

Introduction to Database Systems



Why Study Databases??



- ❖ Shift from *computation* to *information*
 - at the “low end”: scramble to webspace (a mess!)
 - at the “high end”: scientific applications
- ❖ Datasets increasing in diversity and volume.
 - Digital libraries, interactive video, Human Genome project, EOS project
 - ... need for DBMS exploding
- ❖ DBMS encompasses most of CS
 - OS, languages, theory, “AI”, multimedia, logic

What Is a DBMS?



- ❖ A very large, integrated collection of data
- ❖ Models real-world *enterprise*
 - Entities (e.g., students, courses)
 - Relationships (e.g., Madonna is taking CS432)
- ❖ A *Database Management System (DBMS)* is a software package designed to store and manage databases

Why Use a DBMS?



- ❖ Reduced application development time (Queries)
- ❖ Data independence and efficient access
- ❖ Concurrent access
- ❖ Crash recovery
- ❖ Uniform data administration

Data Models

- ❖ A *data model* is a collection of concepts for describing data.
- ❖ A *schema* is a description of a particular collection of data, using the a given data model.
- ❖ The *relational model of data* is the most widely used model today.
 - Main concept: *relation*, basically a table with rows and columns.
 - Every relation has a *schema*, which describes the columns, or fields.

Queries

Data Independence

- ❖ Applications insulated from how data is structured and stored.
- ❖ *Physical data independence*: Protection from changes in *physical* structure of data.
- ❖ *Logical data independence*: Protection from changes in *logical* structure of data.

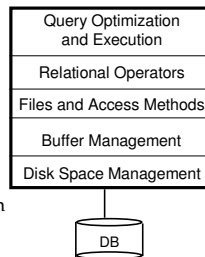
☒ One of the most important benefits of using a DBMS!

Concurrency Control

Recovery

Structure of a DBMS

- ❖ A typical DBMS has a layered architecture.
- ❖ The figure does not show the concurrency control and recovery components.
- ❖ This is one of several possible architectures; each system has its own variations.



Summary

- ❖ DBMS used to maintain, query large datasets.
 - Benefits include quick application development, data independence, concurrency control, recovery
- ❖ A DBMS typically has a layered architecture.
- ❖ DBMS R&D is one of the broadest, most exciting areas in CS.
- ❖ DBAs hold responsible jobs and are well-paid!

