Chapter 9:
Database Systems

Computer Science: An Overview
Twelfth Edition

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Altered by N. Harris

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PEARSON


I THINK WE SHOULD BUILD AN SQL DATABASE.
UH-OH
DOES HE UNDERSTAND WHAT HE SAID OR IS IT SOMETHING HE SAW IN A TRADE MAGAZINE AD?
S.Adams
© 1995 United Feature Syndicate, Inc.(NYC)
WHAT COLOR DO YOU WANT THAT DATABASE?
I THINK MAUVE HAS THE MOST RAM.

Objectives of today's session

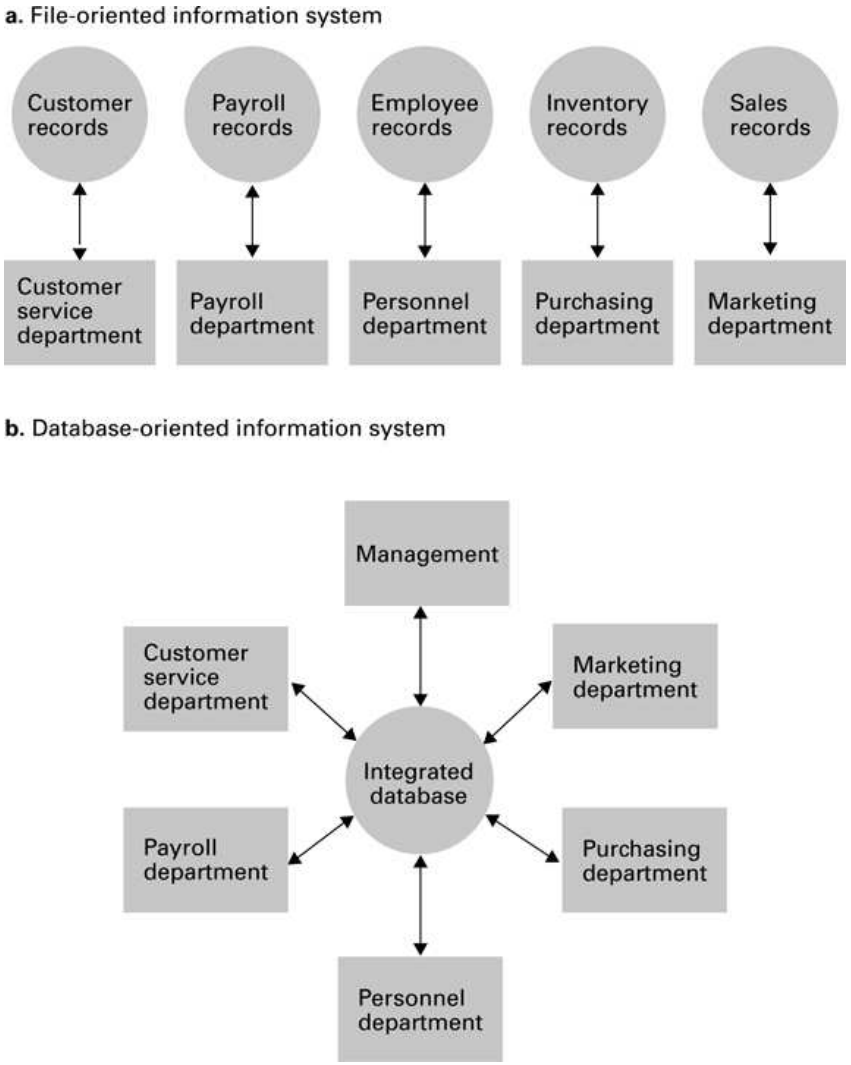
- Introduce you to the terminology of databases if this is unfamiliar
- Describe the context of databases (why are they necessary)
- Give you a chance to practice writing queries using a postgresql database.

Database

A collection of data that is multidimensional in the sense that internal links between its entries make the information accessible from a variety of perspectives – Brookshear

“A usually large collection of data organized especially for rapid search and retrieval (as by a computer)” – MerriamWebster online

Figure 9.1 **A file versus a database organization**



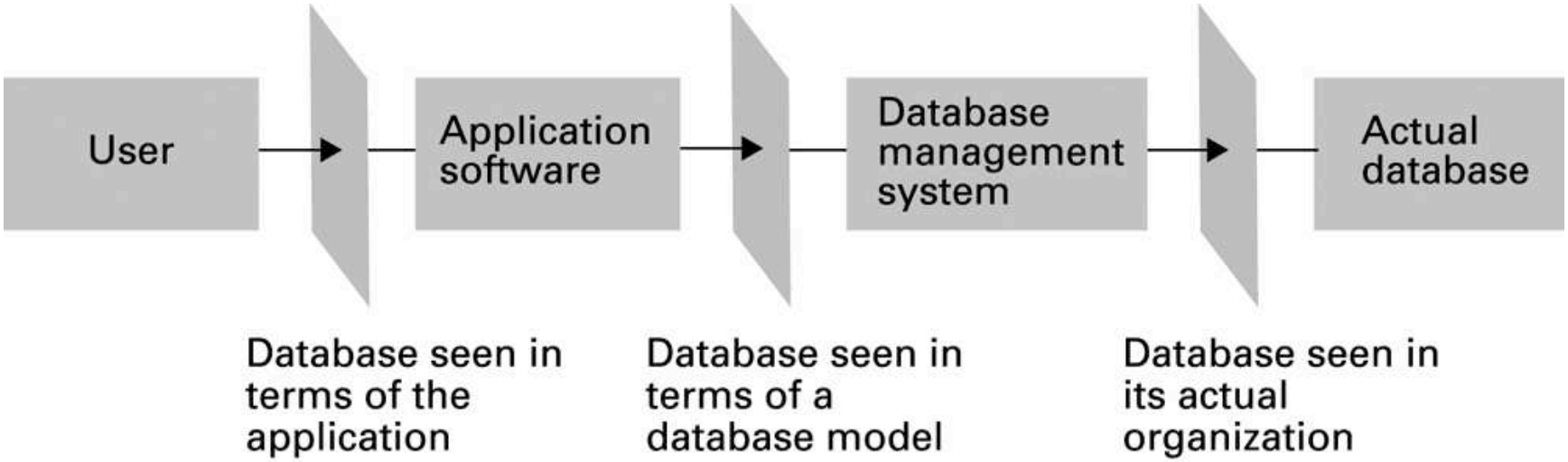
Excel “dbs”

Database Management Systems

- **Database Management System** (DBMS): A software layer that manipulates a database in response to requests from applications

- **Distributed Database:** A database stored on multiple machines
  - DBMS will mask this organizational detail from its users

Figure 9.2 The conceptual layers of a database implementation



Data independence: The ability to change the organization of a database without changing the application software that uses it

Schemas

- **Schema:** A description of the structure of an entire database, used by database software to maintain the database
- **Database model:** A conceptual view of a database
  - Relational database model
  - Object-oriented database model

Relational Database Model

- **Relation:** A rectangular table
  - **Attribute:** A column in the table
  - **Tuple:** A row in the table

Empl Id	Name	Address	SSN
25X15	Joe E. Baker	33 Nowhere St.	111223333
34Y70	Cheryl H. Clark	563 Downtown Ave.	999009999
23Y34	G. Jerry Smith	1555 Circle Dr.	111005555
•	•	•	•
•	•	•	•
•	•	•	•

Activity – Given the database displayed…

Figure 9.5 An employee database consisting of three relations

EMPLOYEE relation

Empl Id	Name	Address	SSN
25X15	Joe E. Baker	33 Nowhere St.	111223333
34Y70	Cheryl H. Clark	563 Downtown Ave.	999009999
23Y34	G. Jerry Smith	1555 Circle Dr.	111005555

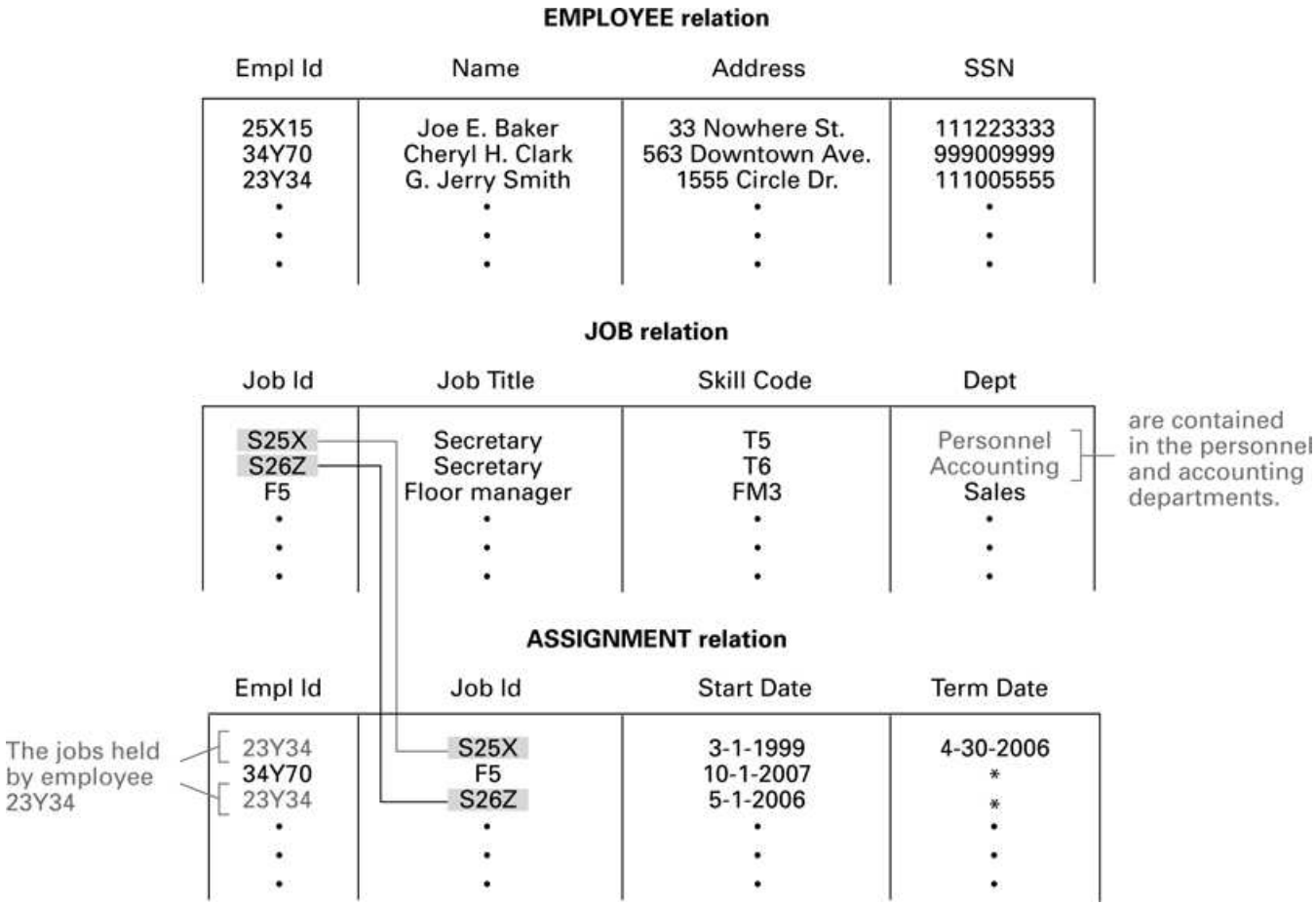
JOB relation

Job Id	JobTitle	Skill Code	Dept
S25X	Secretary	T5	Personnel
S26Z	Secretary	T6	Accounting
F5	Floor manager	FM3	Sales
•	•	•	•
•	•	•	•
•	•	•	•

ASSIGNMENT relation

Empl Id	Job Id	Start Date	Term Date
23Y34	S25X	3-1-1999	4-30-2006
34Y70	F5	10-1-2007	*
23Y34	S26Z	5-1-2006	*
•	•	•	•
•	•	•	•
•	•	•	•

Figure 9.6 Finding the departments in which employee 23Y34 has worked



Structured Query Language (SQL)

- Operations to manipulate tuples
  - insert
  - update
  - delete
  - select

Structured Query Language

- Common among relational database systems.
- Each will have its own “dialect” … functions or conventions
- Consists of a series of “clauses”
- We will focus on the SELECT operation

SQL Examples

```
SELECT EmplId, Dept
FROM Assignment JOIN Job
ON Assignment.JobId = Job.JobId
WHERE Assignment.TermData = '*';
```

- SELECT chooses fields
- FROM chooses the tables
- ON describes how to join the tables
- WHERE defines the condition (true display)

SQL Examples (continued)

- ```
  DELETE FROM Employee
  WHERE Name = 'G. Jerry Smith’;
  ```

- ```
  UPDATE Employee
  SET Address = '1812 Napoleon Ave.'
  WHERE Name = 'Joe E. Baker’;
  ```

- ```
  INSERT INTO Employee
  VALUES ('43212', 'Sue A. Burt',
            '33 Fair St.', '444661111');
  ```
  ```

Lab: Let's Try SQL

Object-relational database system.
Open source.

PGAdmin is a graphical tool which you can use to manipulate your databases.

Login

- Login to the lab machines using the student login (student – CSLab248)
- Open the pgAdmin tool.
- Put in the password CTA2014 when prompted.

Queries

- First start with select and a single table.
- Stop and we'll then move on to joining tables together.
- This is just a taste of SQL. There is always much more to learn.

Social Impact of Database Technology

- Problems
  - Massive amounts of personal data are being collected
    - Often without knowledge or meaningful consent of affected people
  - Data merging produces new, more invasive information
  - Errors are widely disseminated and hard to correct
- Remedies
  - Existing legal remedies often difficult to apply
  - Negative publicity may be more effective

Lab: Let's Try SQL