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Fundamentals of Database Management Systems

Unit – 11

Kavitha S N

Objectives

In this unit, you will learn

1. Database definition
2. File systems and Drawbacks of using file systems
3. An example of database system
4. Characteristics of database approach
5. Data Processing and Types of Data Processing
6. Acess methods
7. DBMS Vs RDBMS
8. Advantages of DBMS
9. Application of Databases

Data

- The term “data” has originated from the plural of a Latin word ‘datum’
- Data represents some facts, observations, assumptions and occurrence regarding people, process, functions and events related to an organization's internal and external environment.

Database

A database is a collection of related data with an implicit meaning.

Examples of Databases are:

- Train booking Database
- Employee details Database
- Sales Database
- Airline booking Database
- Cricket Database

The example database named “Debit Cards”

CUSTOMER

CUST	NAME	CITY
1	Perez	Madrid
2	Smith	New York
3	Bonner	Paris
4	Chen	Hong Kong

BANK

BNK	BANK
BA	Bank A
BB	Bank B
BC	Bank C

ATM

ATM	CITY	BNK
a1	Paris	BA
a2	Roma	BB
a3	Madrid	BA
a4	Rio	BB
a5	Paris	BC

ACCOUNT

ACC	CUST	BNK
8123	2	BB
4551	2	BA
3212	3	BC
3529	3	BC
4254	1	BB
4572	1	BA

DEPOSIT

DEP	ACC	DATE	CUST	AMOUNT	WIT
d1	8123	12/05/2005	2	2000	*null*
d2	4551	17/05/2005	1	3000	*null*
d3	4254	21/05/2005	1	2500	*null*
d4	3212	25/05/2005	1	400	r2
d5	3529	27/05/2005	4	1500	*null*
d6	3212	12/06/2005	2	450	r5
d7	4254	15/06/2005	3	150	r7

WITHDRAWAL

WIT	ACC	DATE	AMOUNT	ATM
r1	8123	25/05/2005	300	a1
r2	4254	25/05/2005	400	*null*
r3	4551	05/06/2005	300	*null*
r4	3529	10/06/2005	250	a2
r5	8123	12/06/2005	450	*null*
r6	4254	12/06/2005	200	*null*
r7	3529	15/06/2005	150	*null*
r8	3212	17/06/2005	200	a3
r9	4551	20/06/2005	500	a4

Database Management System (DBMS)

- DBMS is a collection of programs that enables users to **create** and **maintain** database
- It is a general purpose software system that facilitates the process of **defining, constructing, manipulating** and **sharing** databases among various users and applications.

Database Management System (DBMS)

- **Defining** a database involves specifying the data types, structures and constraints of the data to be stored in the database.
- **Constructing** the database is process of storing the data on some storage medium that is controlled by the DBMS.

Database Management System (DBMS)

- **Manipulating** a database includes functions such as querying the database to retrieve the specific data and updating the database.
- **Sharing** the database allows multiple users and programs to access the database simultaneously.

Characteristics of database approach

- Self describing nature of database system
- Insulation Between Programs and Data
- Support of multiple views of data
- Sharing of data and multiuser transaction processing

A simple database system environment

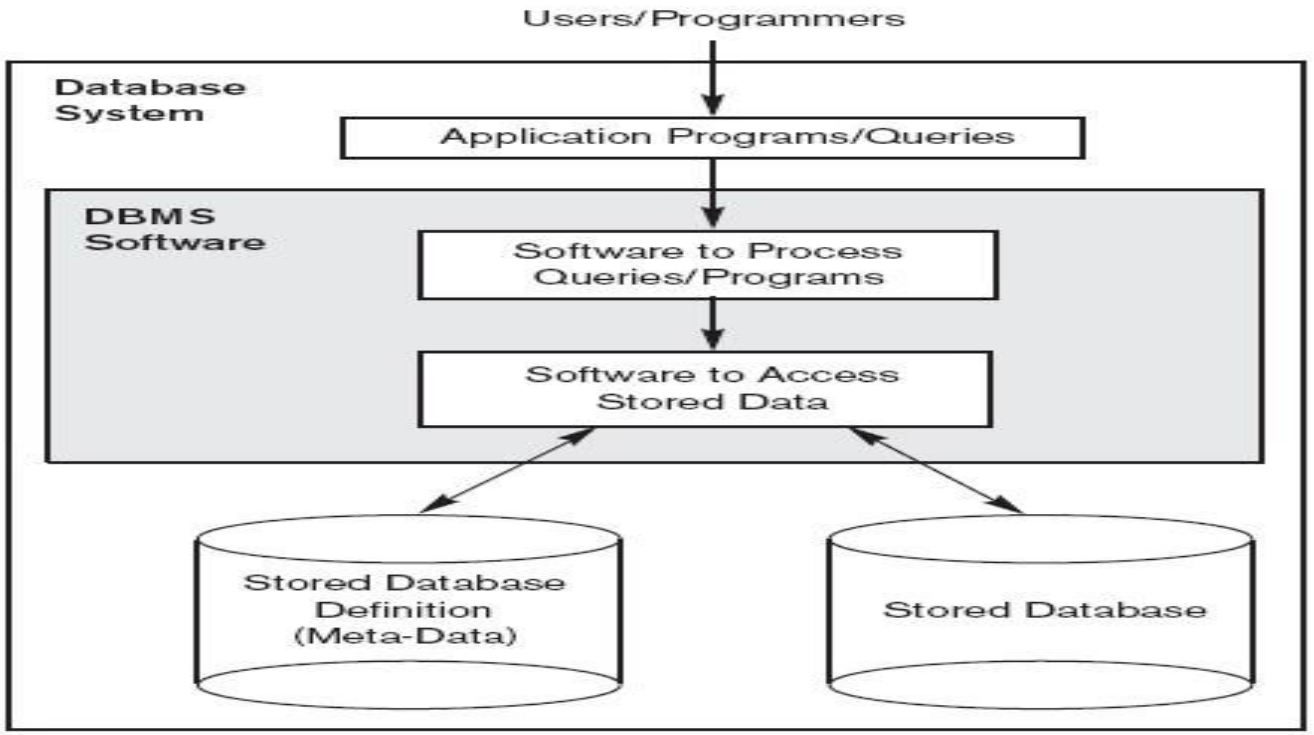


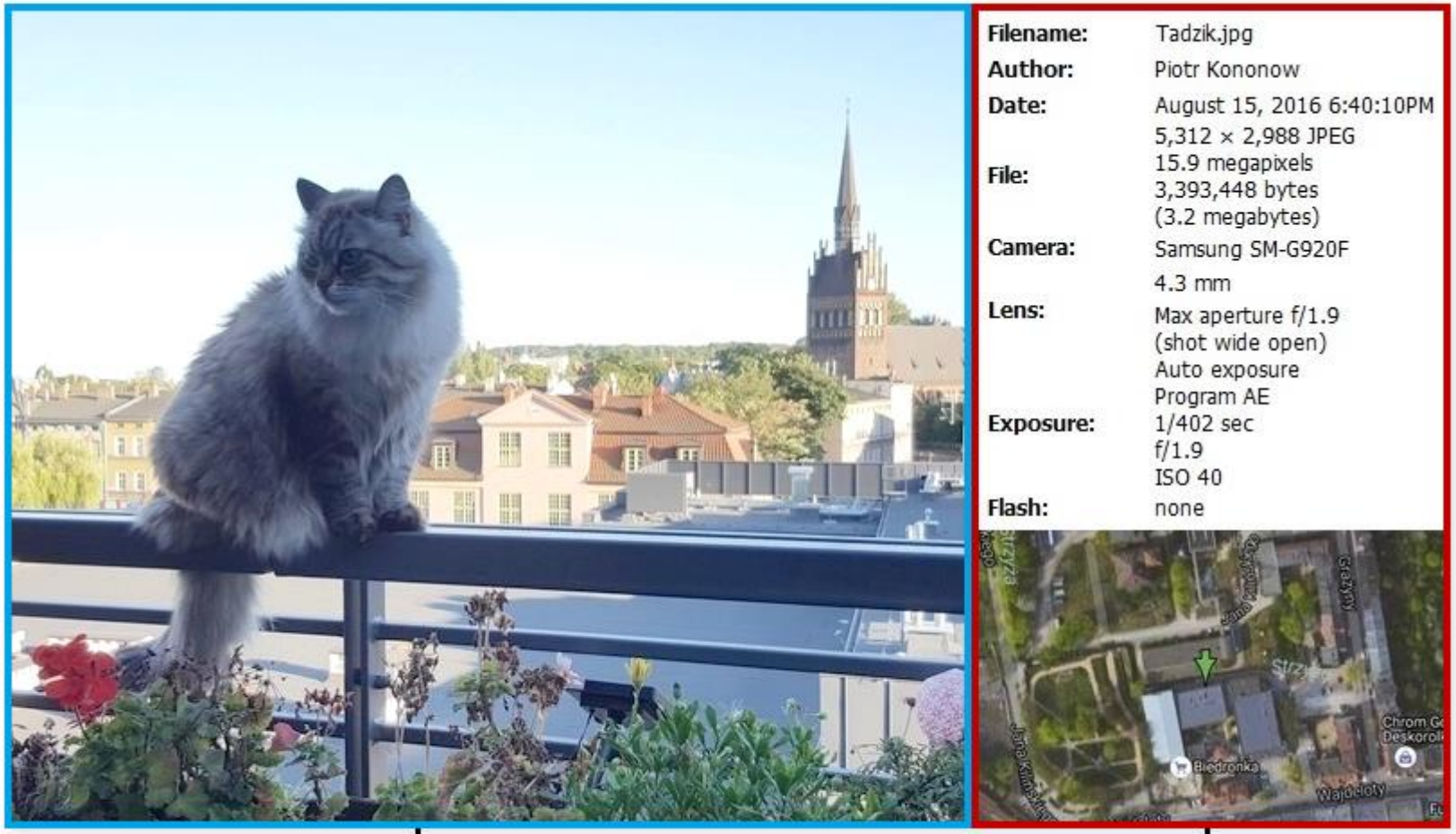
Figure 1.1
A simplified database system environment.

Characteristics of database approach

Self describing nature of database system

Database system contains complete definition of structure and constraints

- Meta-data: Describes structure of the database



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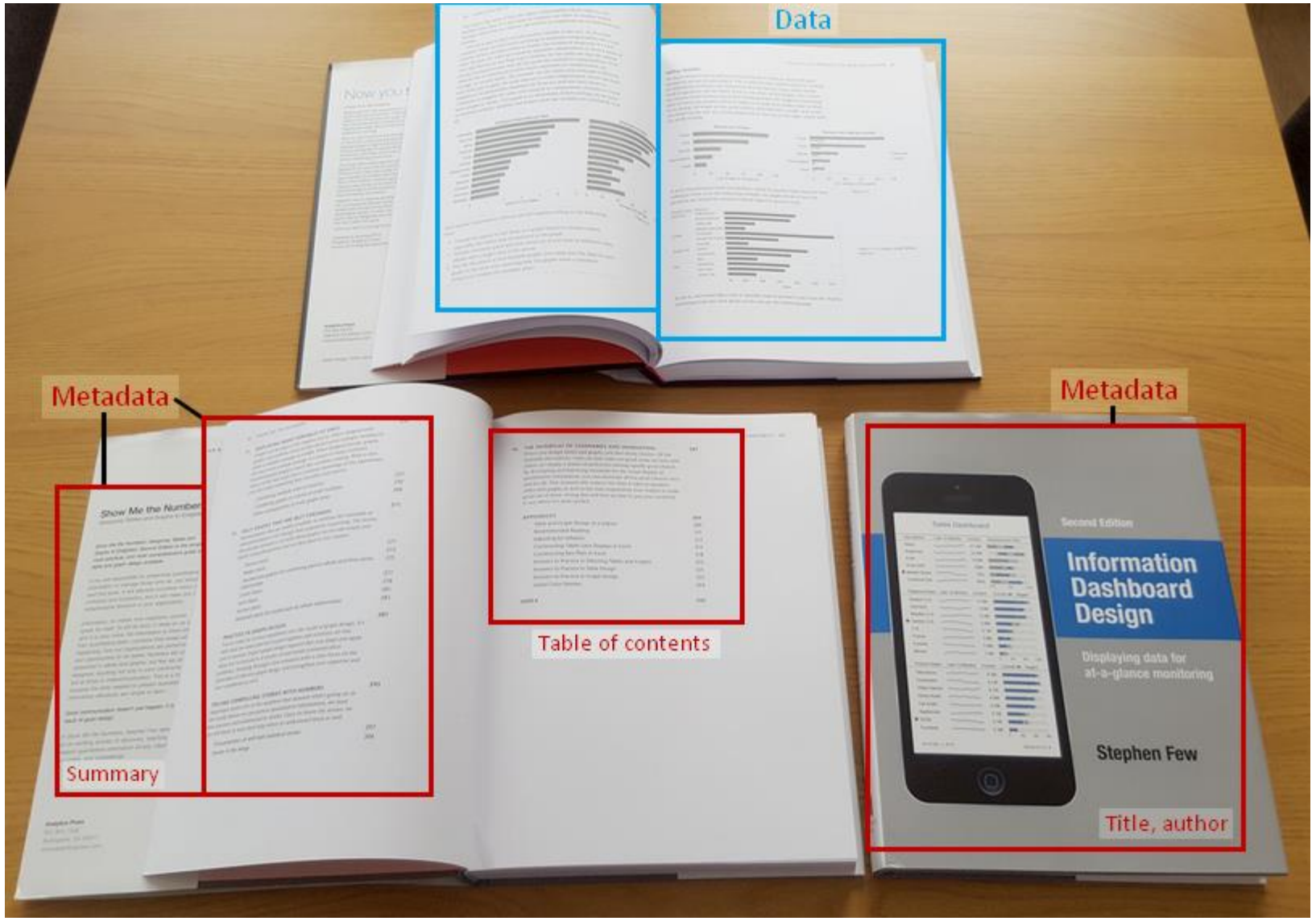
Author:	Piotr Kononow
Date:	August 15, 2016 6:40:10PM
File:	5,312 × 2,988 JPEG 15.9 megapixels 3,393,448 bytes (3.2 megabytes)
Camera:	Samsung SM-G920F
Lens:	4.3 mm Max aperture f/1.9 (shot wide open) Auto exposure Program AE
Exposure:	1/402 sec f/1.9 ISO 40
Flash:	none

Data

Metadata


Data
Metadata
Summary
Table of contents
Metadata
Second Edition
Information Dashboard Design
Displaying data for at-a-glance monitoring
Stephen Few
Title, author

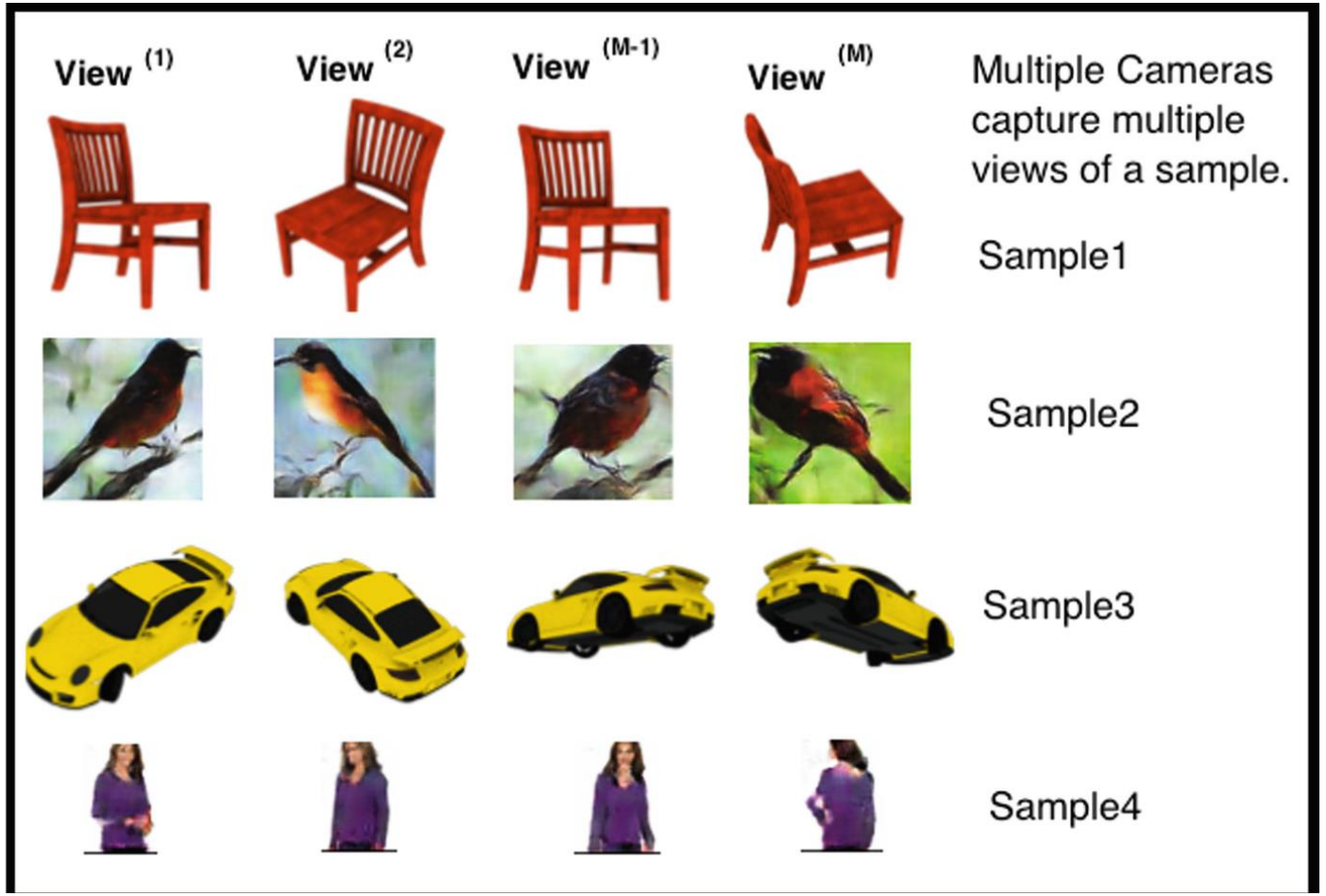
Characteristics of database approach

Insulation Between Programs and Data

- Program-data independence
- Data abstraction

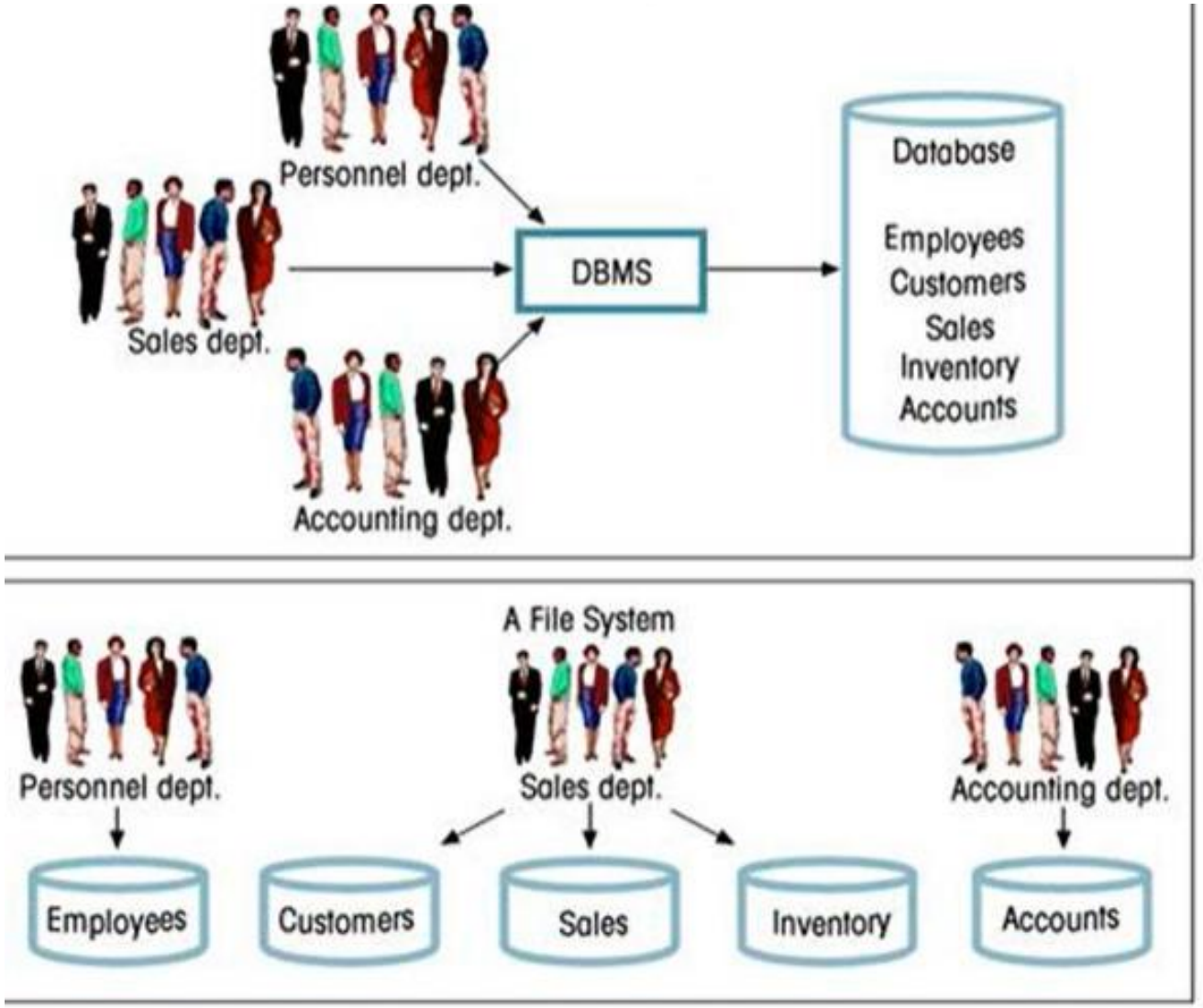
Characteristics of database approach

- Support of multiple views of data
- Sharing of data and multiuser transaction processing


View (1)
View (2)
View (M-1)
View (M)
Multiple Cameras capture multiple views of a sample.
Sample1
Sample2
Sample3
Sample4

File-based systems

- File-based data systems are systems that are used to manage and maintain data files.
- To retrieve information from such files, the entries are either searched sequentially or an indexing system could be used to locate such information.


Personnel dept.
Sales dept.
Accounting dept.
DBMS
Database
Employees
Customers
Sales
Inventory
Accounts
A File System
Personnel dept.
Sales dept.
Accounting dept.
Employees
Customers
Sales
Inventory
Accounts

Drawbacks of using file systems to store data:

- Data redundancy and inconsistency
- Difficulty in accessing data
- Data isolation — multiple files and formats

Data Processing

- Data in its raw form is not useful to any organization.
- Data processing is the method of collecting raw data and translating it into usable information.
- It is usually performed in a step-by-step process by a team of data scientists and data engineers in an organization.
- The raw data is collected, filtered, sorted, processed, analysed, stored, and then presented in a readable format.

Types of Data Processing

- Commercial Data Processing
- Scientific Data Processing
- Batch Processing
- Online Processing
- Real-Time Processing

Types of Data Processing

1. Commercial Data Processing: Commercial data processing is a way of using relational databases in a commercial setting.

- It feeds the system a big amount of data and producing a significant volume of output with fewer computing processes.
- It essentially mixes commerce and computers to make it beneficial for a company.
- Accounting software is a good example of a data processing application.

Types of Data Processing

2. Scientific Data Processing:

- It makes extensive use of computer processes while requiring fewer inputs and outputs.
- Arithmetic and comparison operations are among the computing operations. Any risk of mistakes is unacceptable in this sort of processing since it would lead to erroneous decisions.
- Processing, managing and distributing science data products are common examples of scientific data processing.

Types of Data Processing

3. Batch Processing: when the data is homogeneous and in big amounts, and it is gathered and analyzed in batches.

- Simultaneous batch processing happens when all of the cases are processed at the same time by the same resource.
- Sequential batch processing happens when distinct cases are processed by the same resource either simultaneously or sequentially.
- When they are processed by the same resources yet partially overlap in time, this is referred to as concurrent batch processing.
- It's usually utilized in banking applications or areas where higher degrees of security are necessary.

Types of Data Processing

4. Online Processing: "online" means "interactive"

- Online processing, like traditional query processing engines, may be created out of a variety of relatively basic operators.
- Processing through the Internet analytical processes usually require big chunks of data from large databases.
- As a result, it should come as no surprise that today's online analytical tools include interactive functionality.

Types of Data Processing

5. Real-Time Processing: Data is processed within seconds when the input is given. Used for small amounts of data.

This type of processing is used where an immediate result is required.

Eg: withdrawing money from ATM

Access Methods

- The part of a computer's operating system responsible for structuring data sets and directing them to specified storage devices is known as an access method.
- Random and sequential access are the two types of access methods.
- To process queries and obtain data, data access methods are employed. The data to be queried is stored in database objects such as tables, forms, reports etc.

- Sequential access is more convenient when the storage medium is magnetic tape, rather than disk.
- Random access method is of great use for immediate access to large amounts of information.
- Other access methods can also be used such as Indexed sequential access method.
- These methods generally use an index for the file.

Advantages of Using the DBMS Approach

- Controlling redundancy
- Restricting unauthorized access
- Providing backup and recovery
- Providing multiple user interfaces
- Enforcing integrity constraints
- Available up-to-date information

	DBMS	RDBMS
1)	DBMS applications store **data as file**.	RDBMS applications store **data in a tabular form**.
2)	In DBMS, data is generally stored in either a hierarchical form or a navigational form.	In RDBMS, the tables have an identifier called primary key and the data values are stored in the form of tables.
3)	**Normalization is not** present in DBMS.	**Normalization is** present in RDBMS.
4)	DBMS does **not apply any security** with regards to data manipulation.	RDBMS **defines the integrity constraint** for the purpose of ACID (Atomocity, Consistency, Isolation and Durability) property.
5)	DBMS uses file system to store data, so there will be **no relation between the tables**.	in RDBMS, data values are stored in the form of tables, so a **relationship** between these data values will be stored in the form of a table as well.
6)	DBMS is meant to be for small organization and **deal with small data**. it supports **single user**.	RDBMS is designed to **handle large amount of data**. it supports **multiple users**.
7)	Examples of DBMS are file systems, **xml, MS Access** etc.	Example of RDBMS are **mysql**, **postgre**, **sql server**, **oracle** etc.

Database Applications:

- Banking: all transactions
- Airlines: reservations, schedules
- Universities: registration, grades
- Sales: customers, products, purchases
- Online retailers: order tracking, customized recommendations
- Manufacturing: production, inventory, orders, supply chain
- Human resources: employee records, salaries, tax deductions

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Q & A


THANK YOU