Database Management System

Overview of Database Management System

Data –Data is a collection of raw facts and figures.

Data vs. Information

Information –Information is the processed, organized data presented in a given context and is useful to humans.

Database –Collection of interrelated data.

Database

A database is organized collection of related data of an organization stored in formatted way which is shared by multiple users.

The main feature of data in a database are:

1. It must be well organized

2. it is related

3. It is accessible in a logical order without any difficulty

4. It is stored only once

Why Database?

In order to overcome the limitation of a file system, a new approach was required.

  The initial attempts were to provide a centralized collection of data.

  For easy data share and well data organization.

  A small database can be handled manually but for a large database and having multiple users it is difficult to maintain it, In that case a computerized database is useful.

Drawbacks of using file systems

In the early days, database applications were built on top of file systems

Drawbacks of using file systems to store data:

Data redundancy and inconsistency

Difficulty in accessing data

Data isolation —no features of multiple files and formats

Drawbacks of using file systems (cont.)

No any solution to Integrity problems like name, mobile number, age.

Atomicity of updates may be fail.

No Concurrent access by multiple users Security problems

Database systems offer solutions to all the above problems

Database Management System (DBMS)

DBMS –A Database management system is a collection of interrelated data and a set of programs to access data.

those DBMS contains information about a particular

enterprise and *efficient to use*. DBMS provides an environment that is both *convenient*

Banking: all transactions
Database Applications:
Airlines: reservations, schedules
Universities: registration, grades
Sales: customers, products, purchases
Manufacturing: production, inventory, orders, supply chain
Human resources: employee records, salaries, tax deductions

Databases touch all aspects of our lives

Advantages of DBMS:

1. **Defining database structure**.

2. **Reduction of redundancies**

3. **Manipulation of the database.**

4. **Sharing of data.**

5. **Protection of database.**

6. **Database recovery.**

File System	DBMS
Storing and retrieving of data can't be done efficiently in a file system.	DBMS is efficient to use as there are a wide variety of methods to store and retrieve data.
It does not offer data recovery processes.	There is a backup recovery for data in DBMS.
Protecting a file system is very difficult.	DBMS offers good protection mechanism.
In a file management system, the redundancy of data is greater.	The redundancy of data is low in the DBMS system.
DataSharing is difficult.	DataSharing is easy.
There is no efficient query processing in the file system.	You can easily query data in a database using the SQL language.

MOST POPULAR DATABASES

1 Oracle

. MySQL

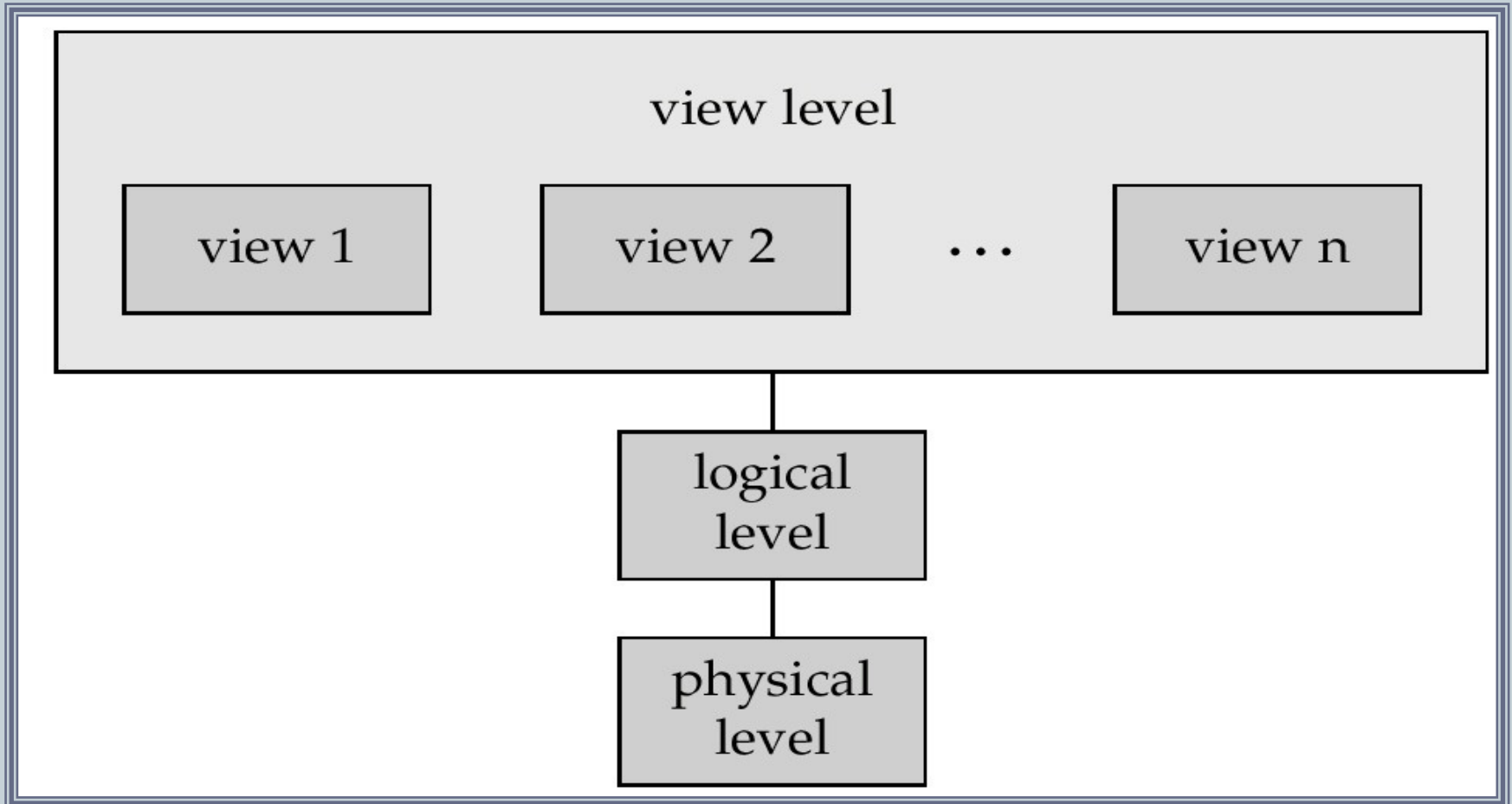2 Microsoft SQL Server
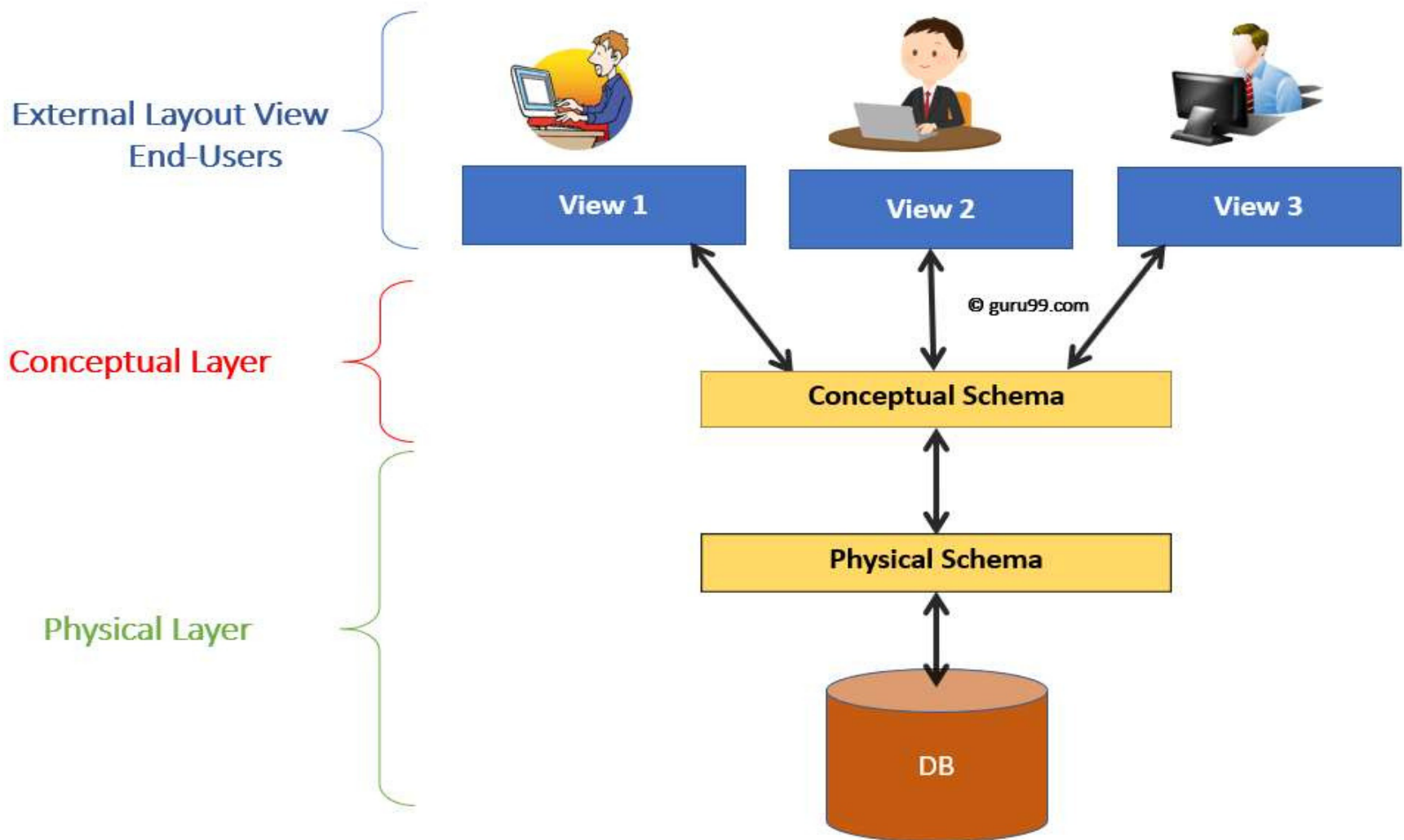
. PostgreSQL

3 MongoDB

. DB2

6

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Questions:

1. What is DBMS? Explain Data, Information?

2. What are difference between file system and database system?

An Architecture for a Database System

view level

view 1	view 2	...	view n

logical level

physical level

An Architecture for a Database System

Instances and Schemas

Similar to types and variables in programming languages

Schema–the logical structure of the database
e.g., the database consists of information about a set of customers and accounts and the relationship between them)
Analogous to type information of a variable in a program
Physical schema: database design at the physical level
Logical schema: database design at the logical level

Instance–the actual content of the database at a particular point in time
Analogous to the value of a variable

Levels of Abstraction

Physical level describes how a record (e.g., customer) is stored.

Logical level: describes data stored in database, and the relationships among the data.

typecustomer = **record**

name: string;   *street*: string;

city: integer;
end;

View level: application programs hide details of data types. Views can also hide information (e.g., salary) for security purposes.

Data Independence

Data Independence is defined as a property of DBMS that helps you to change the Database schema at one level of a database system without requiring to change the schema at the next higher level.

Data independence helps you to keep **data** separated from all programs that make use of it.

A database system normally contains a lot of data in addition to users' data. For example, it stores data about data, known as **metadata**.

TYPES OF DATA INDEPENDENCE

There are two types of Data Independence

1. **Physical level Data Independence**
2. **Logical level Data Independence**

Physical level Data Independence

Physical data independence can be defined as the capacity to change the internal schema without having to change the conceptual schema.

If we do any changes in the storage size of the database system server, then the Conceptual structure of the database will not be affected.

Example of Physical level Data Independence

Using a new storage device like Hard Drive or Magnetic Tapes

Modifying the file organization technique in the Database Switching to different data structures.

Changing the access method.

Modifying indexes.
Change of Location of Database from say C drive to D Drive
Changes to compression techniques or hashing algorithms.

Logical level Data Independence

Logical data independence refers characteristic of being able to change the conceptual schema without having to change the external schema.

Logical data independence is used to separate the external level from the conceptual view.

If we do any changes in the conceptual view of the data, then the user view of the data would not be affected.

Examples of Logical Data Independence

Due to Logical independence, any of the below change will not affect the external layer.

Add/Modify/Delete a new attribute, entity or relationship is possible without a rewrite of existing application programs

Merging two records into one

Breaking an existing record into two or more records

Database Administration Roles

A**Database Administrator (DBA)**is individual
or person responsible for controlling, maintenance, coordinating, and operation of database
management system. Managing, securing, and taking care of database system is prime responsibility.