

# Chapter 1: The Database Environment

*Modern Database Management*

*6<sup>th</sup> Edition*

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# Definitions

Data: Meaningful facts, text, graphics, images, sound, video segments

Database: An organized collection of logically related data

Information: Data processed to be useful in decision making

Metadata: Data that describes data

## Figure 1-1a Data in Context

### Class Roster

Course: MGT 500 Semester: Spring 200X  
Business Policy

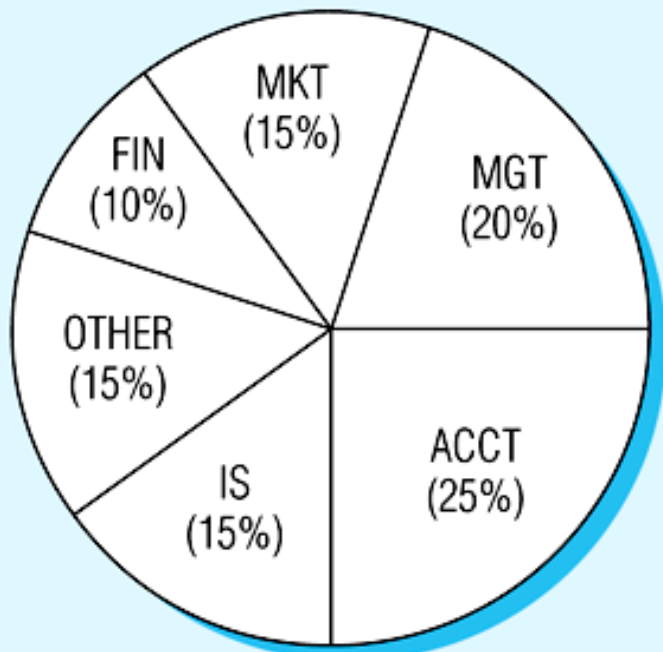
Section: 2

Large volume of facts, difficult to interpret or make decisions based on

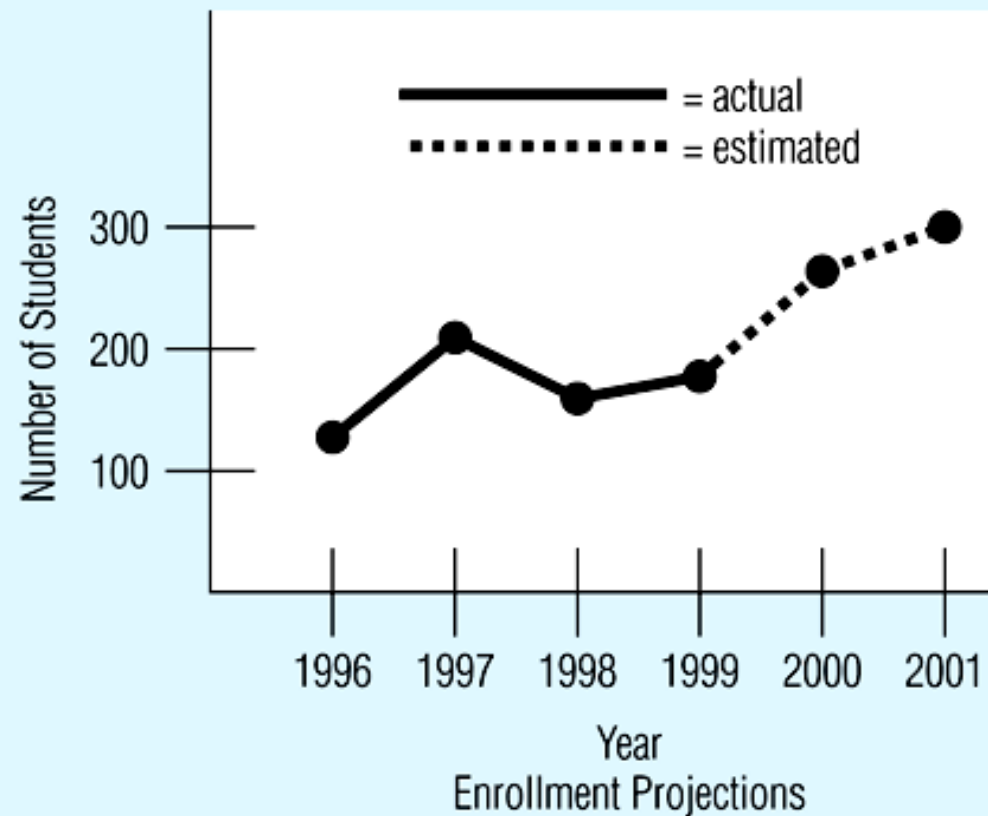
<u>Name</u>	<u>ID</u>	<u>Major</u>	<u>GPA</u>
Baker, Kenneth D.	324917628	MGT	2.9
Doyle, Joan E.	476193248	MKT	3.4
Finkle, Clive R.	548429344	PRM	2.8
Lewis, John C.	551742186	MGT	3.7
McFerran, Debra R.	409723145	IS	2.9
Sisneros, Michael	392416582	ACCT	3.3

## Figure 1-1b Summarized data

Useful information that managers can use for decision making and interpretation



Percent Enrollment by Major (199X)



## Table 1-1 Metadata

Descriptions of the properties or characteristics of the data, including data types, field sizes, allowable values, and documentation

**Table 1-1 Example Metadata for Class Roster**

<i>Data Item</i>			<i>Value</i>		
Name	Type	Length	Min	Max	Description
Course	Alphanumeric	30			Course ID and name
Section	Integer	1	1	9	Section number
Semester	Alphanumeric	10			Semester and year
Name	Alphanumeric	30			Student name
ID	Integer	9			Student ID (SSN)
Major	Alphanumeric	4			Student major
GPA	Decimal	3	0.0	4.0	Student grade point average

# Disadvantages of File Processing

## **Program-Data Dependence**

- All programs maintain metadata for each file they use

## **Data Redundancy (Duplication of data)**

- Different systems/programs have separate copies of the same data

## **Limited Data Sharing**

- No centralized control of data

## **Lengthy Development Times**

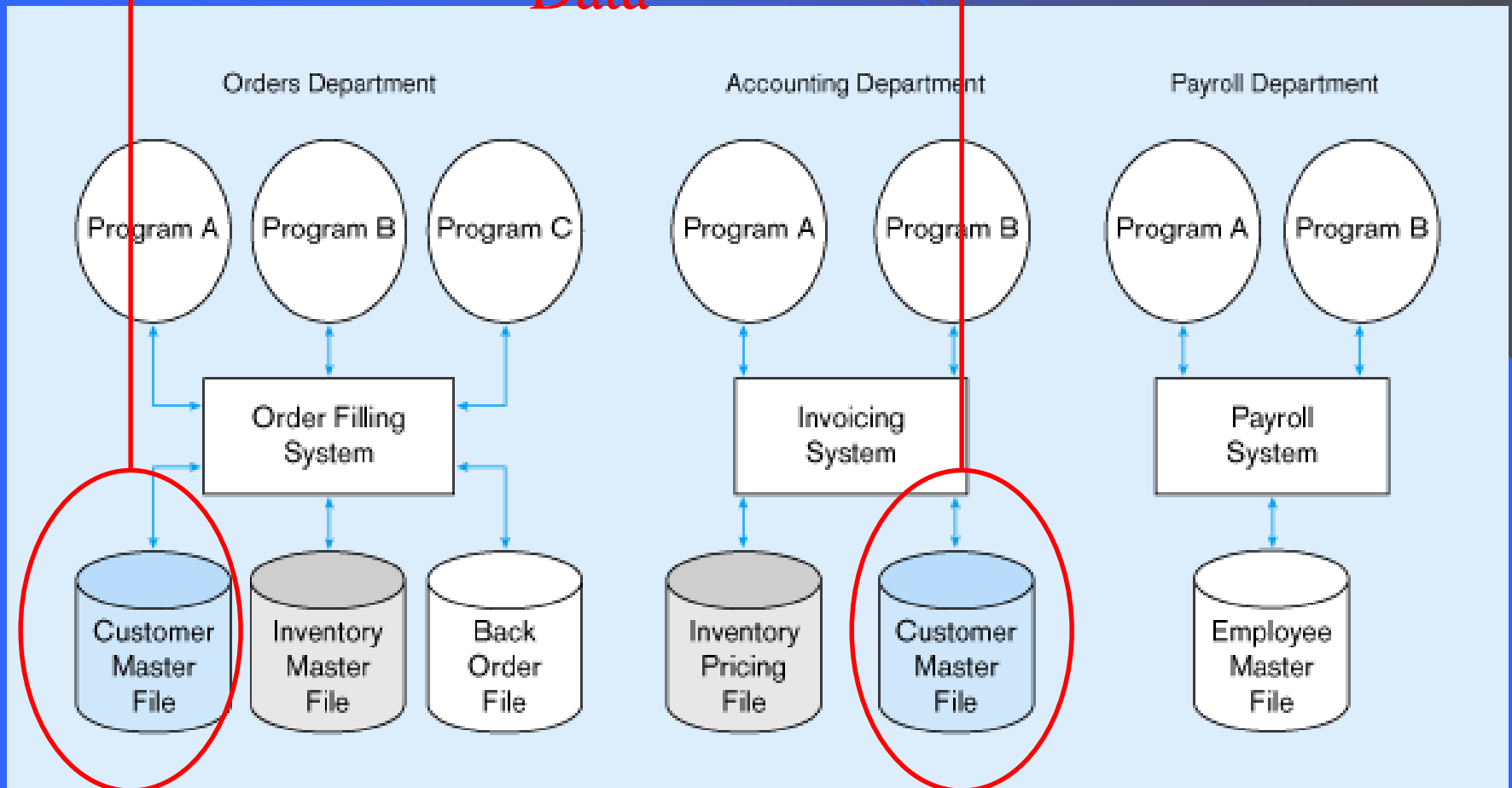
- Programmers must design their own file formats

## **Excessive Program Maintenance**

- 80% of of information systems budget

# Figure 1-2 Three file processing systems at Pine Valley Furniture

Duplicate  
Data



# Problems with Data Dependency

Each application programmer must maintain their own data

Each application program needs to include code for the metadata of each file

Each application program must have its own processing routines for reading, inserting, updating and deleting data

Lack of coordination and central control

Non-standard file formats



# Problems with Data Redundancy

Waste of space to have duplicate data

Causes more maintenance headaches

The biggest Problem:

- **When data changes in one file, could cause inconsistencies**
- Compromises *data integrity*

# SOLUTION:

## The DATABASE Approach

Central repository of shared data

Data is managed by a controlling agent

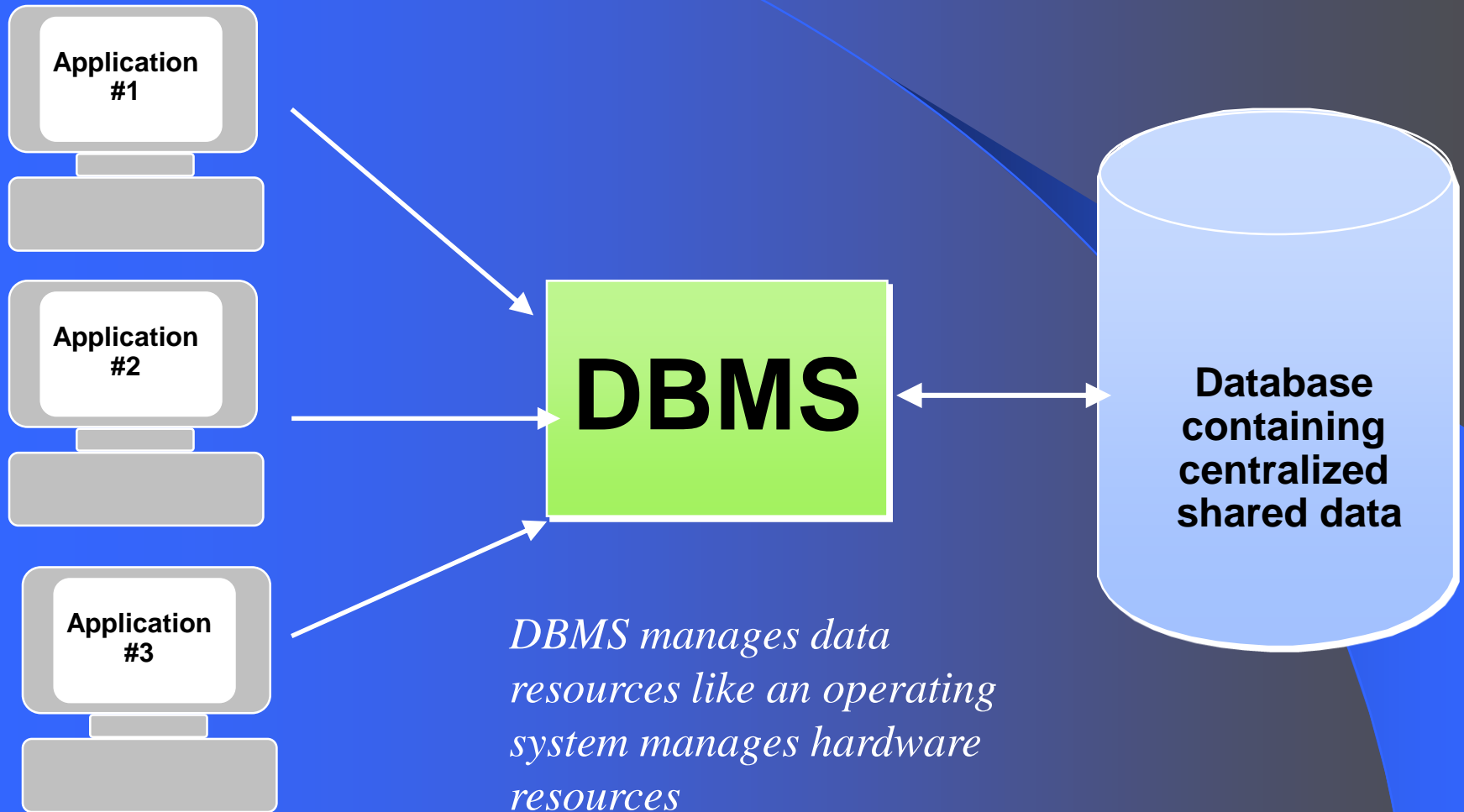
Stored in a standardized, convenient form

Requires a Database Management System (DBMS)

# Database Management System

A DBMS is a data storage and retrieval system which permits data to be stored non-redundantly while making it appear to the user as if the data is well-integrated.

# Database Management System



# Advantages of Database Approach

## Program-Data Independence

- Metadata stored in DBMS, so applications don't need to worry about data formats
- Data queries/updates managed by DBMS so programs don't need to process data access routines
- Results in: increased application development and maintenance productivity

## Minimal Data Redundancy

- Leads to increased data integrity/consistency

# Advantages of Database Approach

## Improved Data Sharing

- Different users get different views of the data

## Enforcement of Standards

- All data access is done in the same way

## Improved Data Quality

- Constraints, data validation rules

## Better Data Accessibility/ Responsiveness

- Use of standard data query language (SQL)

## Security, Backup/Recovery, Concurrency

- Disaster recovery is easier

# Costs and Risks of the Database Approach

## Up-front costs:

- Installation Management Cost and Complexity
- Conversion Costs

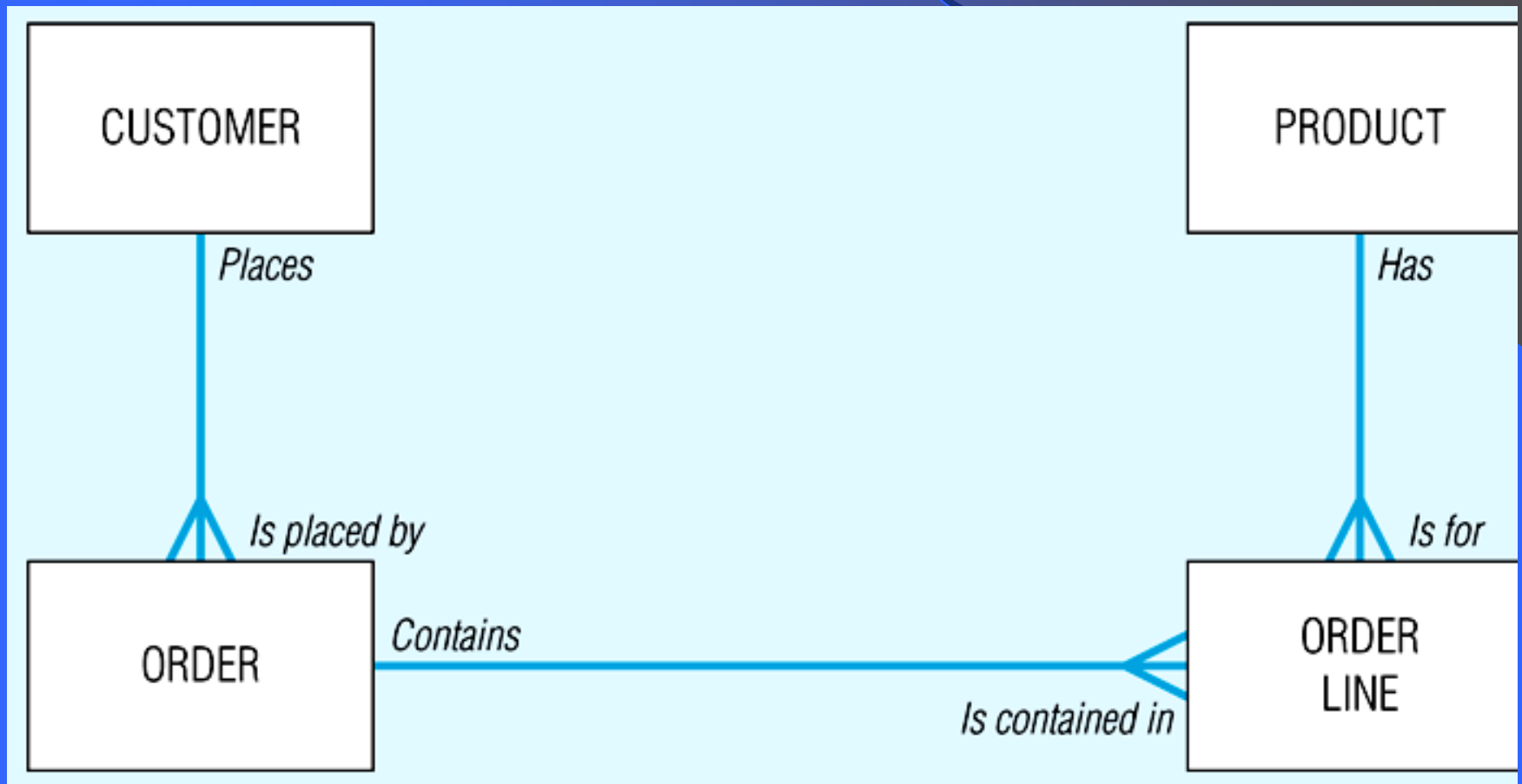
## Ongoing Costs

- Requires New, Specialized Personnel
- Need for Explicit Backup and Recovery

## Organizational Conflict

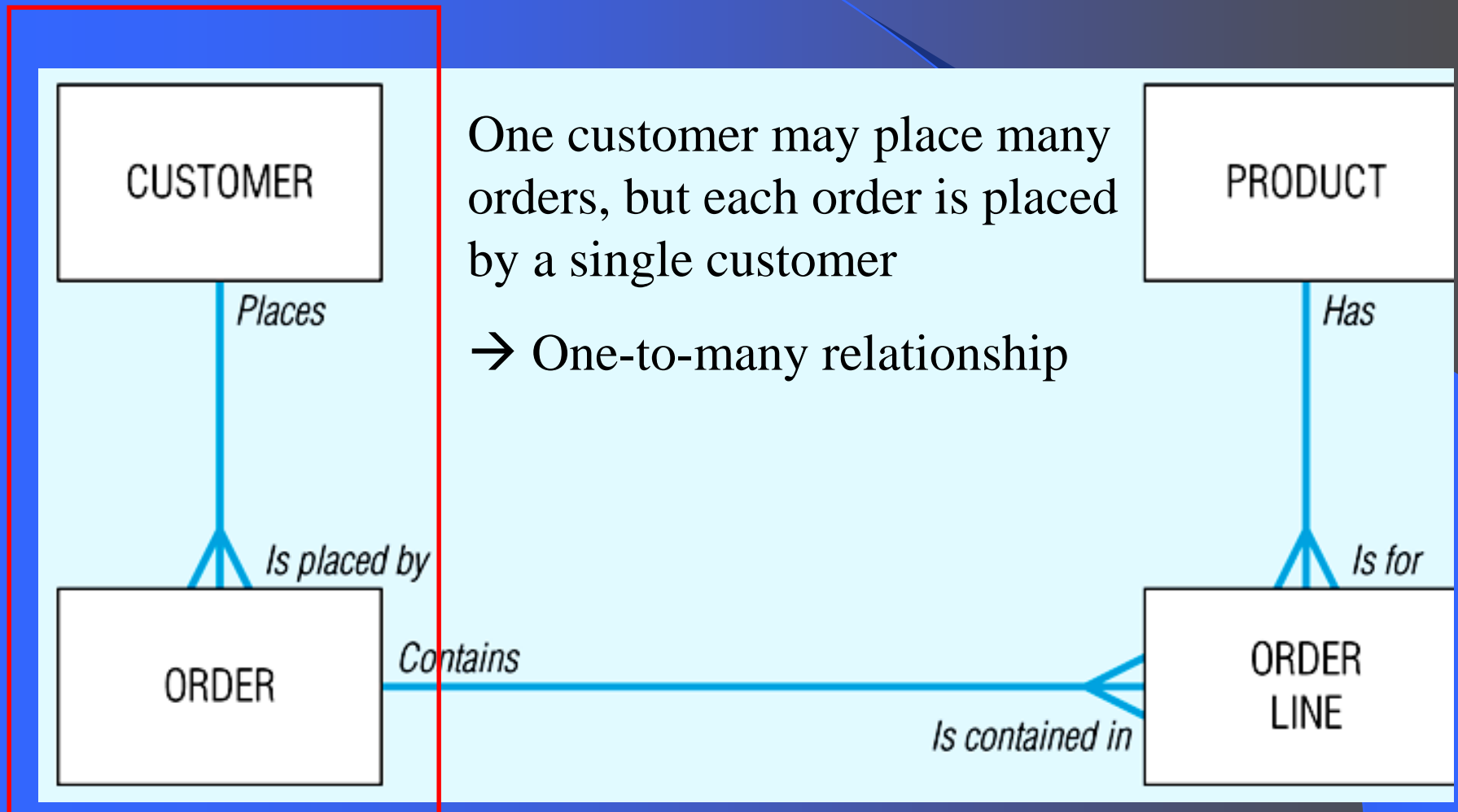
- Old habits die hard

# Figure 1-3 Segment from enterprise data model

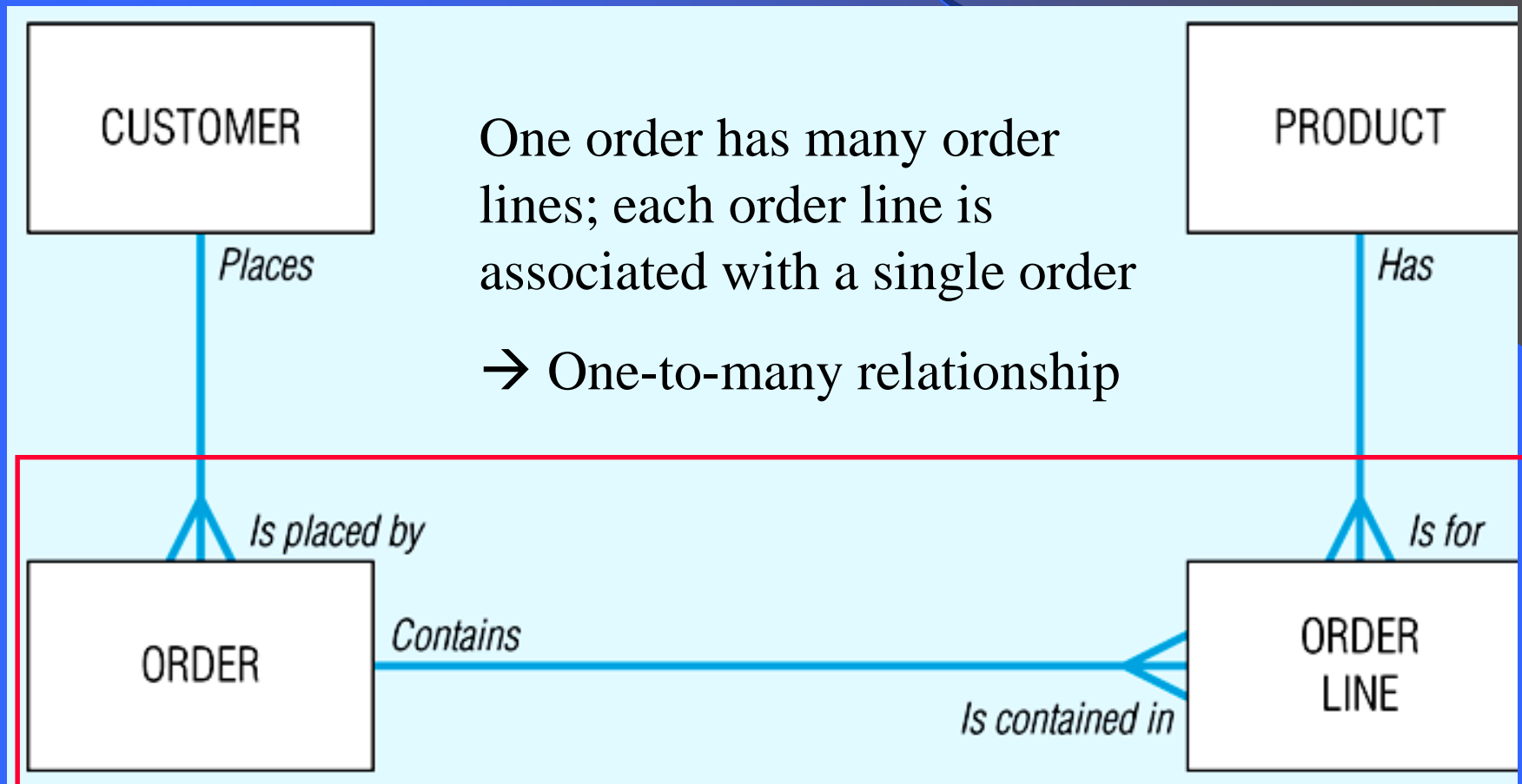




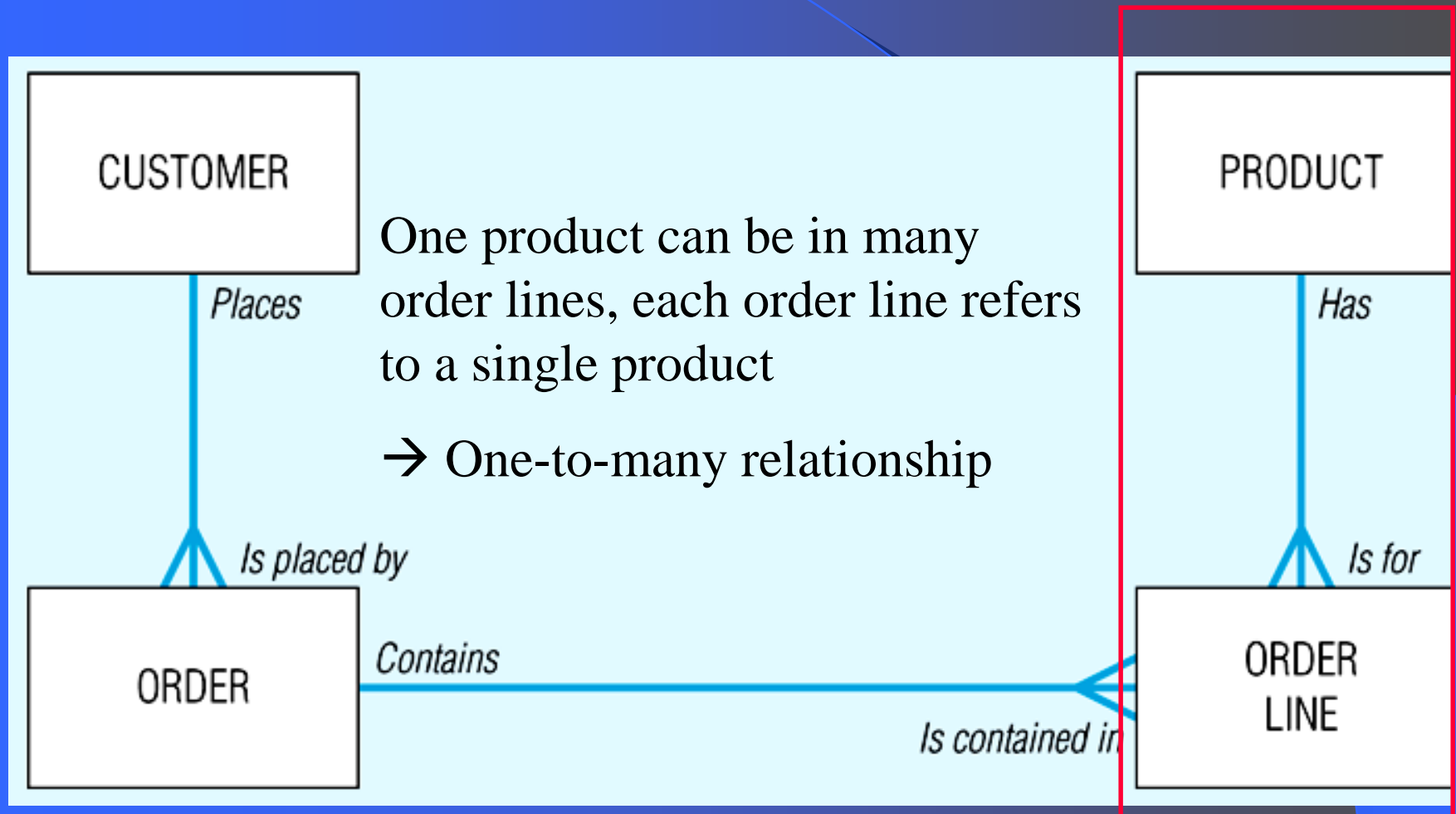
# Figure 1-3 Segment from enterprise data model



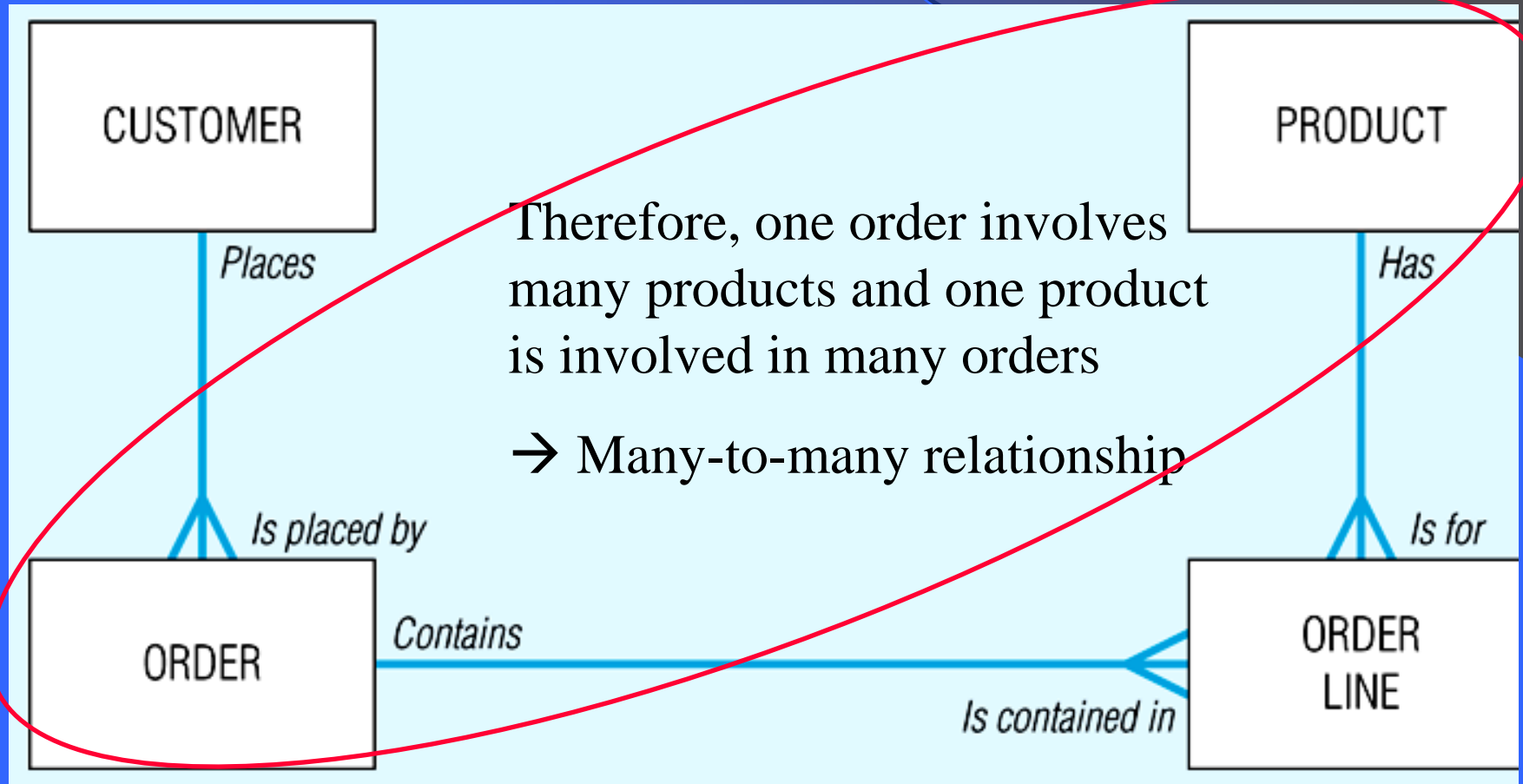
# Figure 1-3 Segment from enterprise data model



# Figure 1-3 Segment from enterprise data model

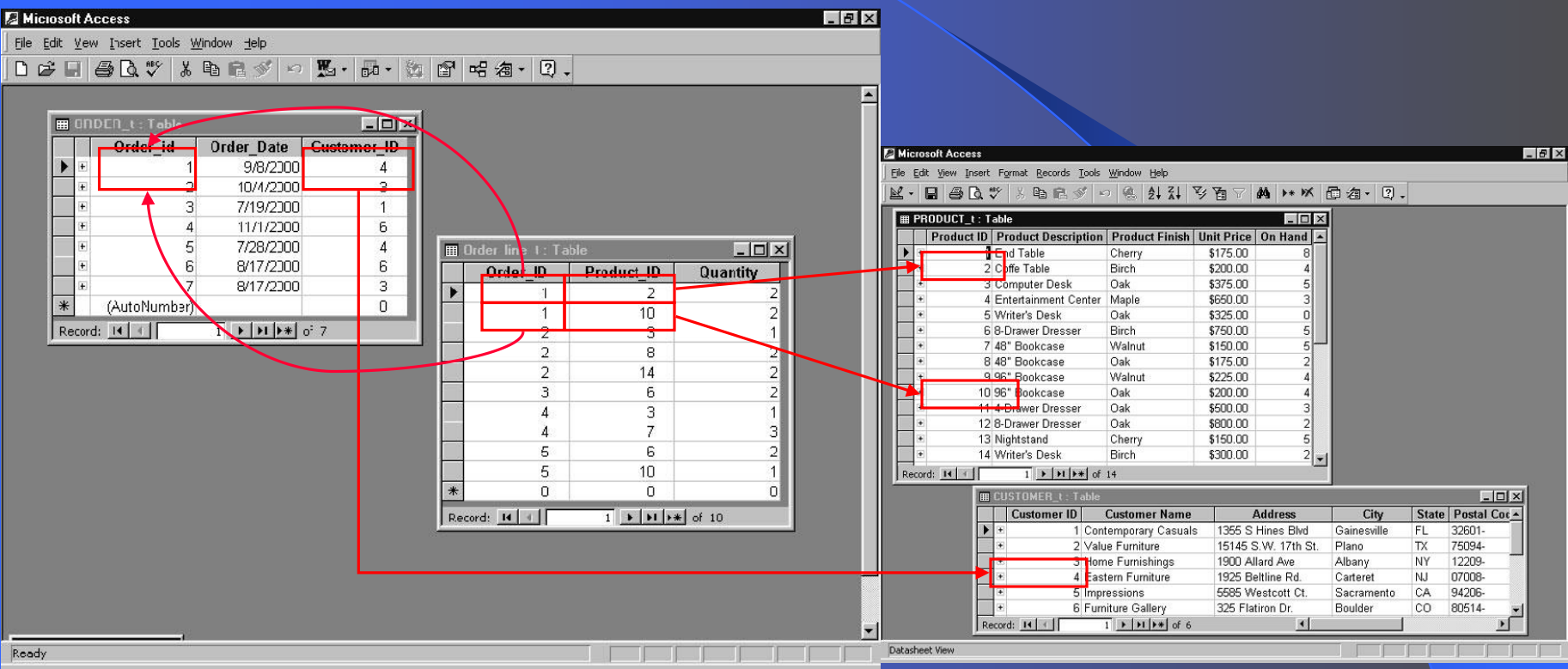


# Figure 1-3 Segment from enterprise data model

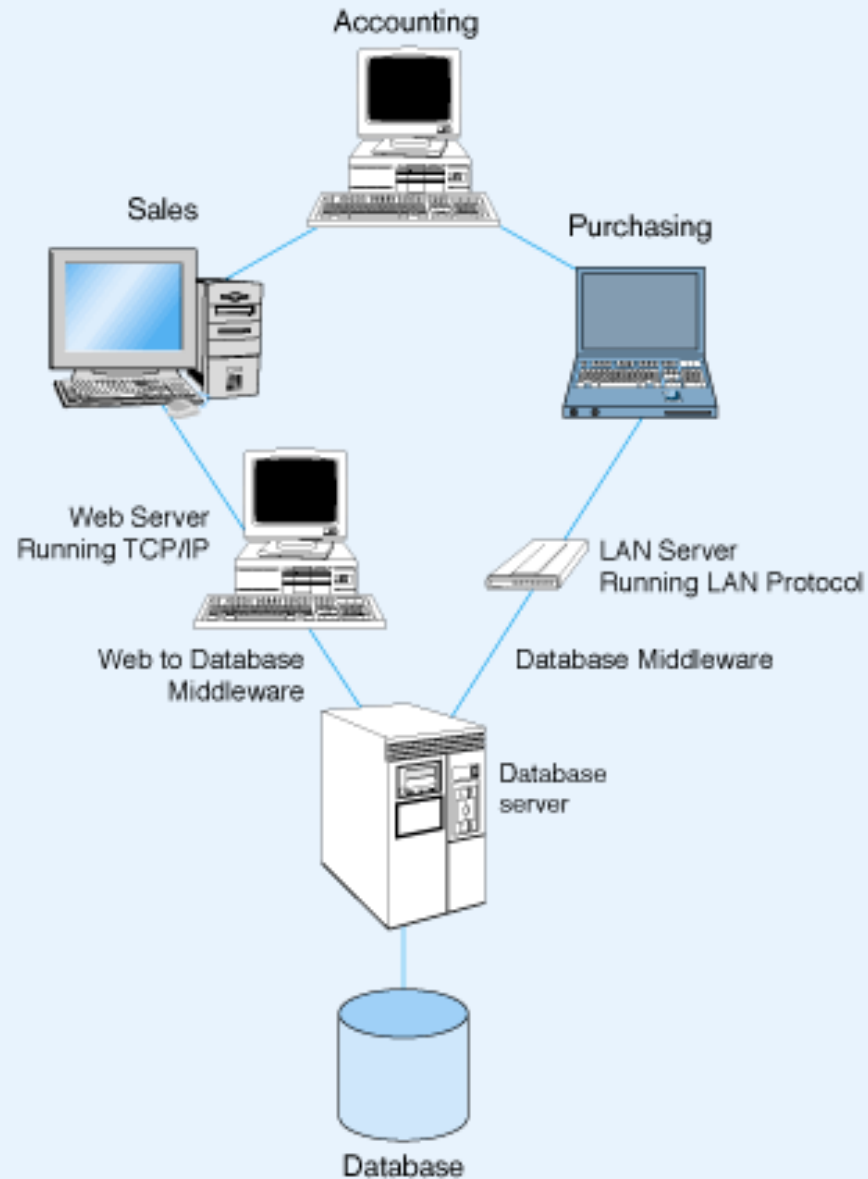


# Figure 1-4 Order, Order\_Line, Customer, and Product tables

Relationships established in special columns that provide links between tables



**Figure 1-5**  
**Client/server**  
**system for**  
**Pine Valley**  
**Furniture**  
**Company**



# Figure 1-6 Customer invoice (Pine Valley Furniture Company)

Application program functions:

inserting new data, updating existing data,  
deleting existing data, reading data for display

**PVFC Customer Invoice**

Customer ID: 2      Order Number: 1006  
Customer Name: Value Furniture      Order Date: 10/24/2000  
Address: 15145 S.W. 17th St.  
Plano, TX 75094

Product ID	Product Description	Finish	Quantity	Unit Price	Extended Price:
7	Dining Table	Natural As	2	\$800.00	\$1,600.00
5	Writer's Desk	Cherry	2	\$325.00	\$650.00
4	Entertainment Center	Natural M	1	\$650.00	\$650.00
<b>Total</b>					<b>\$2,900.00</b>

Page: 1  
Ready

# The Range of Database Applications

Personal Database – standalone desktop database

Workgroup Database – local area network (<25 users)

Department Database – local area network (25-100 users)

Enterprise Database – wide-area network (hundreds or thousands of users)

1. ERP (current data): ex. Scheduling staff & services across all units
2. DWH (historical data): identify patterns & trends for strategic business



**Figure 1-7**  
**Typical data**  
**from a**  
**personal**  
**computer**  
**database**

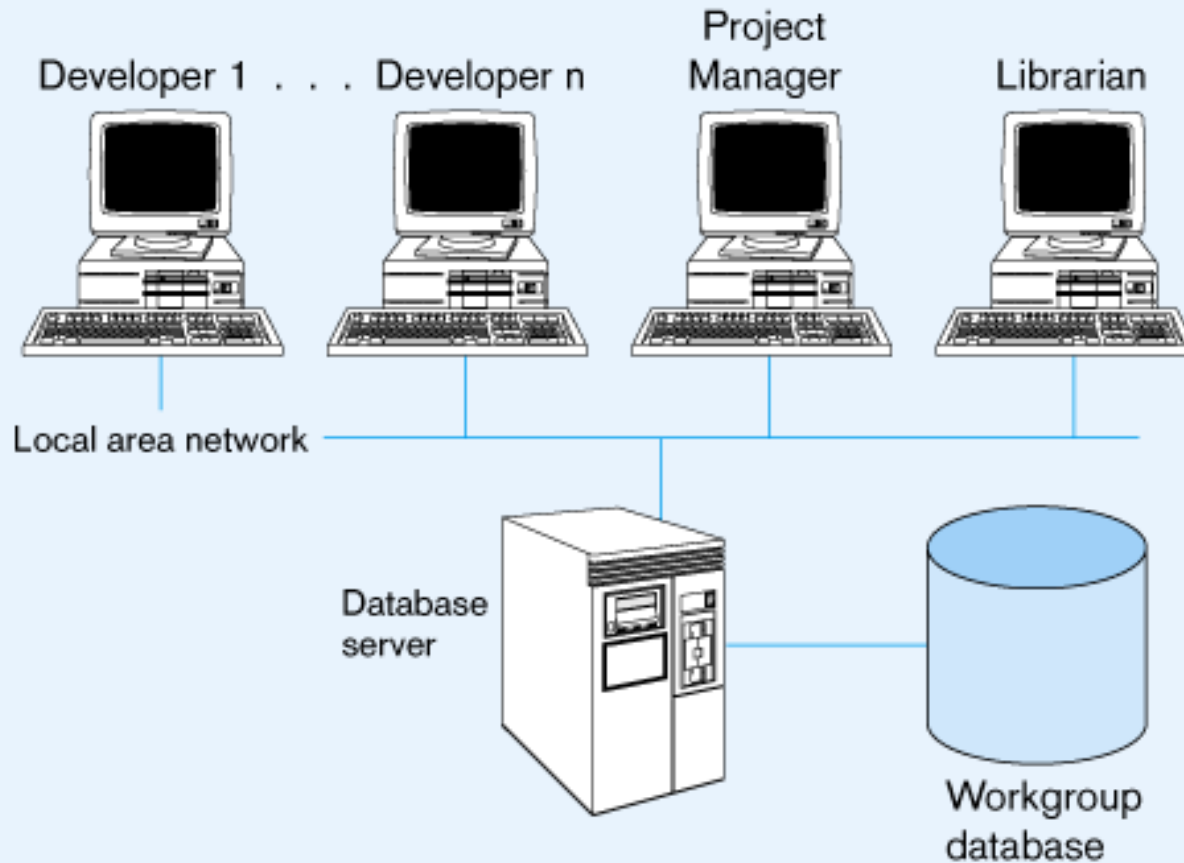
Customer

Customer Name: <b>Multi Media, Inc.</b>	
Address: <b>1000 River Road</b>	
City: <b>San Antonio</b>	
State: <b>TX</b>	
Zip: <b>76235</b>	
Phone: <b>(219) 864-2000</b>	
Next Contact Date: <b>10/17/2000</b>	Time: <b>10:30 AM</b>

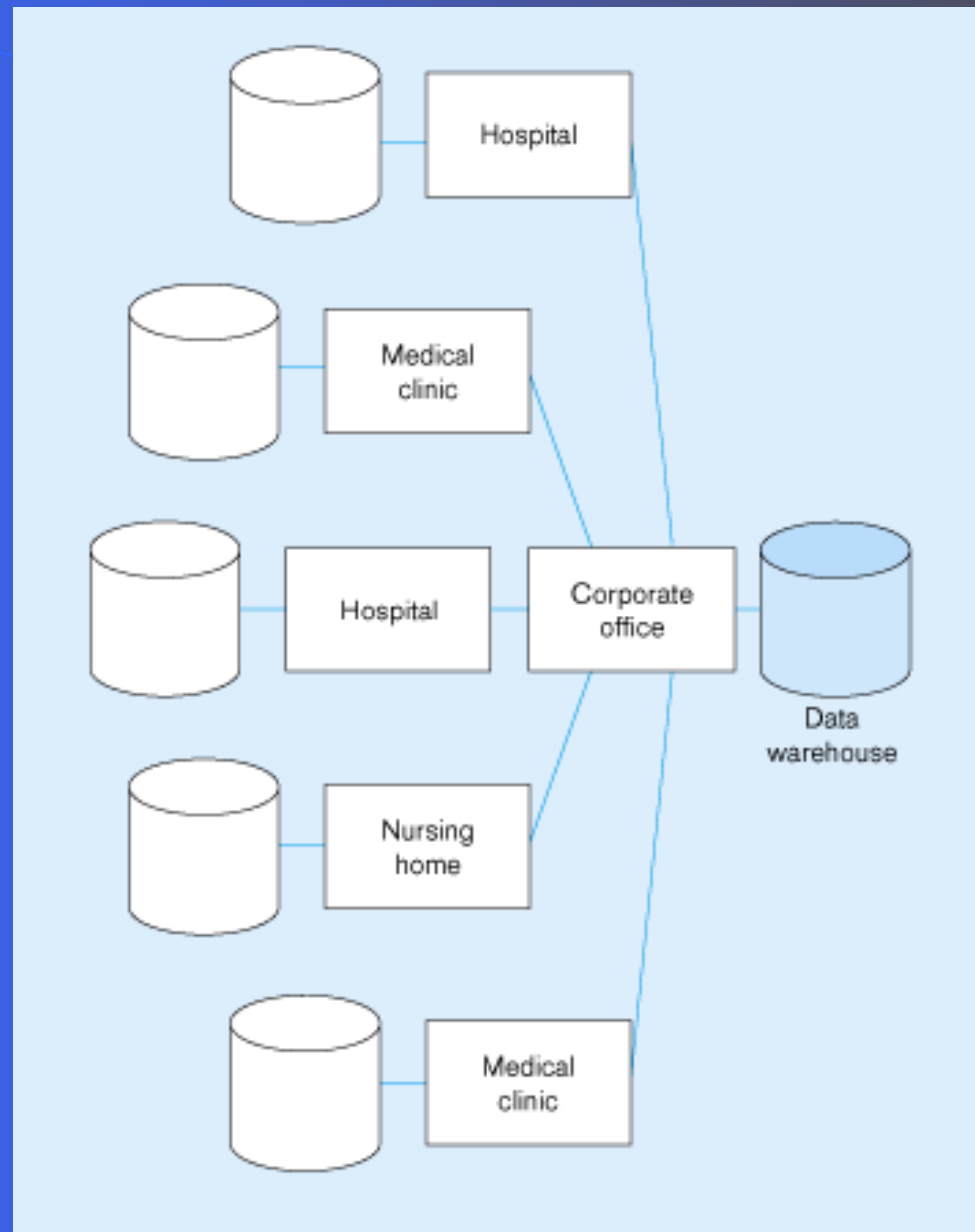
Contact History for Customer

Date	Time	Contact	Comments
08/04/2000	10:00 AM	Roberts	Review proposal
08/19/2000	08:00 AM	Roberts	Revise schedule
09/10/2000	09:00 AM	Pearson	Sign contract
09/21/2000	02:00 PM	Roberts	Follow up

# Figure 1-8 Workgroup database with local area network



**Figure 1-9 An enterprise data warehouse**



# Components of the Database Environment

**CASE Tools** – computer-aided software engineering

**Repository** – centralized storehouse of metadata

**Database Management System (DBMS)** – software for managing the database

**Database** – storehouse of the data

**Application Programs** – software using the data

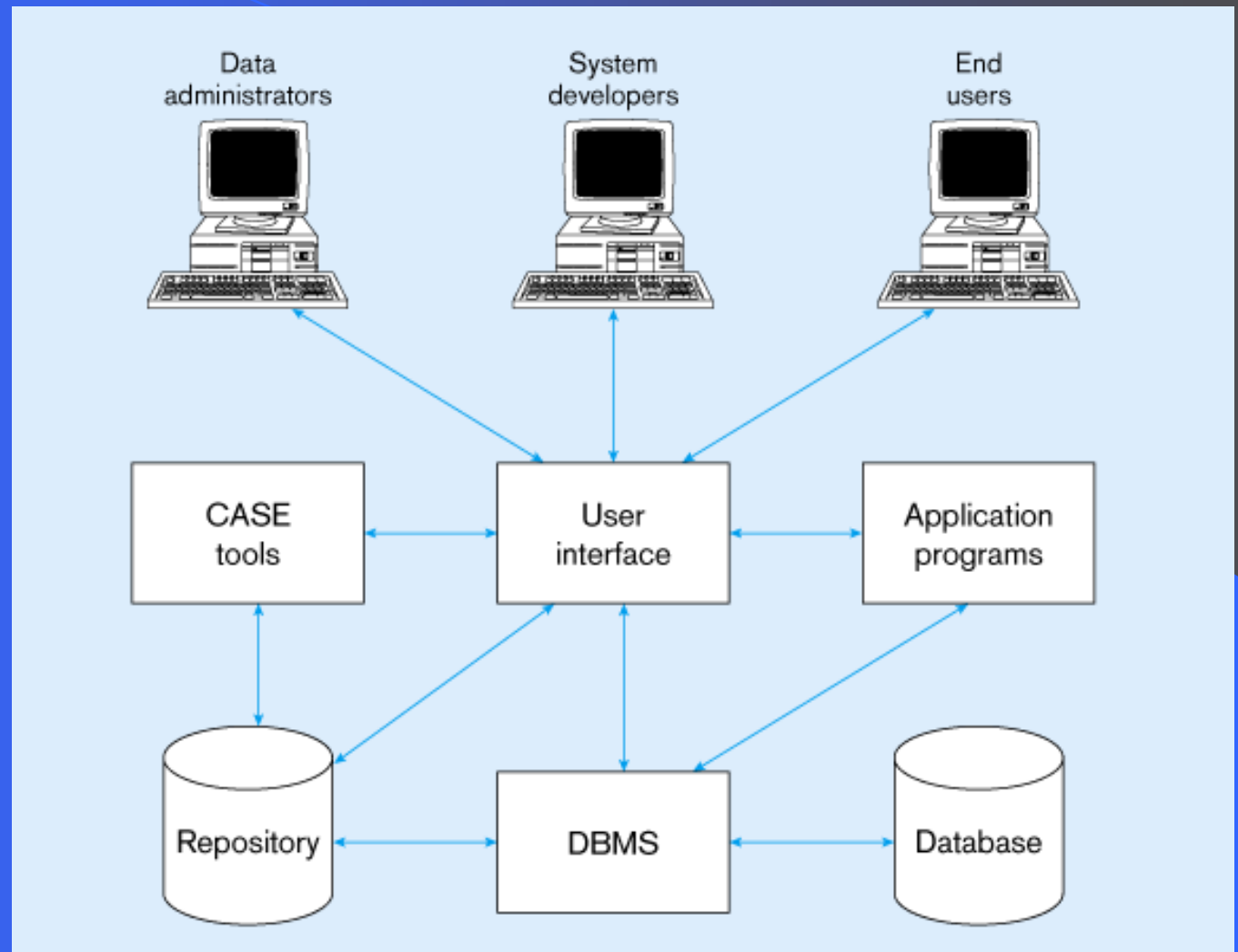
**User Interface** – text and graphical displays to users

**Data Administrators** – personnel responsible for maintaining the database

**System Developers** – personnel responsible for designing databases and software

**End Users** – people who use the applications and databases

**Figure 1-10**  
**Components**  
**of the**  
**database**  
**environment**



# Evolution of DB Systems

- Flat files - 1960s - 1980s
- Hierarchical – 1970s - 1990s
- Network – 1970s - 1990s
- Relational – 1980s - present
- Object-oriented – 1990s - present
- Object-relational – 1990s - present
- Data warehousing – 1980s - present
- Web-enabled – 1990s - present