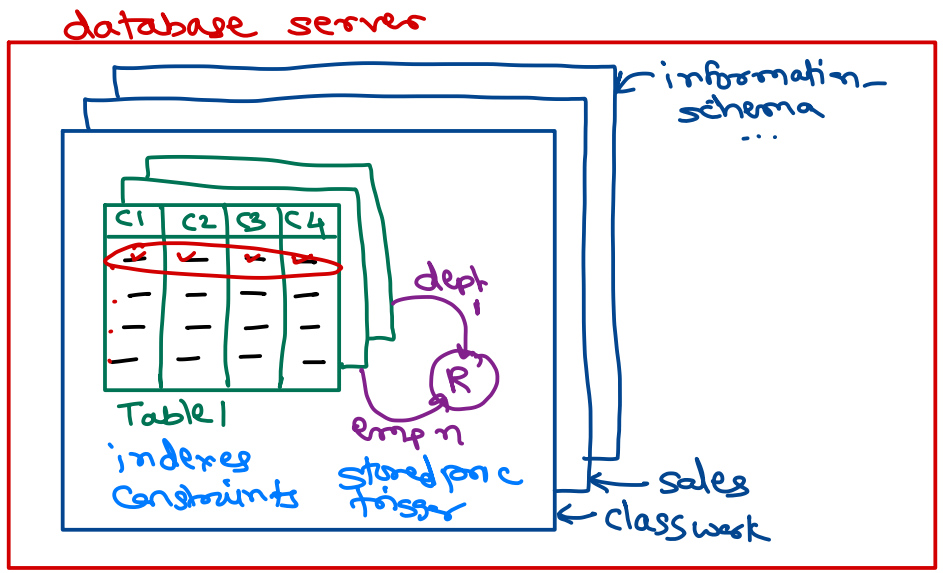
MySQL - RDBMS

Trainer: Mr. Nilesh Ghule

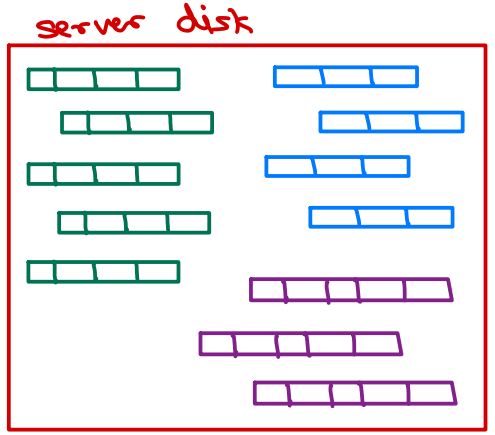
Database logical layout

- Database/schema is like a namespace/container that stores all db objects related to a project.
- It contains tables, constraints, relations, stored procedures, functions, triggers, ...
- There are some system databases e.g. mysql, performance_schema, information_schema, sys, ... They contains db internal/system information.
  - e.g. SELECT user, host FROM mysql.user;
- A database contains one or more tables.
- Tables have multiple columns.
- Each column is associated with a data-type.
- Columns may have zero or more constraints.
- The data in table is in multiple rows.
- Each row have multiple values (as per columns).



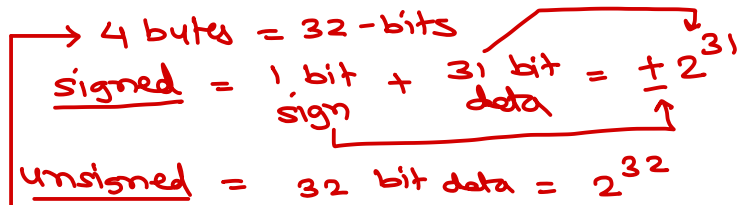
Database physical layout

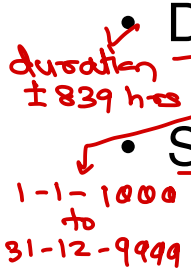
- In MySQL, the data is stored on disk in its data directory i.e. /var/lib/mysql
- Each database/schema is a separate sub-directory in data dir.
- Each table in the db, is a file on disk.
- e.g. student table in current db is stored in file /var/lib/mysql/db/student.ibd.
- Data is stored in binary format.
- A file may not be contiguously stored on hard disk.
- Data rows are not contiguous. They are scattered in the hard disk.
- In one row, all fields are consecutive.
- When records are selected, they are selected in any order.



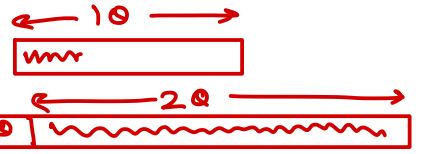
MySQL data types

- RDBMS have similar data types (but not same).
- MySQL data types can be categorised as follows
  - Numeric types (Integers)
    - TINYINT (1 byte), SMALLINT (2 byte), MEDIUMINT (3 byte), INT (4 byte), BIGINT (8 byte), BIT(n bits)
    - integer types can signed (default) or unsigned.
  - Numeric types (Floating point)
    - approx. precision – FLOAT (4 byte), DOUBLE (8 byte) | DECIMAL(m, n) – exact precision
  - Date/Time types
    - DATE, TIME, DATETIME, TIMESTAMP, YEAR
  - String types – size = number of chars * size of char
    - CHAR(1-255) – Fixed length, Very fast access.
    - VARCHAR(1-65535) – Variable length, Stores length + chars.
    - TINYTEXT (255), TEXT (64K), MEDIUMTEXT (16M), LONGTEXT (4G) – Variable length, Slower access.
  - Binary types – size = number of bytes
    - BINARY, VARBINARY, TINYBLOB, BLOB, MEDIUMBLOB, LONGBLOB
  - Miscellaneous types
    - ENUM, SET





depend on char encoding

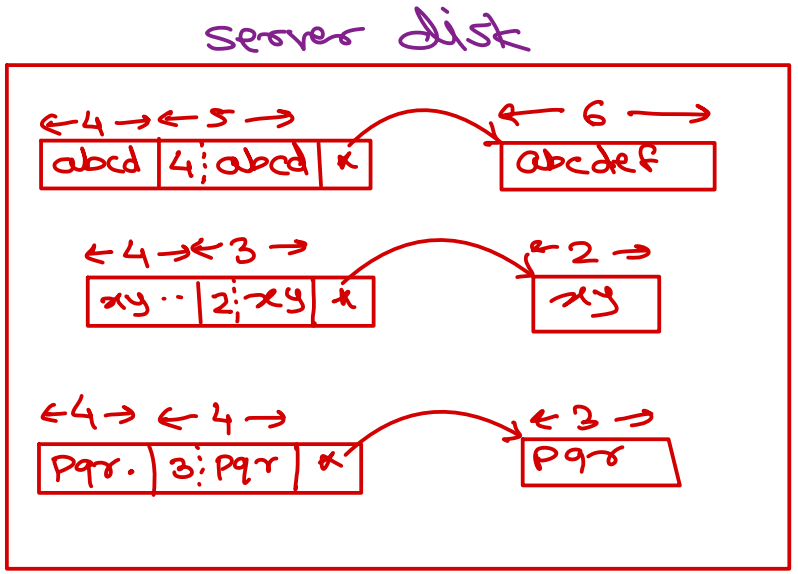


CHAR vs VARCHAR vs TEXT

- CHAR
  - Fixed inline storage.
  - If smaller data is given, rest of space is unused.
  - Very fast access.
- VARCHAR
  - Variable inline storage.
  - Stores length and characters.
  - Slower access than CHAR.
- TEXT
  - Variable external storage.
  - Very slow access.
  - Not ideal for indexing.

sizeof a char
- ascii = 1 byte
- unicode = 2 byte
  - UTF16BE
  - UTF16LE
  - UTF ...
- ebcdif = 4 byte

CHAR(4) → max 4 chars
- Ascii – 4 bytes
- Unicode – 8 bytes.

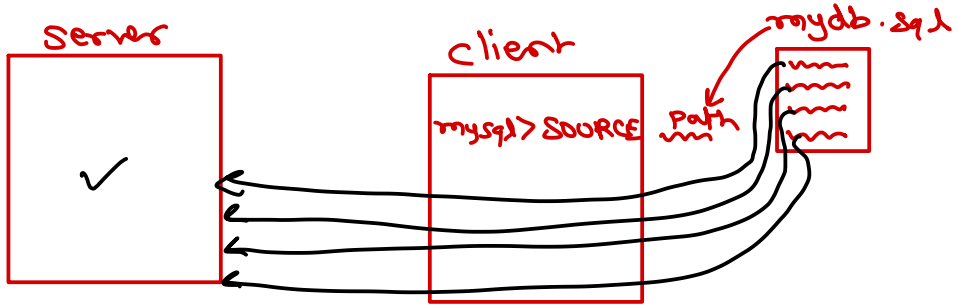


- CREATE TABLE temp(c1 CHAR(4), c2 VARCHAR(4), c3 TEXT(4));
- DESC temp;
- INSERT INTO temp VALUES('abcd', 'abcd', 'abcdef');

SQL scripts

collection of sql commands in a text file (.sql).

- SQL script is multiple SQL queries written into a .sql file.
- SQL scripts are mainly used while database backup and restore operations.
- SQL scripts can be executed from terminal as:
  - terminal> mysql –u user –ppassword db < /path/to/sqlfile
- SQL scripts can be executed from command line as:
  - mysql> SOURCE /path/to/sqlfile
- Note that SOURCE is MySQL CLI client command.
- It reads commands one by one from the script and execute them on server.



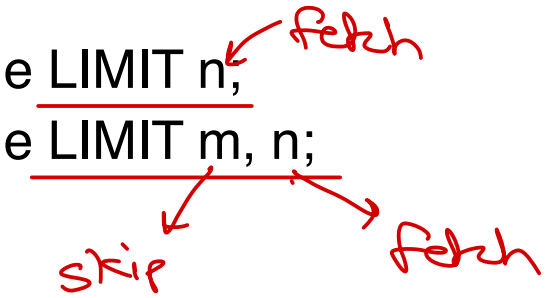
SELECT – DQL

- Select all columns (in fixed order).
  - SELECT * FROM table;
- Select specific columns / in arbitrary order.
  - SELECT c1, c2, c3 FROM table;
- Column alias
  - SELECT c1 AS col1, c2 col2 FROM table;
- Computed columns.
  - SELECT c1, c2, c3, expr1, expr2 FROM table;

```
SELECT c1,
CASE WHEN condition1 THEN value1,
WHEN condition2 THEN value2,
...
ELSE valuen
END
FROM table;
```

SELECT – DQL

- Distinct values in column.
  - SELECT DISTINCT c1 FROM table;
  - SELECT DISTINCT c1, c2 FROM table;
- Select limited rows.
  - SELECT * FROM table LIMIT n;
  - SELECT * FROM table LIMIT m, n;



SELECT – DQL – WHERE

- BETWEEN operator (include both ends)
  - c1 BETWEEN val1 AND val2
- IN operator (equality check with multiple values)
  - c1 IN (val1, val2, val3)
- LIKE operator (similar strings)
  - c1 LIKE ‘pattern’.
  - % represent any number of any characters.
  - _ represent any single character.

Thank you!

Nilesh Ghule <nilesh@sunbeaminfo.com>