IT Department

Data Models and Database Schema

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Outline

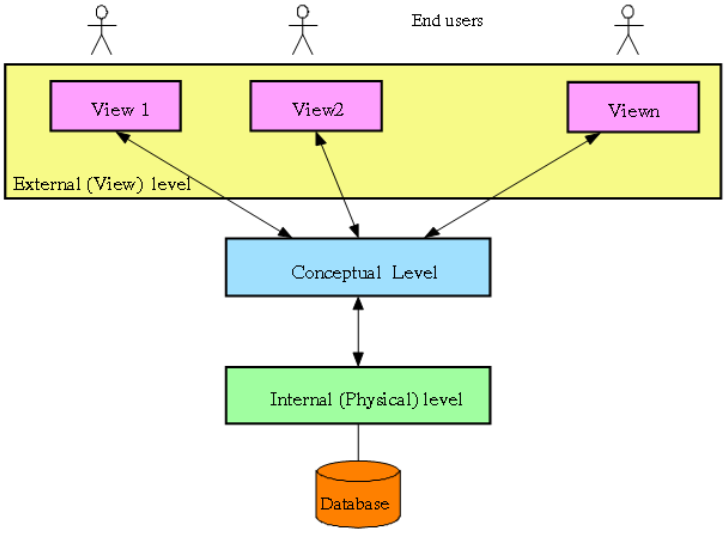
- **Three-Level Database Architecture**
- **Data Models**
  - **Relational** Model
  - **Entity-Relationship** Model (**E-R** Diagram)
- **Database Schema**
- **Entity, Attributes, Relationships and Cardinality of Relationships**

Abstraction

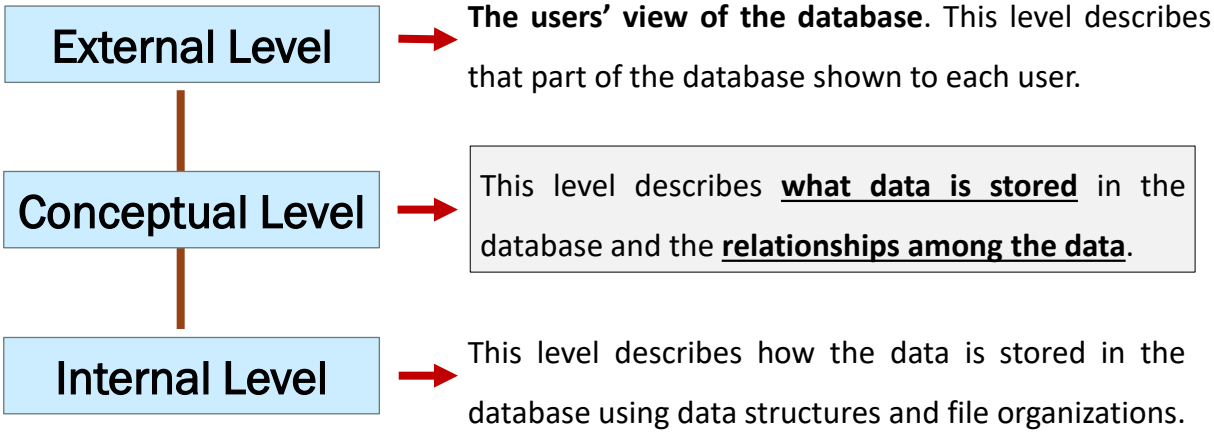
- A major aim of a database system is to provide users with an **abstract view of data**,
  - hiding certain details of how data is stored and manipulated.
- So, the starting point for the design of a database must be **an abstract and general description of the information requirements of the organization** that is to be represented in the database.

Three-Level Database Architecture

- Levels of Abstraction:
  - **External** Level
  - **Conceptual** Level
  - **Internal** Level



Database architecture levels in simple words



Database Schema

- **Database Schema** → The overall design of the database.
- There are three different types of schema in the database:
  - **External** Schema
  - **Conceptual** Schema
  - **Internal** Schema
- There is only **one conceptual schema** and **one internal schema** per database.
- There is **more than one external schema** per database, as each external schema is for one user's view.

Main Reason for Creating Three-Level Architecture:

Keeping the physical database separate from the user applications by hiding technical details.

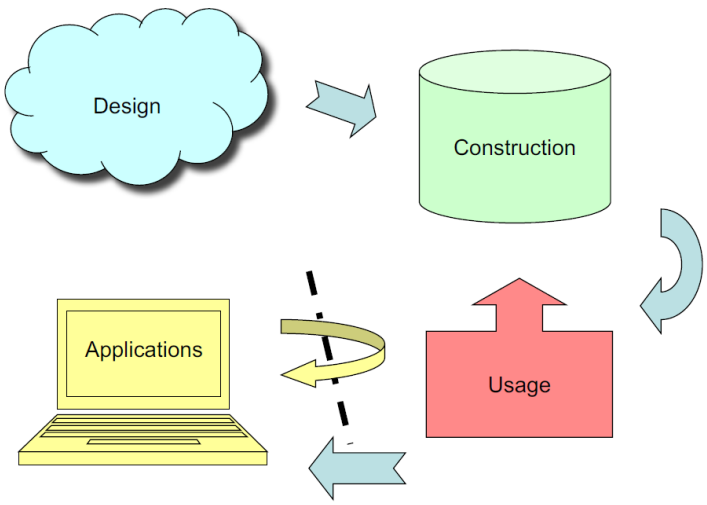
Data Models

- A **data model** is a collection of concepts for describing and manipulating data, relationships between data, and constraints (rules) on the data in an organization.
- In other words, data models show how data in the database are:
  - **Stored**
  - **Connected**
  - **Accessed**
  - **Updated**.

Data Model Types in Database Systems

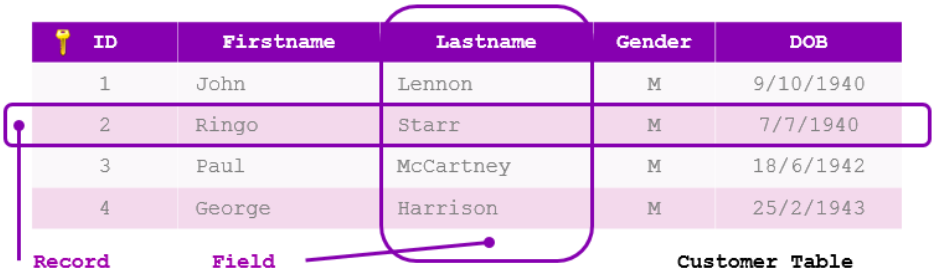
- **Relational Model** ← The most widely used data model
- **Entity-Relationship (ER) Model**
- Network Model
- Object-Oriented Data Model
- Object-Relational Data Model
- Hierarchical Data Model
- …

Database Design, Construction, Usage and Applications



Relational Data Model

- Stores data in a structured format, using **fields** and **records**.
- In the relational model:
  - The term **relation** refers to a table,
  - The term **record** refers to a row,
  - The term **field** refers to a column of a table.



ID	Firstname	Lastname	Gender	DOB
1	John	Lennon	M	9/10/1940
2	Ringo	Starr	M	7/7/1940
3	Paul	McCartney	M	18/6/1942
4	George	Harrison	M	25/2/1943

Customer Table

Example of a Relational Database

deptName	deptCode	office
Biology	BI03	B210
Computer Science	CS04	C004
English	EN05	E231
History	HI01	H111
Mathematics	MA02	M101
Sport	SP06	S098

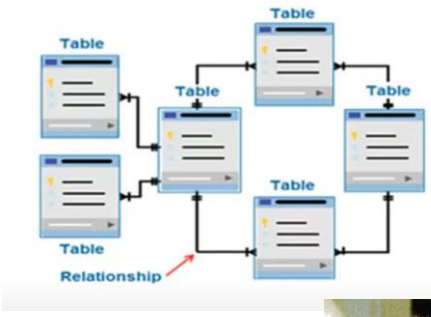
Department Table

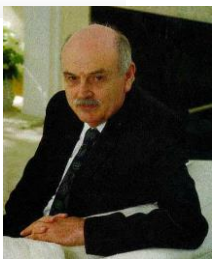
Student Table

stuId	lastName	firstName	major	credits
S1001	Smith	Tom	History	90
S1002	Chin	Ann	Mathematics	36
S1004	Smith	Jack	English	75
S1005	Lee	Perry	History	3
S1007	Streep	Sarah	English	81
S1010	Burns	Edward	Biology	63
S1011	Roberts	Mike	English	66

Relational DBMS

- **R**elational **DBMS** (**RDBMS**) is designed specifically for Relational Databases.
- Stores data in **tabular form**.
- **Edgar F. Codd** at **IBM** invented the relational database in 1970.





Examples of RDBMS

- **Microsoft Access**
- Microsoft SQL Server
- MySQL
- Oracle
- php MyAdmin
- PostgreSQL
- IBM DB2
- MariaDB
- …

Thank You!