

Database Management Systems (CS-351)

Lecture 1: Overview

BTech 3rd Year (CSE)

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Outline

- The Need for Databases
- Data Models
- Relational Databases
- Database Design
- Storage Manager
- Query Processing
- Transaction Manager

Database Management Systems (DBMS)

- Interrelated data about a particular enterprise
- Set of programs/applications to access the data
- Examples in real life:
 - Banking: transactions
 - Airlines: reservations, schedules
 - Universities: registration, grades
 - Sales: customers, products, purchases
 - Online retailers: order tracking, customized recommendations
 - Manufacturing: production, inventory, orders, supply chain
 - Human resources: employee records, salaries, tax deductions

Why not File Systems?

- **Data redundancy and inconsistency** — Multiple file formats, duplication of information in different files.
- **Difficulty in accessing data** — Need to write a new program to carry out each new task.
- **Data isolation** — Multiple files and formats.
- **Integrity problems** — Integrity constraints are not stated explicitly. Hard to add new constraints or change existing ones.

Why not File Systems? (contd.)

- **Atomicity of updates** — Failures may leave database in an inconsistent state with partial updates carried out.
- **Concurrent access by multiple users** — Uncontrolled concurrent accesses can lead to inconsistencies.
- **Security problems** — Hard to provide user access to some, but not all, data.

Levels of Abstraction

- Physical level — describes how a record (e.g., instructor) is stored.
- Logical level — describes data stored in database, and the relationships among the data.
- View level — application programs hide details of data types.

Schema and Instance

- Logical Schema — the overall logical structure of the database
- Physical Schema — the overall physical structure of the database
- Instance — the actual content of the database at a particular point in time
- Physical Data Independence — the ability to modify the physical schema without changing the logical schema

Data Models

- A collection of tools for describing Data, Data relationships, Data semantics, Data constraints
- Relational model
- Entity-Relationship data model (mainly for database design)
- Object-based data models (Object-oriented and Object-relational)
- Semistructured data model (XML)
- Other older models: Network model, Hierarchical model