

Lesson 1

Introduction

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October 19, 2015

1

1. Introduction

- Good decisions require good information derived from raw facts.
- Data is managed most efficiently when stored in a database.
- Databases evolved from computer file systems.
- Understanding file system characteristics is important.

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2

2. Why Databases?

- Databases solve many of the problems encountered in data management.
 - Used in almost all modern settings involving data management:
 - Business
 - Research
 - Administration
- Important to understand how databases work and interact with other applications.

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3

3. Data vs. Information

- **Data** are raw facts.
- **Information** is the result of processing raw data to reveal meaning.
- Raw data must be formatted for storage, processing, and presentation.
- Data are the foundation of information, which is the bedrock of **knowledge**.

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4

4. Introducing the Database

- Database: shared, integrated computer structure that stores a collection of:
 - End-user data: raw facts of interest to end user
 - **Metadata**: data about data
 - Provides description of data characteristics and relationships in data
- **Database management system (DBMS)**: collection of programs
 - Manages structure and controls access to data

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5

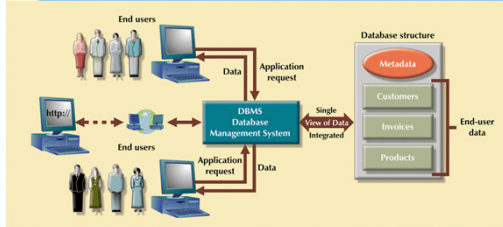
5. Role and Advantages of the DBMS

- DBMS is the intermediary between the user and the database
 - Database structure stored as file collection
 - Can only access files through the DBMS
- DBMS enables data to be shared
- DBMS integrates many users' views of the data

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6

FIGURE 1.2 The DBMS manages the interaction between the end user and the database



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7

5. Role and Advantages of the DBMS (cont'd.)

- Advantages of a DBMS:
 - Improved data sharing
 - Improved data security
 - Better data integration
 - Minimized **data inconsistency**
 - Improved data access
 - Improved decision making
 - Increased end-user productivity

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8

6. Types of Databases

- Databases** can be classified according to:
 - Number of users
 - Database location(s)
 - Expected type and extent of use
- Single-user database** supports only one user at a time
 - Desktop database: single-user; runs on PC
- Multuser database** supports multiple users at the same time
 - Workgroup** and **enterprise** databases

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9

6. Types of Databases (cont'd.)

- Centralized database:** data located at a single site
- Distributed database:** data distributed across several different sites
- Operational database:** supports a company's day-to-day operations
 - Transactional or production database
- Data warehouse:** stores data used for tactical or strategic decisions

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10

TABLE 1.1 Types of Databases

PRODUCT	NUMBER OF USERS			DATA LOCATION		DATA USAGE		XML
	SINGLE USER	MULTIUSER WORKGROUP	ENTERPRISE	CENTRALIZED	DISTRIBUTED	OPERATIONAL	DATA WAREHOUSE	
MS Access	X	X		X		X		
MS SQL Server	X [*]	X	X	X	X	X	X	X
IBM DB2	X [*]	X	X	X	X	X	X	X
MySQL	X	X	X	X	X	X	X	X [*]
Oracle RDBMS	X [*]	X	X	X	X	X	X	X

* Supports XML functions only. XML data are stored in large text objects.

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11

7. Why Database Design Is Important ?

- Database design** focuses on design of database structure used for end-user data
 - Designer must identify database's expected use
- Well-designed database:**
 - Facilitates data management
 - Generates accurate and valuable information
- Poorly designed database:**
 - Causes difficult-to-trace errors

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12

8. Evolution of File System Data Processing

- File systems typically composed of collection of file folders, each tagged and kept in cabinet.
 - Organized by expected use
- Contents of each file folder are logically related
- Manual systems
 - Served as a data repository for small data collections
 - Cumbersome for large collections

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13

8. Evolution of File System Data Processing

- Computerized file systems
 - Data processing (DP) specialist** converted computer file structure from manual system
 - Wrote software that managed the data
 - Designed the application programs

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14

8. Evolution of File System Data Processing

- Initially, computer file systems resembled manual systems
- As number of files increased, file systems evolved,
 - Each file used its own application program to store, retrieve, and modify data
 - Each file was owned by individual or department that commissioned its creation

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15

FIGURE 1.3 Contents of the CUSTOMER file

C_NAME	C_PHONE	C_ADDRESS	C_ZIP	A_NAME	A_PHONE	TP	AMT	REN
Alfred A. Flannery	615-844-2573	218 Fork Rd., Bates, TN	38123	Leah F. Hahn	615-882-1244	T1	100.00	05-Apr-2010
Leonora K. Dunne	713-884-1208	Box 134, Fox, KY	25246	Alex B. Abby	713-226-1249	T1	250.00	16-Jun-2010
Walter W. Smith	615-894-2285	125 Oak Ln., Bates, TN	38123	Leah F. Hahn	615-882-2144	S2	150.00	29-Jan-2011
Paul F. O'Connell	615-894-2180	217 Lee Ln., Bates, TN	38123	Leah F. Hahn	615-882-1244	S1	300.00	14-Oct-2010
Myron Orlando	615-222-1872	Box 111, Henry, TN	38155	Alex B. Abby	713-226-1249	T1	100.00	20-Dec-2010
Amy B. O'Brien	713-442-3381	387 Troll Dr., Fox, KY	25246	John T. Olson	615-123-5589	T2	850.00	22-Sep-2010
James O. Brown	615-287-1228	21 Tye Rd., Nash, TN	37118	Leah F. Hahn	615-882-1244	S1	120.00	25-Mar-2011
George Williams	615-280-2556	155 Maple, Nash, TN	37118	John T. Olson	615-123-5589	S1	250.00	17-Jul-2010
Anne O. Farris	713-382-7185	2119 Elm, Crew, KY	25432	Alex B. Abby	713-226-1249	T2	100.00	03-Dec-2010
Clifford K. Smith	615-287-3809	2782 Main, Nash, TN	37118	John T. Olson	615-123-5589	S2	500.00	14-Mar-2011

C_NAME = Customer name
C_PHONE = Customer phone
C_ADDRESS = Customer address
C_ZIP = Customer zip code
A_NAME = Agent name
A_PHONE = Agent phone
TP = Insurance type
AMT = Insurance policy amount, in thousands of \$
REN = Insurance renewal date

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16

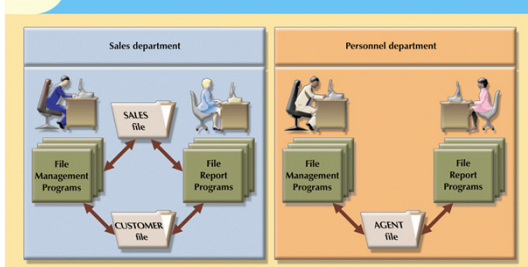
TABLE 1.2 Basic File Terminology

TERM	DEFINITION
Data	"Raw" facts, such as a telephone number, a birth date, a customer name, and a year-to-date (YTD) sales value. Data have little meaning unless they have been organized in some logical manner.
Field	A character or group of characters (alphabetic or numeric) that has a specific meaning. A field is used to define and store data.
Record	A logically connected set of one or more fields that describes a person, place, or thing. For example, the fields that constitute a record for a customer might consist of the customer's name, address, phone number, date of birth, credit limit, and unpaid balance.
File	A collection of related records. For example, a file might contain data about the students currently enrolled at Gigantic University.

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17

FIGURE 1.5 A simple file system



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18

9. Problems with File System Data Processing

- Requires extensive programming
- Retrieval task requires extensive programming
- System administration is complex and difficult
- Difficult to make changes to existing structures
- Security features are likely to be inadequate

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19

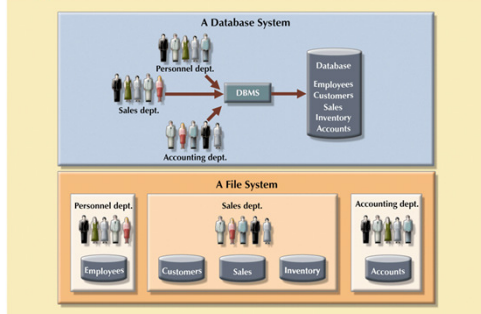
10. Database Systems

- Database system consists of logically related data stored in a single logical data repository.
 - May be physically distributed among multiple storage facilities
 - DBMS eliminates most of file system's problems
 - Current generation stores data structures, relationships between structures, and access paths
 - Also defines, stores, and manages all access paths and components

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20

FIGURE 1.6 Contrasting database and file systems



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21

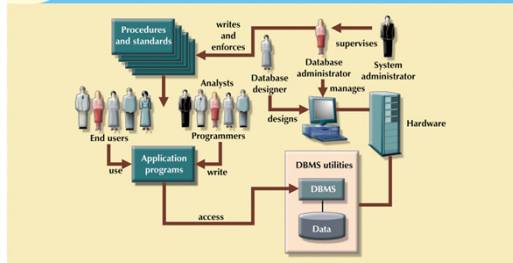
11. The Database System Environment

- **Database system:** defines and regulates the collection, storage, management, use of data
- Five major parts of a database system:
 - Hardware
 - Software
 - People
 - Procedures
 - Data

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22

FIGURE 1.7 The database system environment



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23

11. The Database System Environment

- **Hardware:** all the system's physical devices
- **Software:** three types of software required:
 - Operating system software
 - DBMS software
 - Application programs and utility software

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24

11. The Database System Environment

- **People:** all users of the database system
 - System and database administrators
 - Database designers
 - Systems analysts and programmers
 - End users
- **Procedures:** instructions and rules that govern the design and use of the database system
- **Data:** the collection of facts stored in the database

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25

Your Task

1. Find actors who are involved in the database environment?
2. When is not suitable to use a Database Management System?
3. What are the functions performed by a Database Management System?

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26