Introduction to Database Systems

Chapter 1

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, "A"I, 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
- 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.

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.

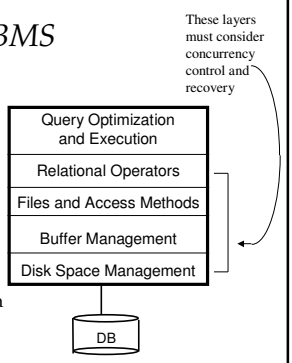
☛ *One of the most important benefits of using a DBMS!*

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!