

Introduction to Introduction to Database Systems

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Role Call

- Please...
 - Correct my mispronunciations
 - Let me know your preferred name



Introductions

- Name
- Major
- Hometown
- An interesting fact about you that others at Rose probably don't know



Course Overview

- Materials on Angel
 - Most also on web and AFS:
www.rose-hulman.edu/Class/csse/csse333
- Test-first teaching
- Syllabus
- Schedule

What databases do you
interact with in a typical
week?



Types of Databases

- ❑ Traditional (numeric, textual)
- ❑ Multimedia
- ❑ Geographic Information Systems
- ❑ Data Warehouses
- ❑ Active Databases



Database: A Collection of Data with Three Properties

- Abstraction of “real world”
- Logically coherent
- Designed to fulfill a purpose



Some Other Terms

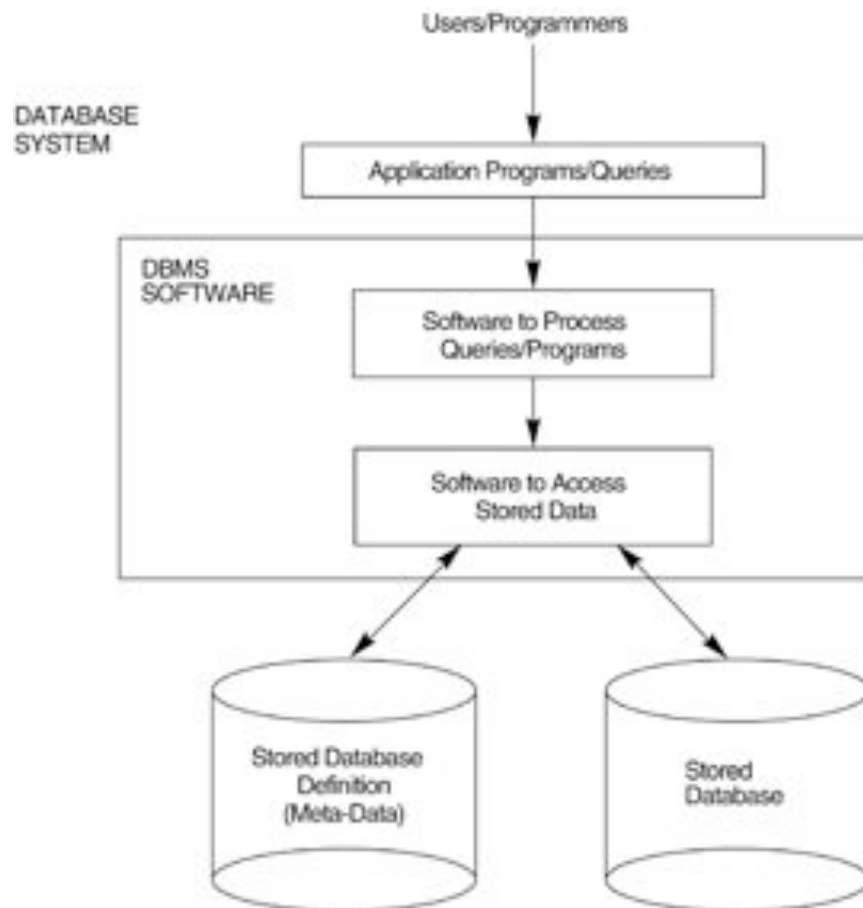
- Data
 - Known facts with implicit meaning
- Mini-world
 - Part of “real” world about which data is stored
- DBMS or Database Management System
 - Software system for creating/maintaining a computerized database
- Database System
 - DBMS + data + applications



DBMS Must Allow

- ❑ **Definition** of data types, structures, constraints
- ❑ **Construction** of database on physical media
- ❑ **Manipulation** to answer queries and add, delete, or modify data
- ❑ **Concurrent access** for multiple users
- ❑ **Secure access** to sensitive data
- ❑ **Active processing** in response to data changes

Database System Architecture





Running Example: University DB

- Entities
 - The **things** that the database tracks
- Relationships
 - How the entities go together

Sample University Data

- Typically a table for each kind of entity
- Rows represent entities
- Columns represent attributes
- Example...

STUDENT	Name	Number	Class	Major
	Smith	6152	2006	CS
	Jones	8941	2007	CS

Views

- Ways of looking at data
- Not necessarily stored in actual tables

(a)

TRANSCRIPT	StudentName	Student Transcript				
		CourseNumber	Grade	Semester	Year	SectionId
Smith	Smith	CS1310	C	Fall	99	119
		MATH2410	B	Fall	99	112
Brown	Brown	MATH2410	A	Fall	98	85
		CS1310	A	Fall	98	92
		CS3320	B	Spring	99	102
		CS3380	A	Fall	99	135

(b)

PREREQUISITES	CourseName	CourseNumber	Prerequisites
Database	Database	CS3380	CS3320
			MATH2410
Data Structures	Data Structures	CS3320	CS1310



Why use databases at all?



Database Stakeholders

- ❑ Workers behind the scenes
- ❑ Workers on the scene
- ❑ End Users
- ❑ Other stakeholders



Workers Behind the Scenes

- DBMS designers
- Tool developers



Workers on the Scene

- DBAs—Database Administrators
 - Control access
 - Monitor use
 - Acquire resources
 - Monitor efficiency
- Database Designers
 - Communicate with end users
 - Define content, structure, and constraints on data



End Users (1/2)

- Casual end users
 - Occasional access as needed
- Naïve (or parametric) end users
 - Use “canned transactions”
 - E.g, bank teller, airline desk agent
 - Typically majority of database use is by naïve end users



End Users (2/2)

- Sophisticated End Users
 - Write custom queries against database
 - E.g., business analysts, scientists, engineers
- Stand-alone End Users
 - Maintain personal databases using COTS packages
 - E.g., iTunes, TurboTax



Database Advantages

- ❑ Are Self-describing
- ❑ Provide Program-Data Independence
- ❑ Require Data Abstraction
- ❑ Show Multiple Views
- ❑ Allow Multi-user Data Sharing



Other Database Advantages

- ❑ Control of redundancy
- ❑ Security enforcement
- ❑ Persistence
- ❑ Efficient data retrieval
- ❑ Robustness
- ❑ Representation of complex relationships
- ❑ Data integrity
- ❑ Referential integrity
- ❑ Deductive capability
- ❑ Standards enforcement
- ❑ Fast application development
- ❑ Flexibility
- ❑ Concurrency management
- ❑ Economies of scale



Database Disadvantages

- ❑ Significant initial financial investment
- ❑ Can increase system overhead
- ❑ Limit rapid prototyping
- ❑ Don't handle rapid changes in data collected
- ❑ Require support resources



Don't Use a Database When System...

- ❑ Has no need for persistence
- ❑ Is computationally, not data, intensive
- ❑ Has a single user and simple data
- ❑ Uses very static data