

## 16.1 Databases-Reading

**Notebook:** How Computers Work [CM1030]

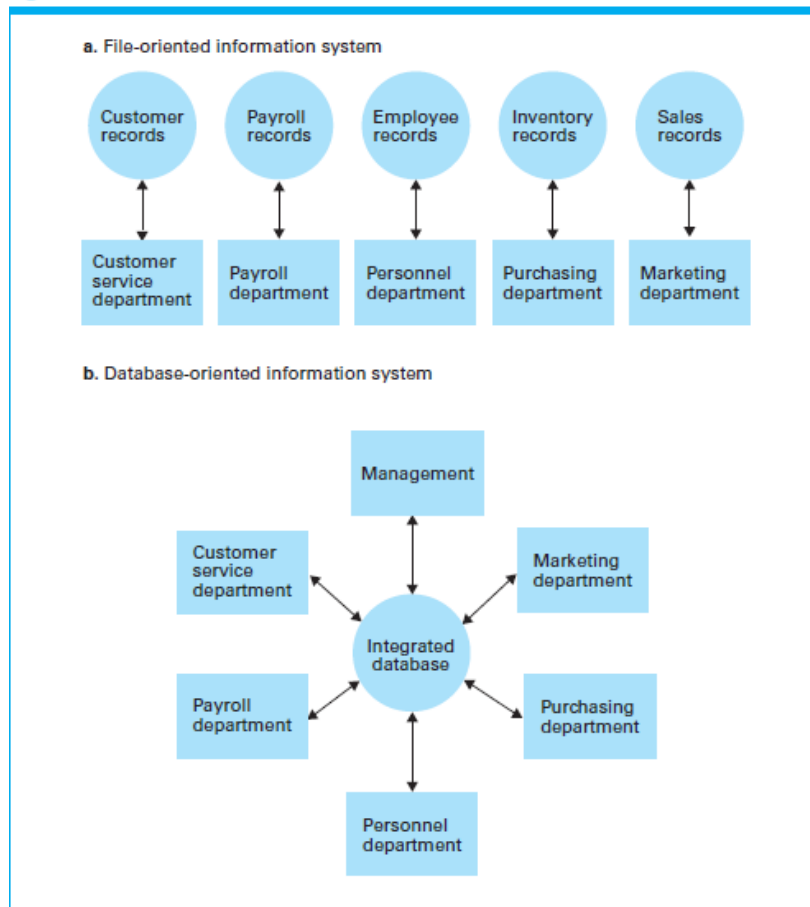
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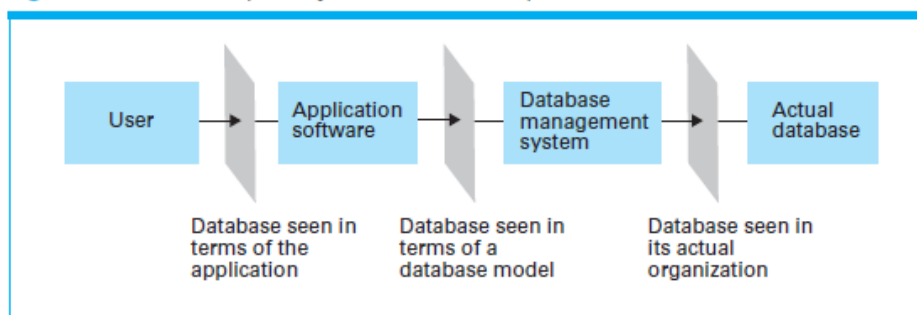
Cornell Notes	Topic:  16.1 Databases-Reading	Course: BSc Computer Science
		Class: How Computer Work [CM1030]-Reading
		Date: January 24, 2020
Essential Question:		
What is a database?		
Questions/Cues:		
<ul style="list-style-type: none"><li>• What is a database?</li><li>• What is a flat file?</li><li>• What is a schema</li><li>• What is a subschema?</li><li>• What is a database management system?</li><li>• What is database model?</li><li>• What is a relational database?</li><li>• What is lossless/Nonloss decomposition?</li><li>• What are the Select, Project and Join Operations in a relational database?</li></ul>		
Notes		
<ul style="list-style-type: none"><li>• Database = collection of data that is multidimensional, internal links between its entries make the info accessible from a variety of perspectives</li><li>• Flat File = one-dimensional storage system, meaning that it presents its info from a single point of view</li></ul>		

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



- Schema = description of the entire database structure that is used by the database software to maintain the database
- subschema = description of only that portion of the database pertinent to a particular user's need

**Figure 9.2** The conceptual layers of a database implementation



- Database management system (DBMS) = the one that actually performs the manipulation of database, if user requests to add/delete info; it alters the database. If the users requests to retrieve info, it is the DBMS that is the one that performs the required searches
- Data independence = the ability to change the organization of the database itself without changing the app software
- Database model = conceptual view of the database
- Relational Database = collection of tables consisting of rows and columns, data stored in rectangular tables called relation, similar to spreadsheets
  - A row in a relation is called a tuple, and columns in a relation are referred to as attributes because each entry in a column describes some characteristic, or attribute of the entry rep'd by the corresponding tuple

**Figure 9.3** A relation containing employee information

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
•	•	•	•
•	•	•	•
•	•	•	•

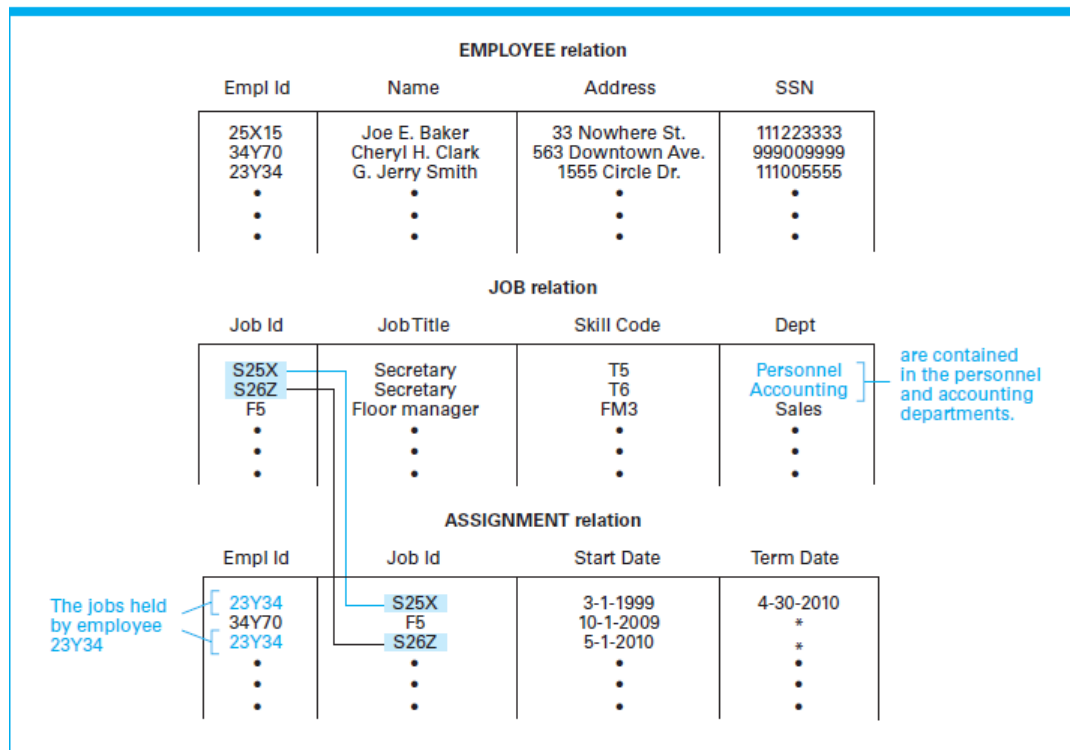
**Figure 9.4** A relation containing redundancy

Empl Id	Name	Address	SSN	Job Id	JobTitle	Skill Code	Dept	Start Date	Term Date
25X15	Joe E. Baker	33 Nowhere St.	111223333	F5	Floor manager	FM3	Sales	9-1-2009	9-30-2010
25X15	Joe E. Baker	33 Nowhere St.	111223333	D7	Dept. head	K2	Sales	10-1-2010	*
34Y70	Cheryl H. Clark	563 Downtown Ave.	999009999	F5	Floor manager	FM3	Sales	10-1-2009	*
23Y34	G. Jerry Smith	1555 Circle Dr.	111005555	S25X	Secretary	T5	Personnel	3-1-1999	4-30-2010
23Y34	G. Jerry Smith	1555 Circle Dr.	111005555	S26Z	Secretary	T6	Accounting	5-1-2010	*
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•
•	•	•	•	•	•	•	•	•	•

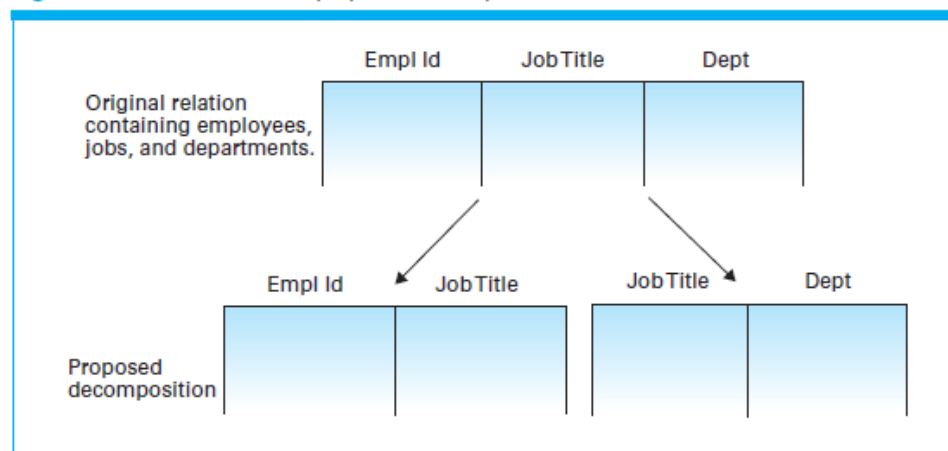
**Figure 9.5** An employee database consisting of three relations

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	4-30-2010
34Y70	F5	10-1-2009	*
23Y34	S26Z	5-1-2010	*
•	•	•	•
•	•	•	•
•	•	•	•

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



**Figure 9.7** A relation and a proposed decomposition



- Lossless decomposition = loss of info when dividing a relation into smaller relation
- Nonloss decomposition = No loss of info when dividing a relation into smaller relations
- Select Operation = taking tuples possessing certain characteristics and to place these selected tuples in a new relation, extracting rows from a relation
- Project Operation = extracts columns from a relation
- Join Operation = used to combine different relations into one relation

Figure 9.8 The SELECT operation

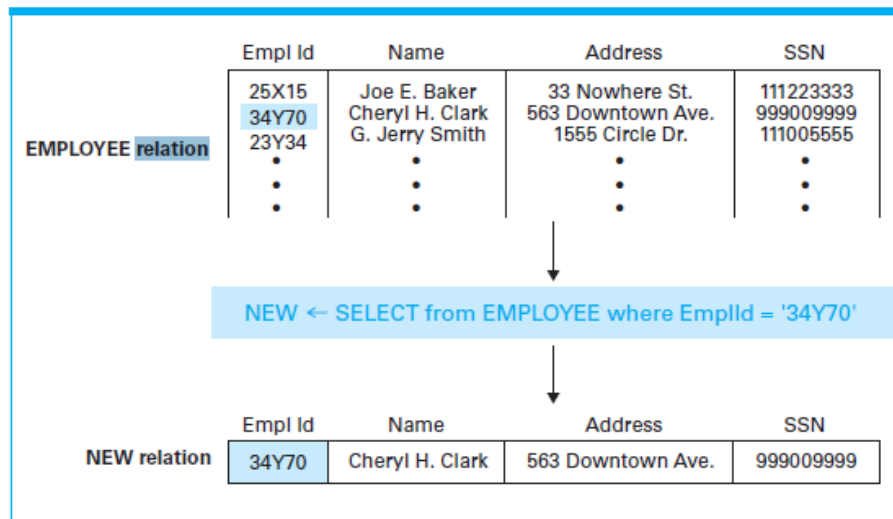


Figure 9.9 The PROJECT operation

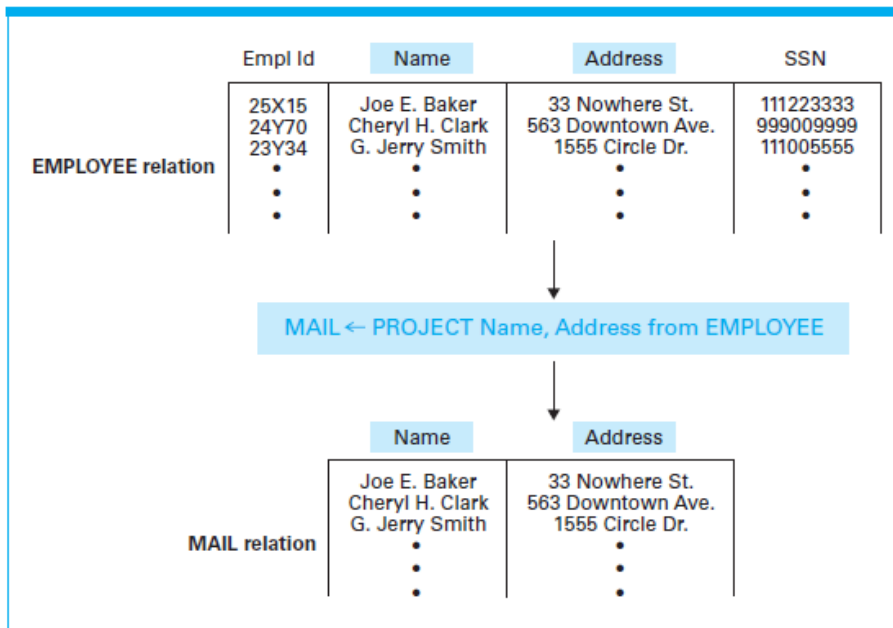
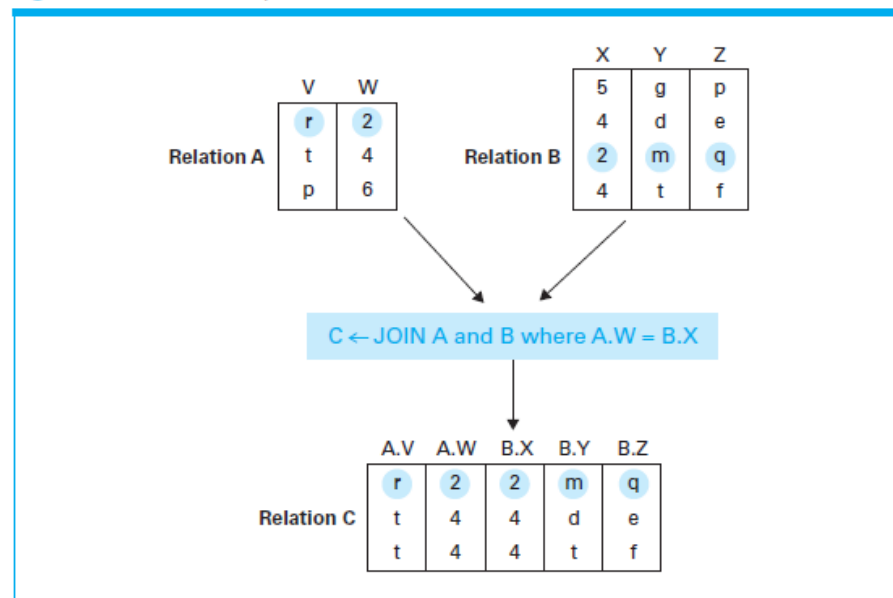
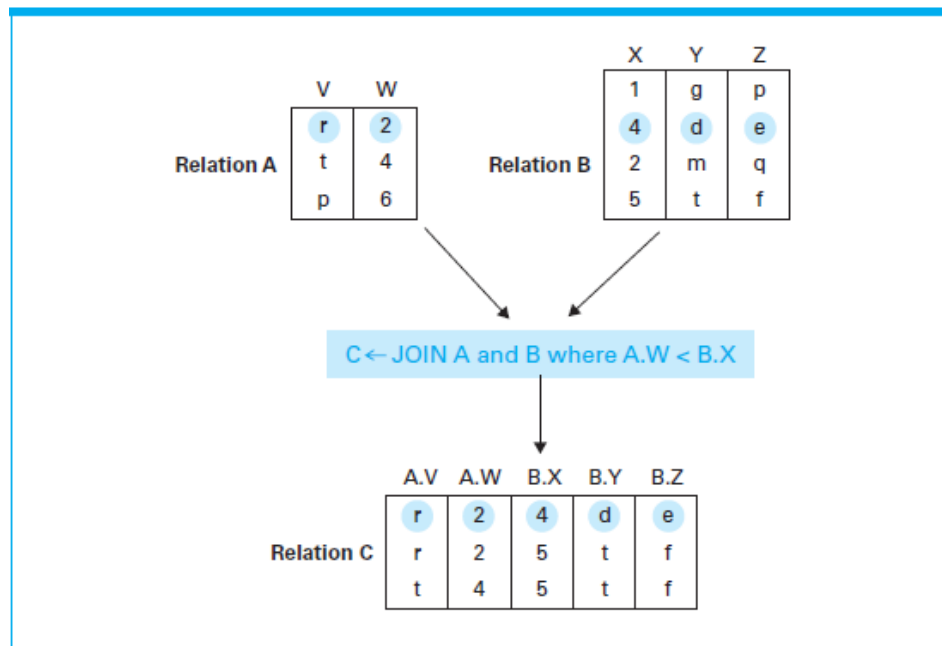


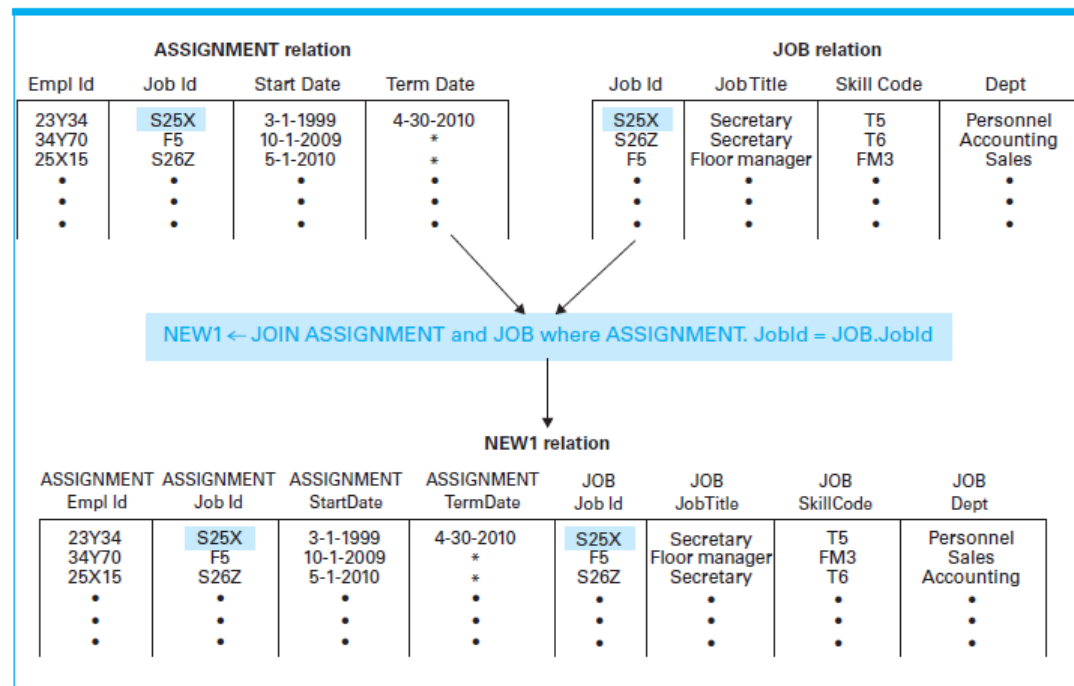
Figure 9.10 The JOIN operation



**Figure 9.11** Another example of the JOIN operation



**Figure 9.12** An application of the JOIN operation



## Summary

In this week, we learned about what database is and the range of functions used to access data from a database.