
بسم الله الرحمن الرحيم

Database Systems
Lecture 5

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Lecture 5

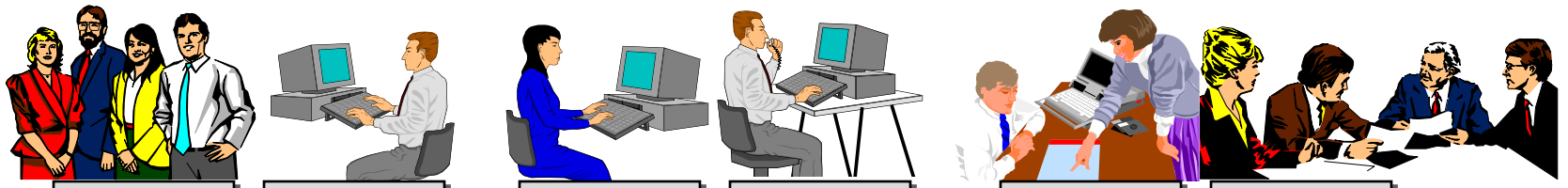
Data Independence and Evolution of DB Systems

Data Independence

- **Logical data independence**
  Immunity of external schemas to changes in the conceptual schema
- **Physical data independence**
  Immunity of the conceptual schema to changes in the internal schema

"Plug and Play!"

Database Environment



User | User | User | User | User | User

Subschema | Subschema | Subschema

Individual Views

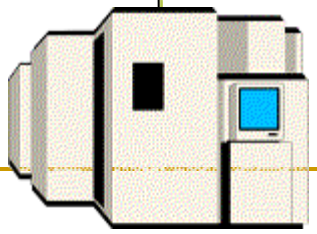
Schema

Complete catalog of all data retained in the database

DBMS Software

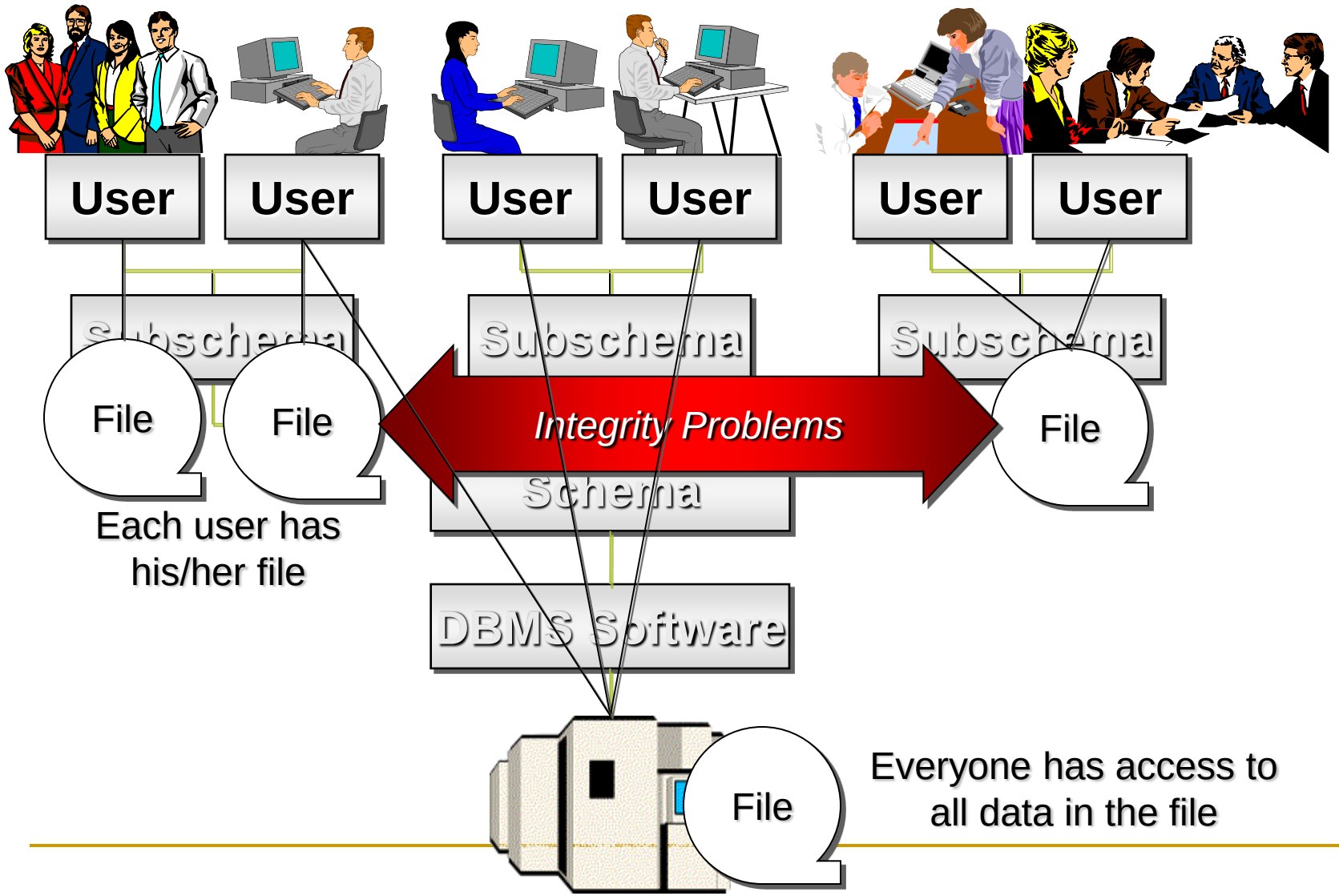
Manages the database

Shared and Managed



Physical Database

File-Based Systems



Database Languages: DDL vs. DML

- Data definition language (DDL)
  Used to describe name the entities required for the application and the relationships that may exist between the different entities
  - Specify or modify the database schema and subschemas
- Data manipulation language (DML)
  Provides a set of operations that support the basic data manipulation operations the data
  - Read and update (i.e., insert, update, delete) the database

Evolution of DB Systems

- Flat files - 1960s - 1980s
- Hierarchical – 1970s - 1990s
- Network – 1970s - 1990s
- Relational – 1980s - present
- Object-oriented – 1990s - present
- Object-relational – 1990s - present
- Data warehousing – 1980s - present
- Web-enabled – 1990s - present

Models

- Represents the real thing
- Identifies the components and their interactions
- Specifies the behavior

For exampl

Data Models

- An integrated collection of concepts for describing and manipulating data, relationships between data and constraints on the data in an organization
- Three components:
  - Structural part - set of rules applied to the construction of the database
  - Manipulative part - defines the types of operations allowed on the data
  - Integrity rules - ensures the accuracy of the data

Database Models

- Definition: collection of logical constructs used to represent data structure and relationships within the database
  - **Conceptual models:** logical nature of data representation; it emphasizes on what entity is presented; it is used for database design as blueprint
  - **Implementation models:** emphasis on how the data are represented in the database

Database Models

- **Conceptual models include**
  - Entity-relationship database model (ERDBD)
  - Object-oriented model (OODBM)
- **Implementation models include**
  - Hierarchical database model (HDBM)
  - Network database model (NDBM)
  - Relational database model (RDBM)
  - Object-oriented database model (ODBM)

Database Models (con't.)

- **Relationships in Conceptual Models**
  - One-to-one (1:1)
  - One-to-many (1:M)
  - Many-to-many (M:N)
- **Implementation Database Models**
  - Hierarchical
  - Network
  - Relational
  - Object-Oriented

Evolution of Database Modals