Tishk International University
Department of Information Technology
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Database Systems I

Lecture 2

Data Models & Database Schema

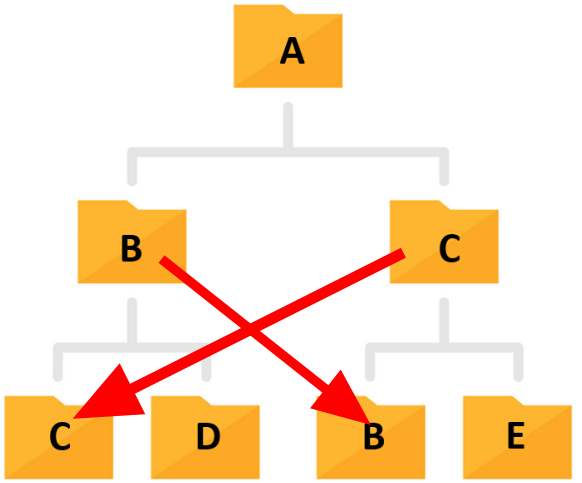
Wisam Abdulaziz Qadir
Wisam.abdulaziz@tiu.edu.iq

Objectives

- Drawbacks of using File System
- Advantages of DBMS
- Levels of Abstraction
- Data Models
- Relational Database & Relational DBMS
- Database Schema

Drawbacks of using File Systems

1. **Data redundancy:** Duplication of data in different files, this leads to memory wastage.



2. **Data Inconsistency:** Data is not in consistent state, because of data redundancy.

   Ex.: When you duplicate a file and you make some modification on only one of them, after that when you want to read the file which one should be read.

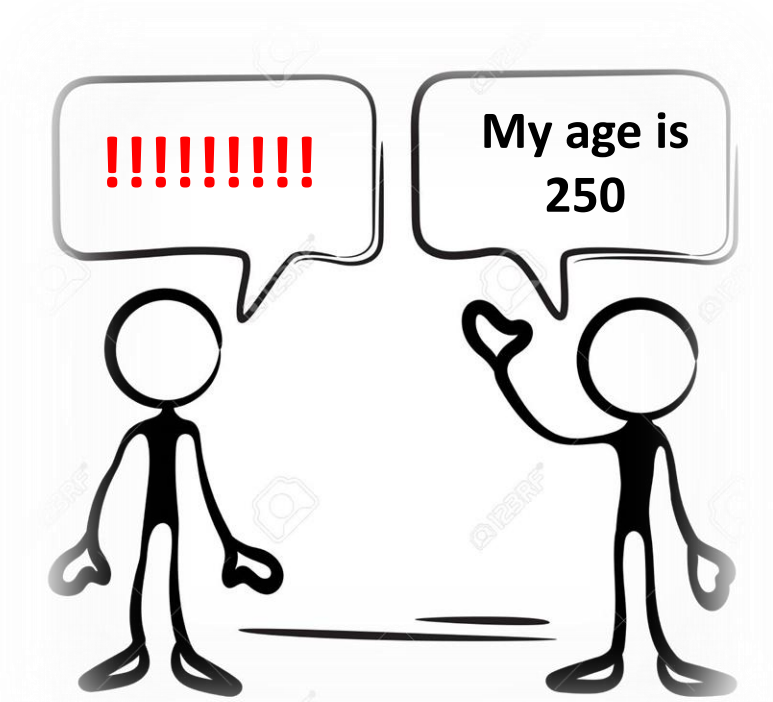
3. **Difficulty in accessing data:** It Needs to write a new program to carry out each new task.

Drawbacks of using File Systems (cont.)

4. **Limited Data Sharing:** It is difficult for applications to retrieve data that are stored in files with different formats (e.g.: .txt, .docs, .pdf,. .xml, etc.).

5. **Integrity problems:** Hard to add new constraints or change existing ones.

   (Data integrity means the data should be both correct and accurate.)



Drawbacks of using File Systems (cont.)

6. **Atomicity of update problems:** Failures may leave data in an inconsistent state when only partial updates carried out.

7. **Concurrent access problem by multiple users:** It cannot guarantee of the correctness of operations by different users at the same time.

8. **Security problems:** Hard to provide user access to some, but not all the data.

Advantages of DBMS over File Systems

- All the mentioned points about drawbacks of File Systems are advantages of DBMS as comparison to File Systems.

- Advantages of DBMS are:

  - No data redundancy
  - Data consistency
  - Simplicity in accessing data
  - Flexibility of Data Sharing
  - Fixing Integrity problems
  - No problems for atomicity of updates
  - Concurrent access by multiple users
  - High Security

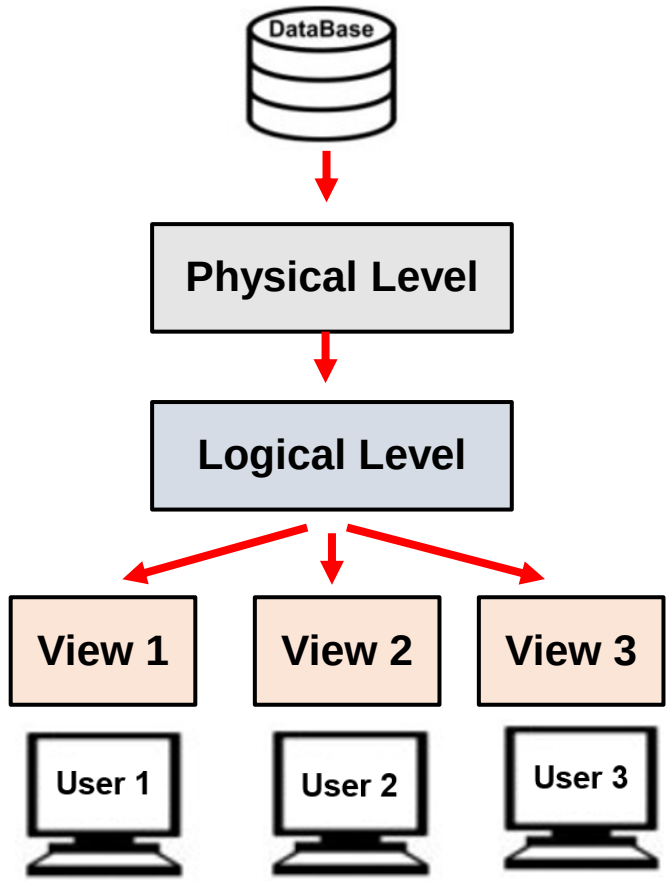
Levels of Abstraction

- Database systems are composed of complex data-structures. In order to make the system efficient in terms of retrieval of data, and reduce complexity in terms of usability of users, developers use **abstraction**.

- E.g.: Hide irrelevant details from the users. This approach simplifies database design.

Levels of Abstraction (cont.)

- **Physical level :** Describes how a record (e.g., customer names) is stored in memory.
- **Logical level :** Describes data stored in database in the form of tables, and the relationships among the data.
- **View level :** Only part of the actual database is viewed by the users.



Data Models

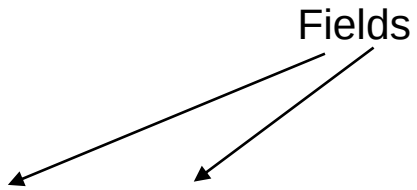
- Are used to show how data in the systems are:
  - Stored
  - Connected
  - Accessed
  - updated.

Data Model Types in DBMS

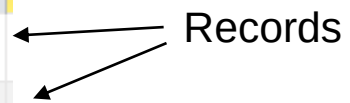
- Relational model  (is the most widely used model)
- Hierarchical Model
- Network Model
- Entity-Relationship Model
- Relational Model
- Object-Oriented Data Model
- Object-Relational Data Model
- Flat Data Model
- Semi-Structured Data Model
- Associative Data Model
- Context Data Model

Relational Model

- Stores data in a structured format, using fields and records.
- Table → Relation
- Column → Field
- Row → Record



ID	student_name	grade	subject	mark
1	Dara	2	Database 1	78
2	Zara	2	Database 1	76
3	Nasrin	2	Database 1	98
4	Azad	2	Database 1	96
5	Hawre	2	Database 1	67



Student table

Sample Relational Database

ID	student_name	dept_name	mark
1	Dara	IT	78
2	Zara	Computer Eng.	76
3	Nasrin	Architecture	98
4	Azad	IT	96
5	Hawre	Dentistry	67

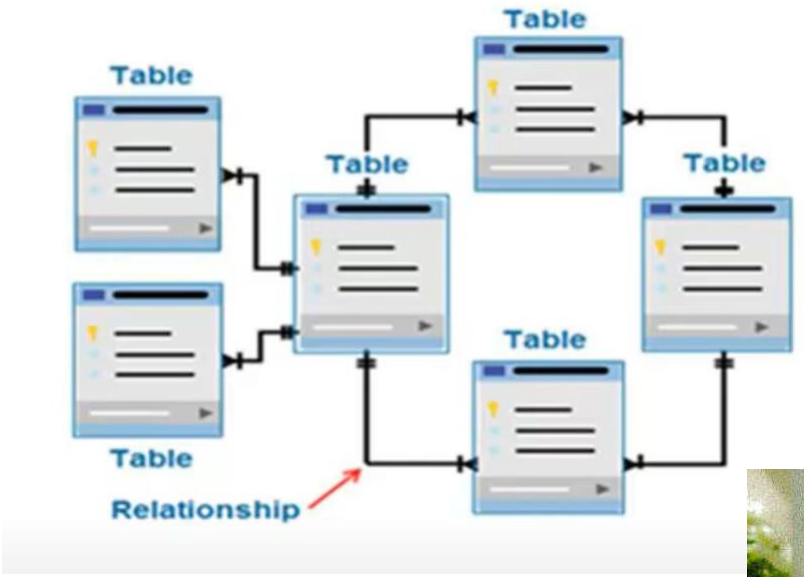
Student table

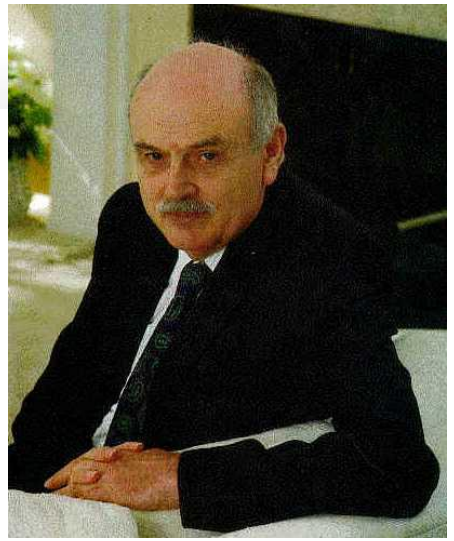
dept_name	building	no_of_students
IT	Main Building	80
Computer Eng.	Main Building	60
Architecture	Main Building	85
Dentistry	Dentistry Building	110
Mathematics	Education Building	40
Mathematics	Education Building	0

Department table

Relational DBMS

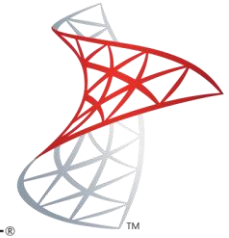
- Is designed specifically for Relational Databases.
- Stores data in tabular form.
- **Edgar F. Codd** at IBM invented the relational database in 1970.

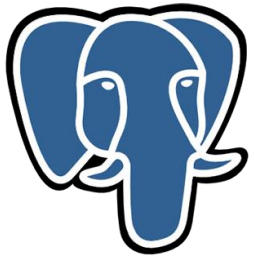




Typical RDBMS

- Microsoft Access
- MySQL
- Microsoft SQL Server
- Sybase
- IBM DB2
- Oracle
- php MyAdmin
- PostgreSQL
- etc.

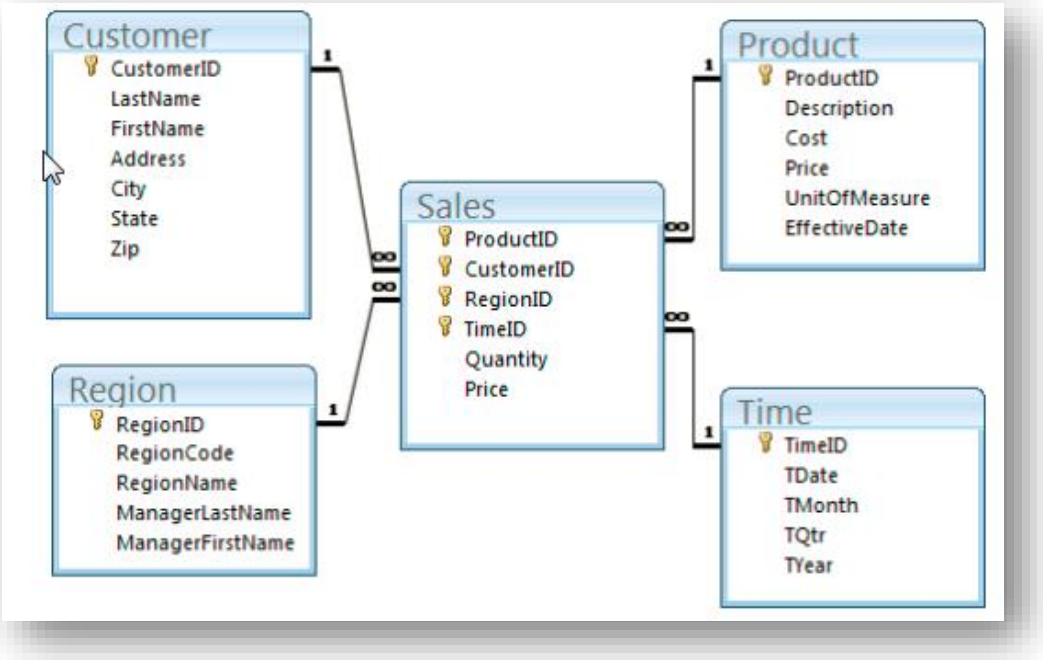




Database Schema (Database Diagram)

- It is the **skeleton structure** that represents the logical view of the entire database.

- It defines how the data is **organized** and how the **relations** are associated.



Thank You