Introduction to Databases

CS4444: DBMS
C-Term, Fall 2002
Course Instructor: Aparna Varde
Data in various domains

- Give examples of data you deal with on a day-to-day basis...

- Doctors: Patient diagnostics
- Lawyers: Client histories
- Managers: Employee records
- Teachers: Student profiles
- Students: Course information
Data Storage

Documents (e.g. Word)

Flat files (Handwritten)

Raw Data (Scattered)

Simple Tables (statistical info)

Images (photos etc.)

Human Mind (too much data)
Need for integration

- Have all the data in one place
- Easy storage
- Fast retrieval
- Simple to change information
- Security esp. with multiple users
- Recovery from failures
Databases

- **Database**: a collection of data that is organized so that its contents can easily be accessed, managed, and updated.
- **DBMS (DataBase Management System)**: a collection of programs that enables users to create and maintain a database.
- **Database System**: Database + DBMS + application programs/queries.
Database System Environment

End-Users

Application Programs/Queries

DBMS Software

Database

Database System
Types of DBMS

- **Relational (RDBMS):** Tables with Rows & columns
- **Object-Oriented (OODBMS):** Objects and Classes like OO-Programming
- **Object-Relational (ORDBMS):** Combination of the two
- **Most common today is RDBMS**
Example of Relational Database

### Book

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<th>Price</th>
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<td>420.00</td>
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<td>TH111</td>
<td>Metals</td>
<td>K.Dalton</td>
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### Author

<table>
<thead>
<tr>
<th>SSN</th>
<th>Name</th>
<th>Address</th>
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</tr>
</thead>
<tbody>
<tr>
<td>111 67 8999</td>
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</tr>
</tbody>
</table>
Terminology

- **Table**: Database representation of an entity in real world, e.g. book table.
- **Schema**: Structure of DB, not content e.g. the tables without entries.
- **Tuple**: Instance of entity, row in DB e.g. each book in the book table.
- **Attribute**: Property of entity, column in DB e.g. author, title.
Terminology (contd...)

- **Primary Key**: Attribute(s) that uniquely identify a tuple, e.g. ISBN number
- **Foreign Key**: Attribute(s) connecting two or more tables, e.g. author
- **View**: Subset derived from database e.g. view of authors and titles only.
- **Meta-Data**: Data about data e.g. in library, books form data, catalog forms meta data
Roles in the database world
(You could be one of these)

- Database Administrator
- Database Designers
- End-Users
- System Analysis & Application Developers
In-class Assignment (15 minutes)

- Make groups of four (people next to you)
- Think of one sample application where you may need databases
- Design on paper the tables needed for this application (at least two tables) and populate them with sample data
- Identify the following in your tables
  - Primary keys, foreign keys
  - Tuples and attributes
  - Meta data
Advantages of DBMS

- Control redundancy
-Restrict unauthorized access
-Provide persistent storage for data
-Represent relationships among data
-Enforce integrity constraints
-Provide backup and recovery
-Allow Concurrency Control
Popular DBMS packages

- **Oracle**: Developed by Oracle, provides relational and OR features
- **Sybase**: Developed by Sybase Inc., has offshoots like Websql
- **MS Access**: Developed by Microsoft, good for PCs.
Summary

- Need for data integration
- Database, DBMS, Database system
- Types of DBMS
- Terminology w.r.t. relational
- Database roles
- Advantages of DBMS
- Popular DBMS packages
Home-work 1 (to be turned in hard copy at beginning of class 2)

Part 1 (to be done individually)
- Collect and store data for a sample application in your domain without using databases. Run simple retrieval tasks on your data.

Part 2 (teams of four)
- Discuss the difficulties involved in the above task. Record difficulties of each member in your team including yourself.
Lab 1 (to be turned in electronically in the week after class 2)

- Get an account on Oracle from the CCC
- Then do the following
  - Login to wpi.wpi.edu
  - At prompt, say "source coraenv"
  - Then enter, "sqlplus"
  - System will prompt you for Oracle username and password. Enter that.
- Refer to Chapter 1 of the Oracle handbook.
  - Create the simple database with 3 tables as explained in the example there.
  - Populate the table with sample entries from the manual
  - Turn in an electronic screen dump of created, populated tables in the database.