

Chapter 2 - DB System Concepts and Architecture

Client / Server module: Separation of duties between client serving GUI, and server module handling data processing

Data Models / Schemas / Instances:

Data abstraction: Supression of details of data organization and storage

Data model: Collection of concepts used to describe DB structure

→ Conceptual data models represent data the way people do.

→ Low-level / physical data models represent lower, OS-level metrics

→ Representational data models are in-between e.g. relational data model

2.12 - Schemas / Instances / DB state

→ In a data model, it's important to distinguish between description of the database, and the database itself.

Schema diagram → Way of displaying database schemas

STUDENT			
Name	Student_number	Class	Major

COURSE			
Course_name	Course_number	Credit_hours	Department

→ Example schema diagram

→ Schema is sometimes referred to as intension, and the database state is called the extension

2.21 - Three Schema Architecture

→ Goal: separate the user applications from the physical database

Internal model / level: physical data storage

Conceptual level: hides details of physical storage; focuses on describing entities and relationships

External level: Views available to the user that come from schemas

→ Each data request goes through the three levels: (1) external, then (2) conceptual, then (3) internal.

Summary: Databases use client / server model. DB abstracts hide details of data storage. Most DBMS differentiate between description of the data, and the data itself.

Chapter 2 - DB Systems Concepts & Architecture

2018-08-31

2.2.2 - Data Independence

Data independence: Capacity to change schema at one level of DB system without having to change schema at the next highest level

↳ Logical data independence: Being able to change conceptual schema without having to change external schema or programs

↳ Physical data independence: Being able to change internal schema without having to change the conceptual schema.

→ Logical data independence is harder to achieve since the application references specific schemas.

2.3.1 - DBMS Languages

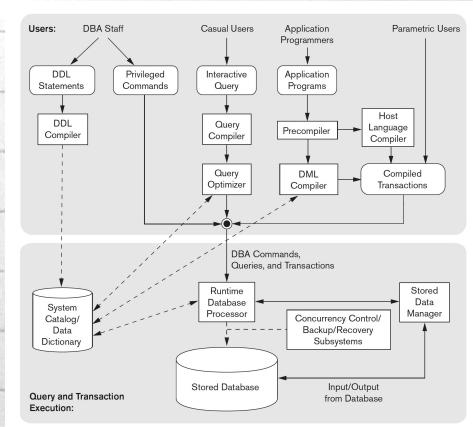
→ Data definition language (DDL) → Used to define conceptual and internal schemas.

↳ Most DBs only have DDL for the conceptual schema and external schema

→ Data Manipulation Language (DML) → Language used for manipulating DB

↳ SQL is the most common data manipulation language, and is a high-level query language

2.4.1 - DBMS Component Modules



→ Most DBMSs have buffer management for performance reasons

→ Casual users use interactive queries

- Runtime database processor handles most interactions between users and the database

- Stored data manager handles low-level read/write operations

Chapter 2 - DB System Concepts & Architecture

2018-08-31

2.5.3 - Two-tier Client/Server Arch

→ Two-tier: Clients running ODBC/JDBC connect to the database servers, which handle SQL transactions, and are thus called query servers.

2.5.4 - Three / N-tier Architecture

→ Modern programs add a middle-layer called the application server, or web server.

→ Presentation layer, business logic layer, and data management layer.

2.6 - Classification

- * First criterion: We can categorize DBMSs based on the data model: Relational, object, object-relational, NoSQL, Key-value, hierarchical, network and other.
 - Second criterion: Number of users (single-user or multi)
 - Third criterion: Number of sites, or distributed vs. non-distributed
 - Federated DBMS: multiple databases stored in heterogeneous environments!
 - Fourth criterion: cost!
- Main criterion: Data model: Relational DBs have relational data model, and object data model
- Big data: (1) Key-value model, (2) document data model, (3) graph data model, (4) column-based data model