

## Databases

### An Introduction

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#### What is a database?

A database is a collection of information that is organized so that it can easily be accessed, managed, and updated.

This is *NOT* a database class, so we will ignore most things, but from an Systems Administration perspective, knowing how to install, configure, and manage a database is important. Rather, being able to do these to a DBMS is important.

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#### What is a DBMS?

- Database Management System.
    - Allows us to manage a collection of databases
    - Also consists of access controls, user information, and database metadata
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#### DBMS Notes

- Users are independent of system users
    - DBMS has own set of users and passwords
  - Users are identified by username *AND* hostname
    - `joe@localhost` and `joe@www.thegummibear.com` are two different users
  - Access controls are given on a per-database / per-user instance
  - User and access control management are administrative actions (the kind we care about)
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#### A few random terms

- Database
    - A collection of tables
  - Table
    - A collection of rows and columns (in db lingo, these are records and fields respectively)
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#### DBMS Actions we care about

- User management
    - add, modify, delete
  - Database management
    - add, delete databases
  - Permissions or user account controls for a database
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#### Non-administrative actions (we only moderately care about)

- Create, Modify, Delete tables
  - Add, update, delete records of a table
  - Retrieve information from a table
  - With RDBMS, these are usually performed using SQL.
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#### DBMS commands we really care about

- To add a user
    - `create user 'fred'@'localhost' identified with mysql_native_password by 'SecretPass123?'`.
  - To remove a user:
    - `drop user 'fred'@'localhost';`
  - Grant permissions
    - `grant all privileges on sampledb.* to 'fred'@'localhost';`
    - this is the most common grant statement, but instead of `all`, you could grant one or all of `select`, `insert`, `update`, `delete` (and more).
  - Revoke permissions
    - `revoke all privileges on sampledb.* from 'fred'@'localhost';`
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## DBMS commands we kind of care about

- Select a database to perform operations on
    - `use mysql;`
    - `use sampledb;`
  - See permissions for a user (after you have selected the mysql db)
    - `select User,Host,Db from db;`
  - See users that you have created
    - `select User,Host from user;`
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## DBMS commands we don't really care about but we need to be able to do in order to test our permissions

- Create a database
    - `create database testdb`
  - Use it
    - `use testdb`
  - Show tables in the db
    - `show tables;`
  - Create a new table (this can be very complex, take the database class for this)
    - `create table numbers (x INT);`
    - Creates a table called numbers with a single field named `x` which is designed to store an integer.
    - `create table garbage (name VARCHAR(10), age INT);`
    - Creates a table named garbage with 2 fields, name and age. Other than that, it is beyond our course.
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## DBMS commands we don't really care about but we need to be able to do in order to test our permissions

- Delete a table
    - `drop table numbers`
  - Insert record (row) into table
    - `insert into numbers values (10);`
    - `insert into garbage VALUES ('tommy', 30);`
  - Delete a record
    - `delete from garbage where name='tommy';`
    - You probably don't really need to know this one.
  - Get info from a table
    - `Select * from numbers`
    - Shows all the records from the numbers table
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## RDBMS Install (Server)

- Install mysql-server package
- Install mysql-client package
- Remove unwanted users and database
- Enable remote connections
- Manage users and databases

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## RDBMS Install (Client)

A client may want to access a database. I.e. a web server may want to load dynamic content from a database onto a website.

Steps:

- connect to db server socket (3306?)
- authenticate with user/pass
- choose db to use
- manipulate tables of db (or read data)
- I usually install the `mysql-tools` package to test connectivity