

7.3 DCL
GRANT ALL PRIVILEGES ON *.* TO 'user1'@'localhost' WITH

   -> GRANT OPTION;

8. Create a database of new users with different privileges. Connect to the database as a new user and verify that the privileges allow or deny certain actions
create user 'user1'@'localhost' identified by 'password';

grant all privileges on *.* to 'user1'@'localhost' with grant option;

sudo mysql -u user1 –p

```
mysql> insert into hardware values ('null',5,'test');
ERROR 1366 (HY000): Incorrect integer value: 'null' for column 'id' at row 1
mysql> insert into hardware values (null,5,'test');
Query OK, 1 row affected (0,00 sec)

mysql> select * from hardware;
+----+--------+------------------------------+
| id | fk_osi | name                         |
+----+--------+------------------------------+
|  1 |      1 | Концентратор                 |
|  2 |      1 | Повторитель                  |
|  3 |      2 | Сетевой мост                 |
|  4 |      2 | Коммутатор                   |
|  5 |      2 | Точка доступа                |
|  6 |      3 | Маршрутизатор                |
|  7 |      3 | Сетевой шлюз                 |
|  8 |      2 | Межсетевой экран             |
|  9 |      5 | test                         |
+----+--------+------------------------------+
9 rows in set (0,00 sec)
```

create user 'user2'@'localhost' identified by 'password';

grant select on *.* to 'user2'@'localhost' with grant option;

```
mysql> select * from hardware;
+----+--------+------------------------------+
| id | fk_osi | name                         |
+----+--------+------------------------------+
|  1 |      1 | Концентратор                 |
|  2 |      1 | Повторитель                  |
|  3 |      2 | Сетевой мост                 |
|  4 |      2 | Коммутатор                   |
|  5 |      2 | Точка доступа                |
|  6 |      3 | Маршрутизатор                |
|  7 |      3 | Сетевой шлюз                 |
|  8 |      2 | Межсетевой экран             |
|  9 |      5 | test                         |
+----+--------+------------------------------+
9 rows in set (0,00 sec)

mysql> delete from hardware where id = 9;
ERROR 1142 (42000): DELETE command denied to user 'user2'@'localhost' for table 'hardware'
mysql>
```

9. Make a selection from the main table DB MySQL

```
ams@ams-virtual-machine: ~

mysql> select * from db /r;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near '/r' at line 1
mysql> select * from db \G;
*************************** 1. row ***************************
                 Host: localhost
                   Db: performance_schema
                 User: mysql.session
          Select_priv: Y
          Insert_priv: N
          Update_priv: N
          Delete_priv: N
          Create_priv: N
            Drop_priv: N
           Grant_priv: N
      References_priv: N
           Index_priv: N
           Alter_priv: N
Create_tmp_table_priv: N
     Lock_tables_priv: N
     Create_view_priv: N
       Show_view_priv: N
  Create_routine_priv: N
   Alter_routine_priv: N
         Execute_priv: N
           Event_priv: N
         Trigger_priv: N
*************************** 2. row ***************************
                 Host: localhost
                   Db: sys
                 User: mysql.sys
          Select_priv: N
          Insert_priv: N
          Update_priv: N
          Delete_priv: N
          Create_priv: N
            Drop_priv: N
           Grant_priv: N
      References_priv: N
           Index_priv: N
           Alter_priv: N
Create_tmp_table_priv: N
     Lock_tables_priv: N
     Create_view_priv: N
       Show_view_priv: N
  Create_routine_priv: N
   Alter_routine_priv: N
```

PART 2

10.Make backup of your database.

sudo mysqldump -u root osi >osi_dump.sql

11.Delete the table and/or part of the data in the table.

```
Database changed
mysql> show tables;
+----------------+
| Tables_in_osi1 |
+----------------+
| hardware       |
| osi_level      |
| protocols      |
+----------------+
3 rows in set (0,00 sec)

mysql> drop table hardware;
Query OK, 0 rows affected (0,17 sec)

mysql> show tables;
+----------------+
| Tables_in_osi1 |
+----------------+
| osi_level      |
| protocols      |
+----------------+
2 rows in set (0,00 sec)
```

12.Restore your database.

sudo mysql -u root osi1 < osi_dump.sql

```
mysql> use osi1;
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_osi1 |
+----------------+
| hardware       |
| osi_level      |
| protocols      |
+----------------+
3 rows in set (0,00 sec)
```

13.Transfer your local database to RDS AWS.
14.Connect to your database.

15.Execute SELECT operator similar step 6.

```sql
select count(fk_osi) from hardware group by fk_osi order by count(fk_osi) desc;
```

16.Create the dump of your database.
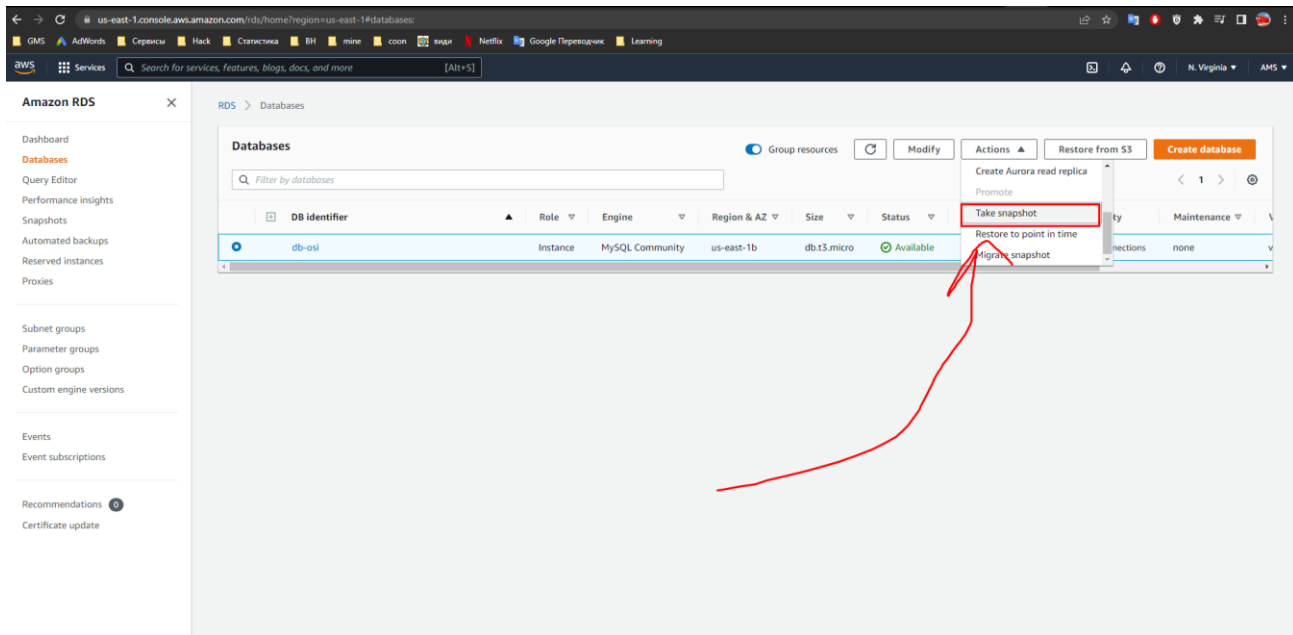
Take DB snapshot

This feature is currently supported for InnoDB storage engine only. If you are using MyISAM, refer to details here ⬀.
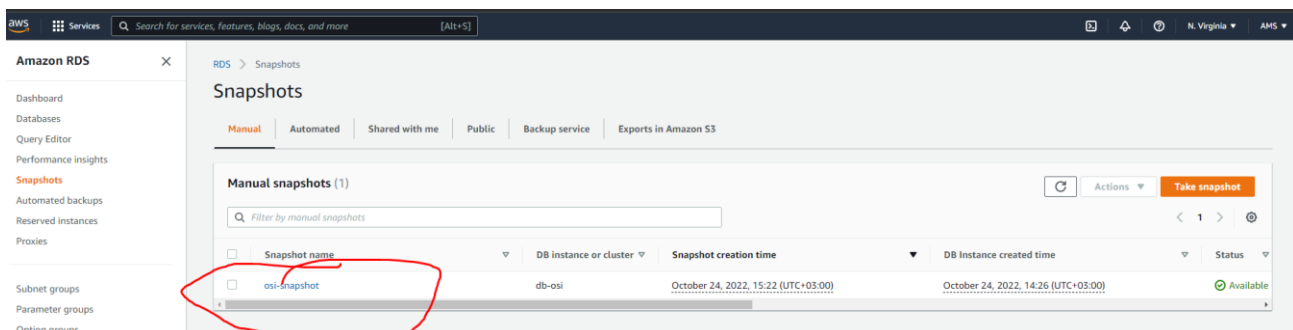
Settings
To take a snapshot of this DB instance you must provide a name for the snapshot.
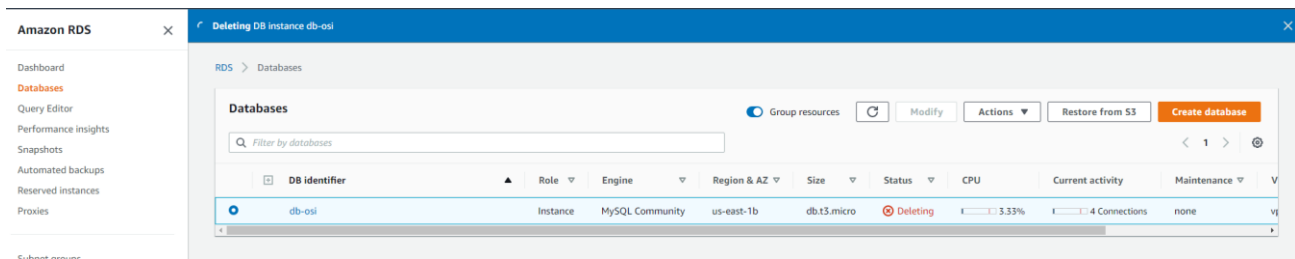
DB instance
The unique key that identifies a DB instance. This parameter isn't case-sensitive.

db-osi

Snapshot name
The identifier for the DB snapshot.

osi-snapshot

Cancel   **Take snapshot**

mysql –h restored-osi.chb8jqqht4za.us-east-1.rds.amazonaws.com -u admin -p

PART 3 – MongoDB

17. Create a database. Use the use command to connect to a new database (If it doesn't exist, Mongo will create it when you write to it).

sudo systemctl start mongod

```
use test;
```

18. Create a collection. Use db.createCollection to create a collection. I'll leave the subject up to you. Run show dbs and show collections to view your database and collections.

db.students.insertMany([

{title: 'Masha', years: 20, languages: ['English', 'French']},

{title: 'Petr', years: 30, languages: ['Polish', 'Ukrainian']},

{title: 'Simona', years: 20, languages: ['German', 'French', 'Italian']}

])

19. Create some documents. Insert a couple of documents into your collection. I'll leave the subject matter up to you, perhaps cars or hats.

```
>>> db.students.find();
[
  {
    _id: ObjectId("635906c644a54e9dcac16c39"),
    title: 'Masha',
    years: 20,
    languages: [ 'English', 'French' ]
  },
  {
    _id: ObjectId("635906c644a54e9dcac16c3a"),
    title: 'Petr',
    years: 30,
    languages: [ 'Polish', 'Ukrainian' ]
  },
  {
    _id: ObjectId("635906c644a54e9dcac16c3b"),
    title: 'Simona',
    years: 20,
    languages: [ 'German', 'French', 'Italian' ]
  }
]
```

20. Use find() to list documents out

```
db.students.find( { "years": 20 } );
```

```
>>> db.students.find( { "years": 20 } );
[
  {
    _id: ObjectId("63590fdf8f8df37b73e3237a"),
    title: 'Masha',
    years: 20,
    languages: [ 'English', 'French' ]
  },
  {
    _id: ObjectId("63590fdf8f8df37b73e3237c"),
    title: 'Simona',
    years: 20,
    languages: [ 'German', 'French', 'Italian' ]
  }
]
```