Birla Institute of Technology & Science, Pilani, K. K. Birla Goa Campus Database Systems (CS F212)
Second Semester 2020-2021 Lab-1

Database Languages

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Structured Query Language(SQL) as we all know is the database language by the use of which we can perform certain operations on the existing database as well as create new ones.

With SQL we can:

- Create tables in the database
- Store data
- Retrieve data
- Change data and change the structure of the underlying tables
- Combine and calculate data
- Provide security

We will be using the open-sourced RDBMS, MySQL

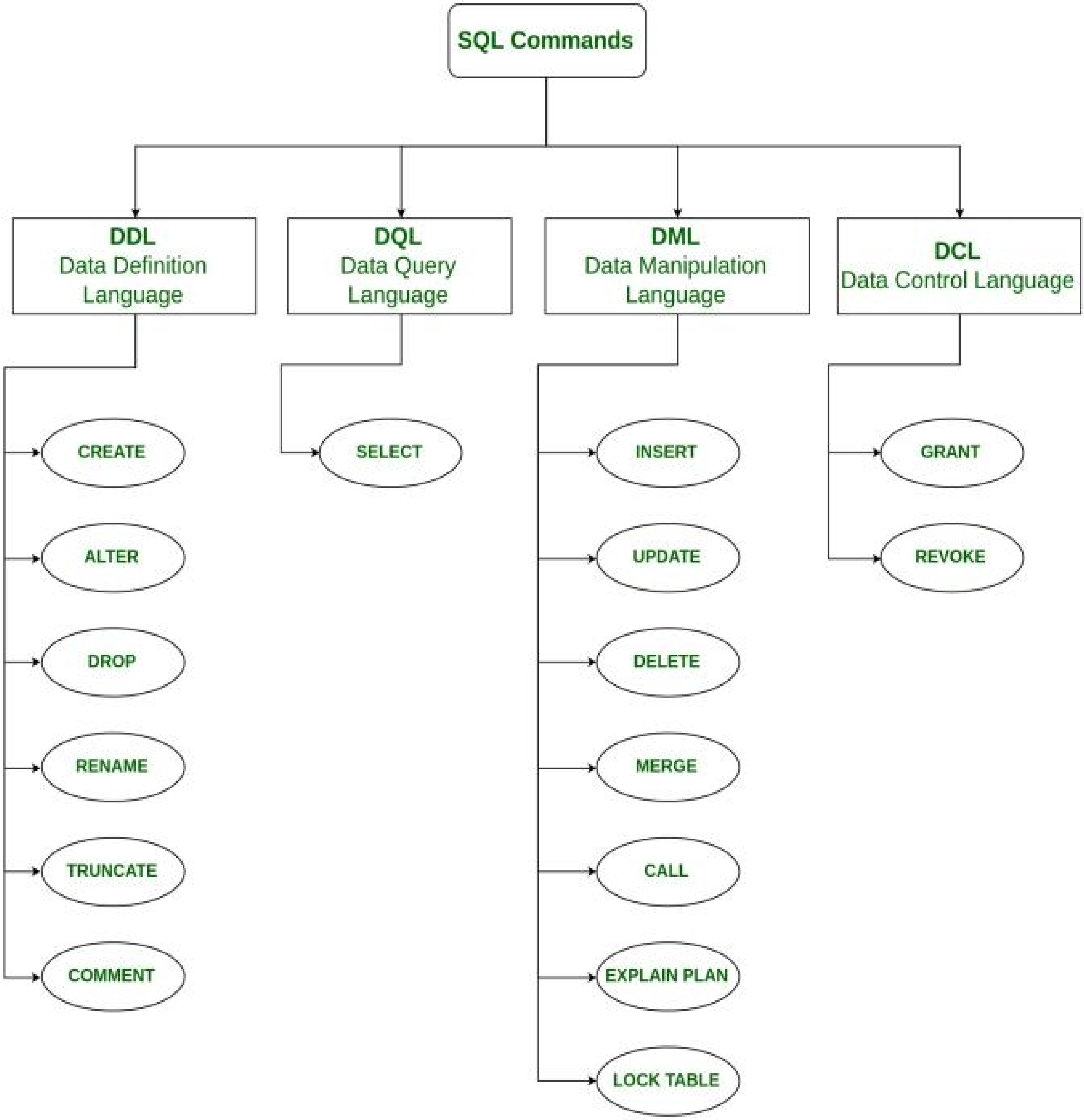
Why MySQL?? It allows us to :

- Enter,edit,store,retrieve and run SQL commands
- Format,perform calculation,store & print query results
- List column definitions for any table
- Access and copy data between SQL databases
- Send/accept messages from/to the end user

SQL commands are mainly categorized into four categories as:

1. DDL - Data Definition Language
2. DQl - Data Query Language
3. DML - Data Manipulation Language
4. DCL - Data Control Language

Types of SQL Commands



The aim of this reading material is to introduce to the syntax and functionality of different SQL commands. It asumes that you have already installed MySQL on your machine. First, we need to log into the MySQL server. This can be done with the command:

```
sudo mysql -h localhost -u root -p
```

The system will ask you for a password. Entering it will log you into the MySQL command prompt.

Once logged in, we can start running various SQL queries. But before that, let’s have a look at a few commands.

1. show databases;

This command shows different databases that are present in the mysql server. If you have not logged in as a root user, then some databases may not be shown. A database can contain several different tables.

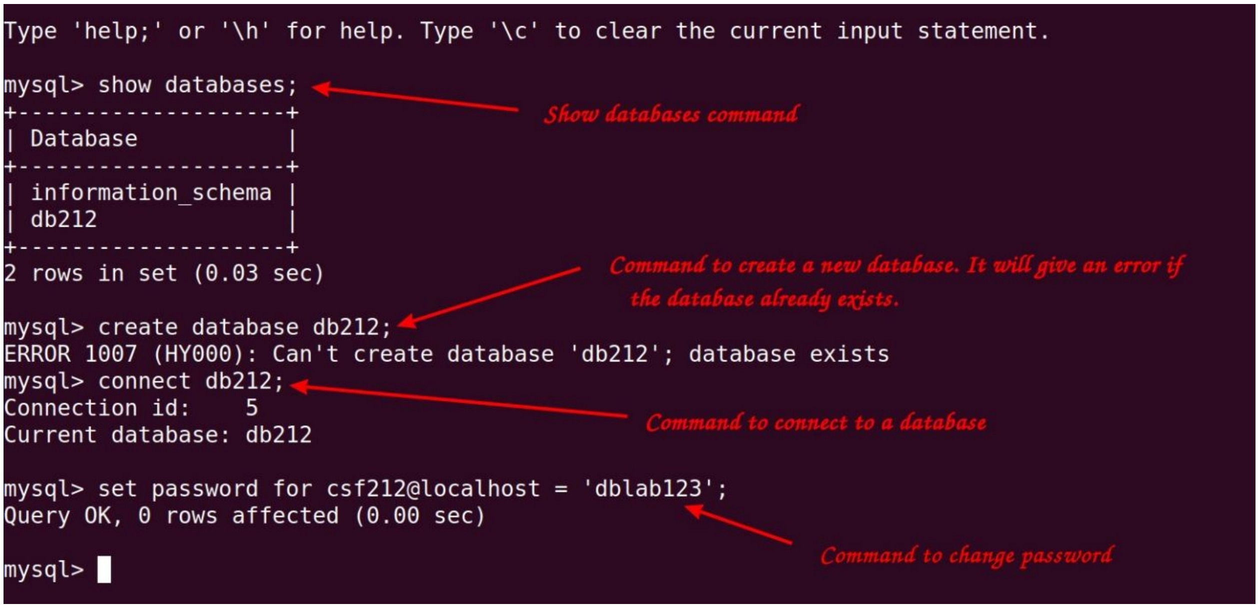
2. create database <xyz>;

This command creates a new database that a user can connect to. To create a new database we need to log into MySQL as a root user.

3. connect <xyz>;

This command allows a user to connect to the database <xyz> .

An example screenshot of these commmands is shown below.



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

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| db212              |
+--------------------+
2 rows in set (0.03 sec)

mysql> create database db212;
ERROR 1007 (HY000): Can't create database 'db212'; database exists
mysql> connect db212;
Connection id:    5
Current database: db212

mysql> set password for csf212@localhost = 'dblab123';
Query OK, 0 rows affected (0.00 sec)

mysql> 
```

Show databases command

Command to create a new database. It will give an error if the database already exists.

Command to connect to a database

Command to change password

NOTE: It is healthy to make a habit of writing your SQL command in an editor (such as gedit), and then copy and paste by right-clicking on MySQL prompt.

Now, moving on the the different types of commands:

DDL COMMANDS

Creating Database:

Syntax to create a database:

create database <database name>;

Example:

```
mysql> create database mydb;
```

Using Database:

Syntax to use a database:

use <database name>;

Example:

```
mysql> use mydb;
```

Listing Databases:

Syntax:

show databases;

Listing tables in current database:

Syntax:

show tables;

NOTE: If you are getting a syntax error when executing these commands (after copy pasting), check the quotes. Due to formatting on Word, mySQL throws an error for quotes. Retype the quotes and it should work.

Creating tables:

Syntax to create a table

create table <table name> (column definition 1, column definition 2, …. ,);

Example:

```
mysql> CREATE TABLE students (id CHARACTER (12),
        -> name VARCHAR(30),
        -> hostel INTEGER NOT NULL,
        -> percentage DECIMAL(5,2) DEFAULT 0.0,
        -> phone INT,
        -> bdate DATE,
        -> gender ENUM('F','M'),
        -> CONSTRAINT uk UNIQUE(name));
```

(OR)

```
CREATE TABLE students (id CHAR(12), name VARCHAR(30) UNIQUE, hostel INT NOT NULL, percentage DECIMAL(5,2) DEFAULT 0.0, phone INT UNIQUE, bdate DATE, gender ENUM('F','M'));
```

Check using 'show tables' command

NOTE: 1) Every SQL statement ends with a semicolon.
2) SQL keywords are not case sensitive, but the data in the table and the name of the table are case sensitive.
3) It is a good practice to write the query with line separator to make error detection more convenient.

There are various inbuilt data types like char (for fixed-length character string to store alphanumeric values), varchar (for variable-length character strings to store alphanumeric values), integer (for integer values), decimal (to store floating-point values), date (for date and time) and others like RAW, Long RAW, LOB, BLOB, CLOB, Bfile for audio and video files.

Also explore big int

Syntax to add constraints like primary key, unique, not null and check while creating a table:

create table <table name> (column definition 1, column definition 2, …. , **primary key**(column name));

Example:

```
mysql> CREATE TABLE gradstudents (id CHARACTER (12), name VARCHAR(30), hostel
INTEGER NOT NULL, percentage DECIMAL(5,2) DEFAULT 0.0, phone INT, bdate DATE,
gender ENUM('F','M'), CONSTRAINT ue UNIQUE (phone),PRIMARY KEY (id) );
```

(OR)

```
mysql> CREATE TABLE gradstudents (id CHARACTER (12) PRIMARY KEY, name
VARCHAR(30), hostel INTEGER NOT NULL, percentage DECIMAL(5,2) DEFAULT 0.0,
phone INT, bdate DATE, gender ENUM('F','M'),CONSTRAINT ue UNIQUE (phone));
```

TRY THIS (justify if you get errors):

```
mysql> CREATE TABLE temp (id char(10), name varchar(30) unique, hostel int, percentage
decimal(5,2) default 0.0, phone VARCHAR(11), bdate date, gender enum('F','M'), primary
key(id), primary key(name) );
```

Correct method to create a composite primary key:

```
mysql> CREATE TABLE temp (id char(10), name varchar(30) unique, hostel int, percentage
decimal(5,2) default 0.0, phone varchar(11), bdate date, gender enum('F','M'), primary
key(id,name) );
```

<u>Describe Table:</u>

Syntax to view the table structure
desc <table name>;

Example:
mysql> desc students;
mysql> desc gradstudents;

Why is the NULL column of the 'id' row in 'students' table YES? Why is it NO in the case of the gradstudents table?

<u>To alter a table:</u>

Syntax to alter the table structure:

alter table <table name> **modify** <column name> <column definition>**;**

alter table <table name> **rename** <new table name>**;**

alter table <table name> **add column** (column definition)**;**

alter table <table name> **change** <old column name> <new name> <old column definition>**;**
alter table <table name> **drop column** <column name>**;**

alter table <table name> **add constraint** <constraint name> (condition);

alter table <table name> **drop constraint** <constraint name>;

<u>Example:</u>

mysql> alter table students modify name varchar (40); *//to increase the size.*

mysql> alter table students modify name varchar (10); *//to decrease the size.*

mysql > alter table students add column address varchar (25); *//to add new column.*

mysql> alter table students change address postaladdress varchar (25); *//to rename a column.*

mysql > alter table students drop column postaladdress; *//to remove a column.*

mysql > alter table students modify phone varchar(10); *//changing type, to accept realistic phone numbers.*

mysql > alter table gradstudents drop index ue; *//to remove unique constraint on phone.*

Check the result of the above queries by 'desc' command.

DML COMMANDS

Insert data:

Syntax to insert a row in a table:
insert into <table name> [field names] **values** (a list of data values);

Examples:

```
mysql> INSERT INTO students VALUES ('PS99305017', 'Mohan Sharma', 13,76.23,
'9800000002', '2001-03-15', 'M');
```

(OR)

```
mysql> INSERT INTO students (id, name, hostel, percentage,phone, bdate, gender) VALUES
('PS99305017', 'Sai Sundar',11,77.23, '9800000001', '2001-01-25','M');
//(Date format is  'YYYY-MM-DD')
```

TRY THIS (justify if you get errors):

```
mysql > INSERT INTO students VALUES ('Sai Sundar','PS99305017',11,77.23,'2001-01-25',
'9800000001','M');
```

Correcting this:

(We cannot enter duplicate values of phone into the table, as we have defined it to be unique)

```
mysql > INSERT INTO students (name, id, hostel, percentage, bdate, phone, gender) VALUES
('Jay Singh','PS99305012',11,83.73,'2000-07-04', '9900000002','M');
```

```
/* to violate unique constraint by inserting same name to another student*/
mysql> INSERT INTO students VALUES ('PS99305018','Sai
Sundar',11,90.23,'9800000001','2001-01-25','M');
```

```
/* to insert blank in primary key column by giving blank id to a student*/
mysql> INSERT INTO students VALUES ('','Shyam Sundar',11,90.23,9800000004,'2001-01-
25','M');
```

```
/* to insert blank in column having unique constraint by giving blank name to a student*/
mysql> INSERT INTO students VALUES ( 'PS99305018', NULL, 11, 90.23, '9800000009',
'2001-01-25',' M');
mysql> INSERT INTO students VALUES ( 'PS99305018','', 11, 90.23, '9800000009', '2001-01-
25',' M');
```

Try running both commands twice. As you can see, NULL does not count as a repeated value.

```
/* to violate not null constraint by inserting NULL in hostel column*/
mysql >INSERT INTO students VALUES
('PS99305020','Sundaram',NULL,90.23,'9800000005', '2001-01-25', 'M');

/* to miss single quote in char or varchar data type);*/
mysql>INSERT  INTO students VALUES (PS99305020,
'Sundaram',11,90.23,9800000006,'2001-01-25','M');

/*to exceed the size of an attribute(name here)*/
mysql > INSERT INTO students VALUES ('PS99305021','Ram Prabhu
Sundaran',11,90.23, '9800000006', '2001-01-25','M');

/*to exceed date limit*/
mysql>INSERT INTO students VALUES ('PS99305023','Ramnarayan
Sundaran',11,90.23,'9800000006','2001-02-30','M');

/*to violate enum datatype */
mysql>INSERT INTO students VALUES ('PS99305025','Narayan
Sundar',11,90.23,'9800000007','2001-02-16','K');
```

DQL COMMANDS

Syntax of select command:

1. to display all rows

select * from <tablename>;

Example:

```
mysql>SELECT * FROM students;
```

Observe the bdate of student with id PS99305023, it is the default value.

Observe percentage of student with id PS99305019, it is 0.0, the default value set by user.

Observe value in gender column of student with id PS99305025, its blank.

2. to display particular column(s)

select column name …. **from** table name;

Example:

```
mysql >SELECT id FROM students;
mysql >SELECT id, name FROM students;
```

3. to display distinct rows

select distinct column name from tablename;

Example:

```
mysql > SELECT DISTINCT name from students;
```

Update Query:

Syntax of update command

update tablename **set** field=value, …**where** condition;

Example:

```
mysql >UPDATE students SET percentage=90.46 WHERE id='PS99305018';
mysql > UPDATE students SET name ='Sham' WHERE name ='Sai Sundar';
mysql > UPDATE students SET hostel=hostel*10;
```

Delete Query:

Syntax of delete command

delete from <table name> **where** condition(and/or conditions);

Example: to delete record of a particular student

```
mysql > delete from students where id='PS99305018';
```

Display system date:

```
mysql >SELECT sysdate() from dual;
```

Some more DDL Commands,

Truncate the table: (Used to delete all records from a table)

Syntax to truncate a table:

truncate table <table name>;

Example:

```
mysql> truncate table gradstudents;
mysql> select * from gradstudents; //to test test result of truncate
```

Dropping the database:

Syntax to drop a database:

drop database <database name>;

Example: Example:

```
mysql> drop database mydb;
mysql> show databases;//to check status
```

Dropping the tables:

Syntax to drop a table:

drop table <table name>;

```
mysql> drop table gradstudents;
```

```
  mysql> show tables;//to check status
```

Find the difference between truncate and drop SQL command?

Importing and Exporting of the database:

Export

To Export a database, open up terminal, making sure that you are not logged into MySQL and
type,

```
mysqldump -u [username] -p [database name] > [database name].sql
```

The database that you selected in the command will now be exported to your droplet.

Import

To import a database, first create a new blank database in the MySQL shell to serve as a destination for your data.

```
CREATE DATABASE newdatabase;
```

Then log out of the MySQL shell and type the following on the command line:

```
mysql -u [username] -p newdatabase < [database name].sql
```

With that, your chosen database has been imported into your destination database in MySQL.

Credits:

1st Picture on types of SQL commands - https://www.geeksforgeeks.org/

Some part of the reading material has been taken from CS F212 Sem II 2019-20 (IC: Dr. Shubhangi Gawali)