



# MySQL - RDBMS

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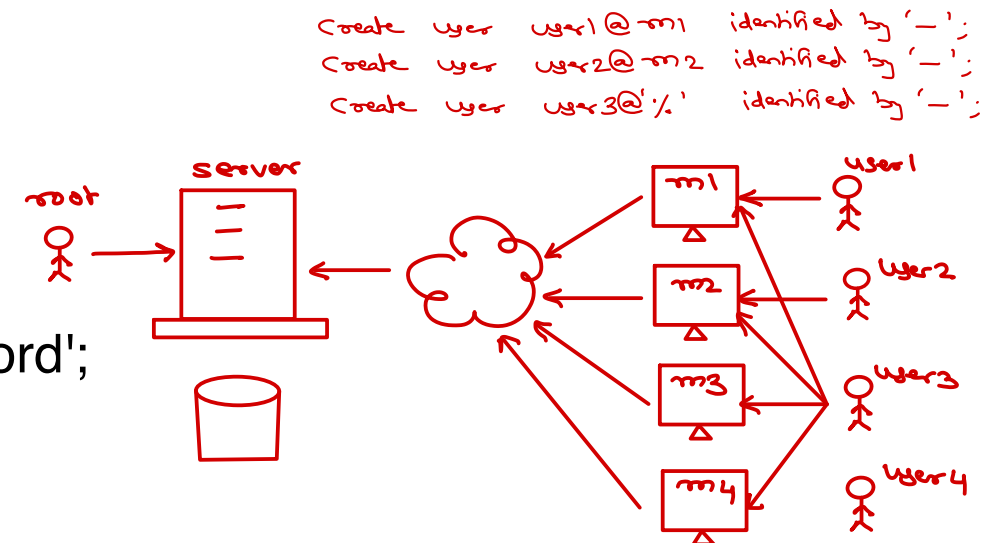
# Data Control Language

- Security is built-in feature of any RDBMS. It is implemented in terms of permissions (a.k.a. privileges).
- There are two types of privileges.
- System privileges
  - Privileges for certain commands i.e. CREATE, ALTER, DROP, ...
  - Typically these privileges are given to the database administrator or higher authority user.
- Object privileges
  - RDBMS objects are table, view, stored procedure, function, triggers, ...
  - Can perform operations on the objects i.e. INSERT, UPDATE, DELETE, SELECT, CALL, ...
  - Typically these privileges are given to the database users.



# User Management

- User management is responsibility of admin (root).
- New user can be created using CREATE USER.
  - CREATE USER user@host IDENTIFIED BY 'password';
  - host can be hostname of server, localhost (current system) or '%' for all client systems.
- Permissions for the user can be listed using SHOW GRANTS command.
  - SHOW GRANTS FOR user@host;
- Users can be deleted using DROP USER.
  - DROP USER user@host;
- Change user password.
  - ALTER USER user@host IDENTIFIED BY 'new\_password';
  - FLUSH PRIVILEGES;



# Data Control Language

- Permissions are given to user using GRANT command.
  - GRANT CREATE ON db.\* TO user@host;
  - GRANT CREATE ON \*.\* TO user1@host, user2@host;
  - GRANT SELECT ON db.table TO user@host;
  - GRANT SELECT, INSERT, UPDATE ON db.table TO user@host;
  - GRANT ALL ON db.\* TO user@host;
- By default one user cannot give permissions to other user. This can be enabled using WITH GRANT OPTION.
  - GRANT ALL ON \*.\* TO user@host WITH GRANT OPTION;
- Permissions assigned to any user can be withdrawn using REVOKE command.
  - REVOKE SELECT, INSERT ON db.table FROM user@host;
- Permissions can be activated by FLUSH PRIVILEGES.
  - System GRANT tables are reloaded by this command. Auto done after GRANT, REVOKE.
  - Command is necessary is GRANT tables are modified using DML operations.



# Index

- Index enable faster searching in tables by indexed columns.
  - `CREATE INDEX idx_name ON table(column);`
- One table can have multiple indexes on different columns/order.
- Typically indexes are stored as some data structure (like BTREE or HASH) on disk.
- Indexes are updated during DML operations. So DML operation are slower on indexed tables.



# Query performance

- Few RDBMS features ensure better query performance.
  - Index speed up execution of SELECT queries (search operations).
  - Correlated sub-queries execute faster.
- Query performance can be observed using EXPLAIN statement.
  - EXPLAIN FORMAT=JSON SELECT ...;
- EXPLAIN statement shows
  - Query cost (Lower is the cost, faster is the query execution).
  - Execution plan (Algorithm used to execute query e.g. loop, semi-join, materialization, etc).
- Optimizations can be enabled or disabled by optimizer\_switch system variable.
  - SELECT @@optimizer\_switch;
  - SET @@optimizer\_switch='materialization=off';





Thank you!

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