Database Fundamentals & PostgreSQL Setup

What Is a Database?

- A database is an organized collection of data stored and accessed electronically.

- A database is an organized collection of data that can be easily accessed, managed, and updated.

Why do we need databases?

- To store large amounts of information

- To retrieve data quickly

- To organize information efficiently

- To ensure data integrity

- To support multiple users at the same time

Types of Databases:

- **Relational Databases (SQL)**
    - Use tables (rows & columns)
    - Examples: PostgreSQL, MySQL, Oracle, SQL Server
- **NoSQL Databases**
    - Document stores, key-value stores, wide-column, graph
    - Examples: MongoDB, Redis, Cassandra
- **In-memory Databases**
    - Data stored in RAM
    - Example: Redis

PostgreSQL is a **relational database**, which is the most widely used model.

What Is PostgreSQL?

- Free & open-source

- Object-relational database system

- Very powerful, reliable, and secure

- Used by companies like Uber, Instagram

Key Database Concepts

- Tables - A table stores data in rows & columns.

- Rows - Each row = one record (example: one user, one order)

- Columns - Each column = attribute (example: name, email, price)

- Primary Key - Unique identifier for a row. (example: user_id, student_id)

- Foreign Key - Links data between tables. (example: order table referencing user table)

- Schema - Blueprint of tables and their relationships

Cont ...

- Relationships: One-to-One, One-to-Many, Many-to-Many

- Normalization: Reduces data redundancy by organizing tables

- Transactions & ACID: Ensures data integrity (Atomicity, Consistency, Isolation, Durability)

- NoSQL Types: Document, Key-Value, Wide-Column, Graph

- When to Use NoSQL: Unstructured data, scalability, flexible schema

PostgreSQL Setup Steps

Step 1: Install PostgreSQL

Download from: https://www.postgresql.org/download/

This installs:

- PostgreSQL server
- pgAdmin (GUI management tool)

Step 2: Open pgAdmin

- Connect to PostgreSQL server
- Create your first database

Reference

Windows installation guide:

https://www.enterprisedb.com/docs/supported-open-source/postgresql/installing/windows/

Linux installation guide:

https://www.enterprisedb.com/docs/supported-open-source/postgresql/installing/linux_x86_64/

Any questions?