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!
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.

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!