Agenda

- DBMS
- RDBMS
- SQL
  - Categories (DDL,DML,DQL,DCL,TCL)
- Mysql History
- Installation
- Getting Started with Mysql
- Database (Physical & Logical Layout)
- Data types
- Basic Queries
- Char vs Varchar vs Text
- SQL Scripts

Managing Data

- Two ways to organize and manage data

1. using file system
   - File systems are used to manage files and directories, and provide basic operations for creating, deleting, renaming, and accessing files.
   - They typically store data in a hierarchical structure, where files are organized in directories and subdirectories.
   - File systems are simple and efficient, but they lack the ability to manage complex data relationships and ensure data consistency.
   - file systems are suitable for managing small amounts of unstructured data.
2. DBMS (Database Management System)
   - DBMS is a software system designed to manage large amounts of structured data, and provide advanced operations for storing, retrieving, and manipulating data.
   - DBMS provides a centralized and organized way of storing data, which can be accessed and modified by multiple users or applications.
   - DBMS offers advanced features like data validation, indexing, transactions, concurrency control, and backup and recovery mechanisms.
   - DBMS ensures data consistency, accuracy, and integrity by enforcing data constraints, such as primary keys, foreign keys, and data types.
   - DBMS is designed for managing large amounts of structured data, and offers more advanced features for ensuring data integrity, security, and performance.

DBMS

- DBMS can be classified into two types

1. Relational Database Management System (RDBMS)

    - Data is organized in the form of tables and each table has a set of rows and columns. The data are related to each other through primary and foreign keys.
2. Non-Relational Database Management System (NoSQL or Non-SQL)
    - Data is organized in the form of key-value pairs, documents, graphs, or column-based. These are designed to handle large-scale, high-performance scenarios.

RDBMS

- Relational DataBase Management System
- It is client-server systemMicheal Wide
- eg -> Oracle, MS-SQL, MySQL, SQLite, etc
- It organizes the data in the table, rows and columns
- Multiple tables are connected to one another
- It is more secure as compared to file based.
- It also supports multi-user i.e multiple clients can work on same data.
- It provides featuers like Rowlocking, table locking, managing the transactions.
- RDBMS design is based on Codd's Rule developed at IBM in 1970
- RDBMS uses SQL language for their data storage and accessibility

SQL

- It stands for Structured Query Language
- Originally known as RQBE (Relational Query By Example)
- SQL is standaradized by ANSI in 1987 and is revised multiple times by adding new features
- SQL is case insensitive language
- SQL is divided into five categories
    1. DDL - Data Defination Language
        - CREATE, DROP, Truncate ALTER, RENAME
    2. DQL - Data Query Language
        - SELECT
    3. DML - Data Manipulation Language
        - INSERT, UPDATE, DELETE
    4. DCL - Data Control Language
        - CREATE USER, GRANT, REVOKE
    5. TCL - Transaction Control Langugae
        - START TRANSACTION,SAVEPOINT, COMMIT,ROLLBACK

Mysql History

- It is developed by nus in 1995.
- MySql is named on the combination of his daugheter's initial 'My'ia and the acronym SQL
- It was acquired by SunMicrosystem in 2008 and then later acquired by oracle in 2010
- It is free and open source database management system under GPL(General Public Licsence)
- However some closed source modules are avaible under commercial version of Mysql
- MariaDB is a clone of mysql which is completely open source
- It Supports multiple database storage and processing engines
    - For mysql version < 5.5 default storage engine was MyISAM
        - No Support for Transactions

    - For mysql version >= 5.5 default Storage engine is InnoDB
        - It Supports ACID Transactions

Installation

- Follow steps from the shared installtion file
- In Windows it is required to set the PATH for the mysql.
- Server and client both are installed on your machine.
- Server (mysqld)
    - linux -> usr/sbin
    - windows -> C:\Program Files\MySQL\MySQL Server 8.0\bin
    - run on port 3306
    - It is implemented in C/C++
- Client (mysql)
    - linux -> usr/bin
    - windows -> C:\Program Files\MySQL\MySQL Server 8.0\bin
- Data
    - linux -> var/lib/mysql
    - windows -> C:\ProgramData\MySQL\MySQL Server 8.0

Getting Started

- We can use terminal as well as the Workbench(GUI) as client to work with the MySQL Server.
- We will be using the terminal for our better understanding.
- open the terminal and give the below command

```
mysql -u root -p

//OR

mysql -h localhost -u root -p

// enter the password and hit enter
// you should be logged into mysql shell
```

- mysql
    - client tool
- -u
    - user
- root
    - name of the user
- -p

    - password
- -h
    - host
- localhost
    - current system, also we can provide other system hostip here.

```
-- to display all existing databases
SHOW DATABASES;

-- To display loggedin user
SELECT USER();

-- To display Selected Database
SELECT DATABASE();

-- To clear the mysql shell window
\! clear

-- to cretae a database
CREATE DATABASE classwork;

-- to use the database
USE classwork;

-- Create a table
-- CREATE TABLE table_name()
CREATE TABLE student(rollno int, name char(10));

-- to remove the entire table
DROP table student;

-- to remove database
DROP DATABASE classwork;
```

Database (Logical & Physical Layout)

- Logical
    - It is a container that stores all the data inside it in the form of multiple tables.
    - The container consists of tables, constraints, relations, stored procedures, functions, triggers
    - Their are some system databases like mysql, performance_schema, etc.
    - These contains mysql db internal/system information
    - Tables inside database can have multiple columns
    - Every column is associated with a datatype
    - Every column may or may not have constraints
    - the data in table is stored in multiple rows.
    - Each row have multiple values.
- Physical

    - It is stored on the disk inside the data directory
    - Every database created have its sub directory inside data directory
    - Each table in database is stored as file on the disk.
    - For every table created inside the selected database a file is created physically inside the directory of that respective database.
    - Data is stored in binary format
    - A file maynot be contiguosly stored onto disk
    - Data rows are not contiguous, they are scattered on harddisk

- Check for physical and logical layout for the above database and tables

DataTypes

- Their are 5 different types of datatypes
    - 1. Numeric
        - tinyint (1 byte)
        - smallint (2 bytes)
        - mediumint(3 bytes)
        - int (4 bytes)
        - bigint (8 bytes)
        - float (4 bytes)
        - double (8 bytes)
        - decimal(m,n)
            - m -> no of digits
            - n -> no of digits after the decimal point
            - eg -> Decimal(4,2) -> 12.34
    - 2. String
        - char(n)
            - n -> no of characters
            - length 0-255
        - varchar(n)
            - n -> no of characters
            - length 0-65535
        - tinytext
            - length is by default 255
        - text
            - can store data of 64K size
        - mediumtext
            - can store data upto 16MB
        - longtext
            - can store data upto 4GB
    - 3. Binary
        - tinyblob
        - blob
        - mediumblob
        - longblob

- 4. DateTime type
  - date
    - yyyy-mm-dd (1000-01-01 to 9999-12-31)
  - time
    - hr::min::sec (839:59:32)
  - datetime
    - yyyy-mm-dd hr::min::sec
    - (1000-01-01 to 9999-12-31) (00:00:00 to 23:59:59)
  - Year
    - 1901 - 2155
  - Timestamp
- 5. Misc types
  - Enum (Bike,Car,Truck) -> radio Button
  - Set (Bike,Car,Truck) -> checkbox

Mysql Basic Queries

```
-- cretae a table student with cols rollno,name and marks
CREATE TABLE student(rollno int, name char(10), marks decimal(5,2));

-- Add some dummy student data in table.
INSERT INTO student VALUES(1,"s1", 50);
INSERT INTO student VALUES(2,"s2", 60);
INSERT INTO student VALUES(3,"s3", 70);

-- display all the data from the table
SELECT * FROM student;
```

Difference between char,varchar and Text

- Diagram of char and varchar

```
CREATE TABLE temp(c1 CHAR(4), c2 VARCHAR(4), c3 TEXT(4));
DESCRIBE temp;
INSERT INTO temp VALUES('ab', 'ab', 'ab');
INSERT INTO temp VALUES('abc', 'abc', 'abc');
INSERT INTO temp VALUES('abcd', 'abcd', 'abcd');
INSERT INTO temp VALUES('abcde', 'abcd', 'abcd'); -- error
INSERT INTO temp VALUES('abcd', 'abcde', 'abcd'); -- error
INSERT INTO temp VALUES('abcd', 'abcd', 'abcde'); --OK
SELECT * FROM temp;
```

SQL Scripts

```
USE classwork;
SELECT DATABASE();

SOURCE D:/classwork-db.sql

SHOW TABLES;
SELECT * FROM books;
SELECT * FROM dept;
```