

## UNIT 1: OVERVIEW TO DATABASE MANAGEMENT SYSTEM

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### DEFINE FOLLOWING TERMS.

#### 1. Data

- Data is a collection of facts such as text, numbers, words, images, sounds etc.
- For example:
  - Your name, age, height, weight, Photo of student, contact details etc.

#### 2. Information

- Information means processed data.
- Data is raw so that we need to do process like calculations, comparisons, analysis, summarization etc.

#### 3. Database

- Database is an organized collection of meaningful data that is design for a specific purpose.
- It is a place where data is stored & retrieve data in a way that we want.
- Some real word example of database are:
  - **Telephone directory , Dictionary , Student attendance register, Employee register**

#### 4. DBMS

- DBMS stands for **Database Management System**.
- It is a collection of software that store, retrieve, manage & maintain database.
- Some popular DBMS software are:

- DBASE , DBASE II, FOXPRO, FOXBASE, SQL SERVER, ORACLE, MYSQL

### **5. Field/attributes**

- A field is a character or group of characters that have a specific meaning.
- A field is a single piece of information.
- It contain similar types of data.

### **6. Record**

- A record is a collection of logically related fields.
- It is known as tuple or entity.

### **7. Meta data**

- Data about data is call Meta data.
- Meta data stores information about tables, fields of tables, data type & the relationship between tables.

### **8. Data dictionary**

- A data dictionary is an information repository, which contains metadata.

## **1. WHAT IS THE PURPOSE OF DBMS?**

- You can use database for
  - Enables the user to create and maintain a database.
  - Allows users to create, manipulate, and design databases for a number of purposes.
  - Handle & deal with large volumes of data.
  - Maintain the security of the information.
  - Processes to back-up the data regularly and recover data if a problem occurs

## **2. EXPLAIN ADVANTAGES OF DBMS.**

- **Remove Data Redundancy (Duplication):**
  - Due to centralized database, it is possible to avoid duplication of information.
  - This leads to reduce data redundancy.
- **Shared Data:**
  - All authorized user and application program can share database easily.
- **Data Consistency:**
  - Data inconsistency occurs due to data redundancy.
  - With reduced data redundancy, such type of data inconsistency can be removed.
  - This results in improved data consistency.
- **Data Access:**
  - DBMS utilizes a variety of techniques to retrieve data.
  - Required data can be retrieved by providing appropriate query to the DBMS.
  - Thus, data can be accessed in a convenient and efficient manner.

- **Data Integrity:**
  - Data in database must be correct and consistent.
  - Therefore data stored in database must satisfy certain types of constraints (rules).
  - DBMS provides different ways to implement such type of constraints (rules) to improve data integrity.
- **Data Security:**
  - DBMS provides way to control the access to data for different user according to their requirement.
  - It prevents unauthorized access to data.
  - Thus, security can be improved.
- **Concurrent Access:**
  - Multiple users allowed to access data simultaneously.
  - Concurrent access to centralized data can be allowed under some supervision.
  - This results in better performance of system and faster response.
- **Guaranteed Atomicity:**
  - Any operation on database must be atomic.
  - This means, operation must be executed either 100% or 0%.
  - This type of atomicity is guaranteed in DBMS.

### **3. LIST AND EXPLAIN THE APPLICATIONS OF DBMS.**

#### **1. Ecommerce:**

- Ecommerce platform use database to maintain Inventory Information, Purchases, sales records, Invoices, billing Etc.

#### **2. Education:**

- Schools and colleges use databases for student's information, course registration, result, and other information.

#### **3. Social media:**

- Social media platform uses database to store User Data, log in informations, Preferences, Etc.

#### **4. Library:**

- Library uses database for keeping records of Books, Issue Date, Return Date & check availability of books etc.

#### **5. Banking:**

- Banks use databases for customer inquiry, accounts, loans, and other transactions.

#### **6. Airlines & railways:**

- Airlines & railways uses database for Flight or rail Information, Reservation Information, Tickets and Schedules etc.

#### **7. Telecommunication:**

- Telecommunication departments use databases to store information about the communication network, telephone numbers, record of calls, for generating monthly bills, etc.

**8. Sales & finance:**

- Sales & finance uses database for store product information, purchases of stocks and bonds, sales, customer and transaction details etc.

**9. Human resource:**

- Human resource department uses database for Employee Information, Salary, Pay cheques, taxes Etc.

**10. Manufacturing:**

- Manufacturing departments uses database for supplier information, bills, inventory, etc.

## 4. WHAT IS SCHEMA & INSTANCE?

### Instance

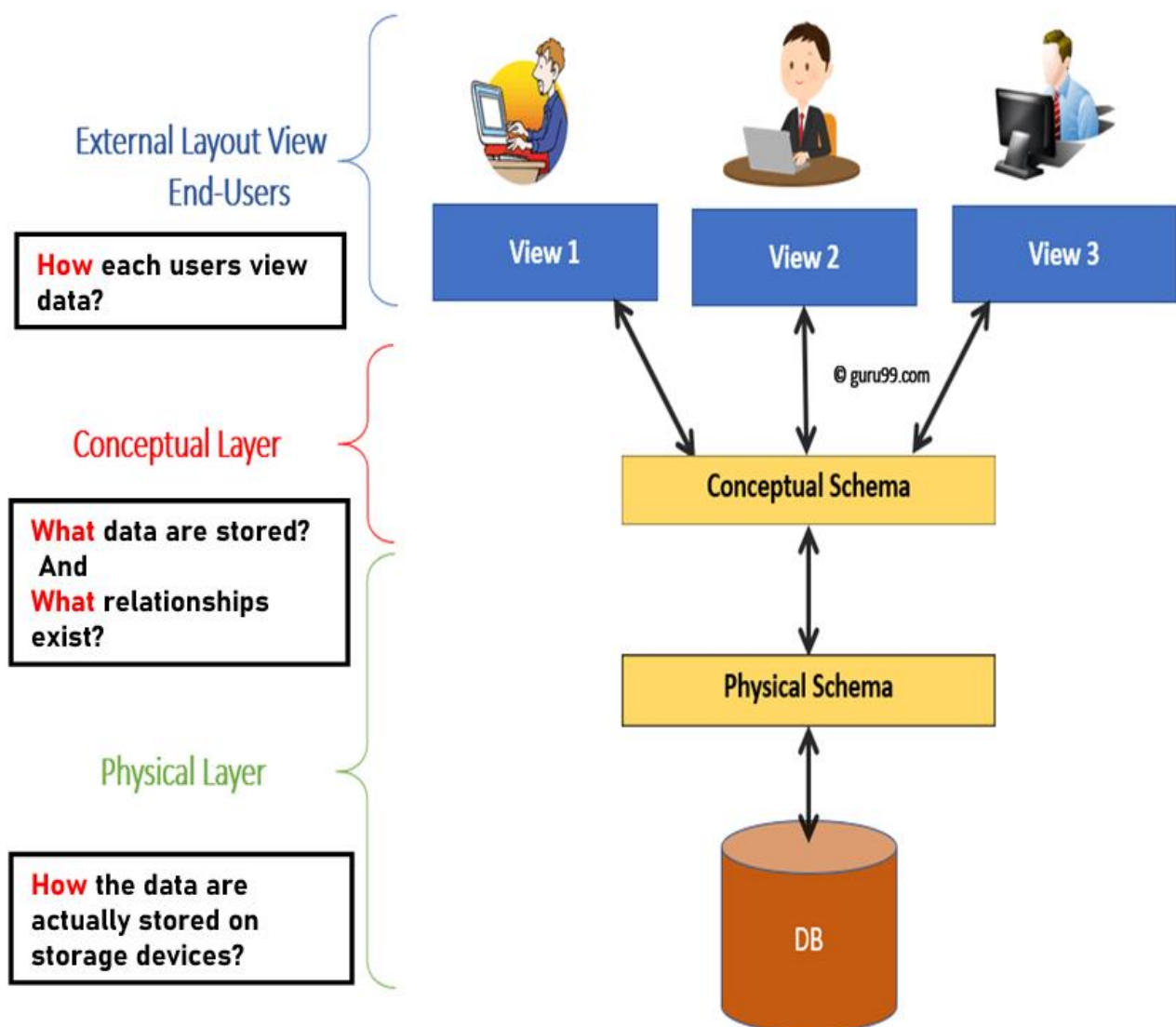
- Instances are the collection of information stored at a particular moment.
- Instances changed **frequently**.
- There are three types of instance: empty state, initial state and current state.

### Schema

- The overall design or descriptions of a database is called schema.
- It represents the logical view of the entire database.
- Schemas changed **rarely**.

## 5. EXPLAIN THREE LEVELS ANSI SPARC DATABASE SYSTEM OR EXPLAIN THREE LEVEL DATA ABSTRACTION.

- Data Abstraction is a process of hiding unwanted or irrelevant details from the end user.
- There are 3 levels of data abstraction:
  - View level (end user level)
  - Conceptual level (logical level)
  - Physical level (internal level)





- **View level ( external level)**

- It is called user view.
- It is a highest level, which specify some part of database.
- Specify **how each users view data**.
- Each user can show a different view for specific data
- It is use by end users and application programmers.

- **Conceptual level (logical level)**

- It is a middle level of data abstractions.
- It describes what data are stored in the database and what are relationships exist among those data.
- It specify table or entity along with its attributes & logical relations between entities.
- At this level, data is represented in the form of table – conceptual level.

- **Physical level (internal level)**

- It is a lowest level of data abstractions.
- It describe how the data is stored on the storage device.
- It provides internal view of physical storage of data.
- At this level, we can know where the data is stored in file, size of the file, memory as well as location of the file.

**6. WHAT IS A DATABASE MODELS? LIST OUT DATA MODELS.**

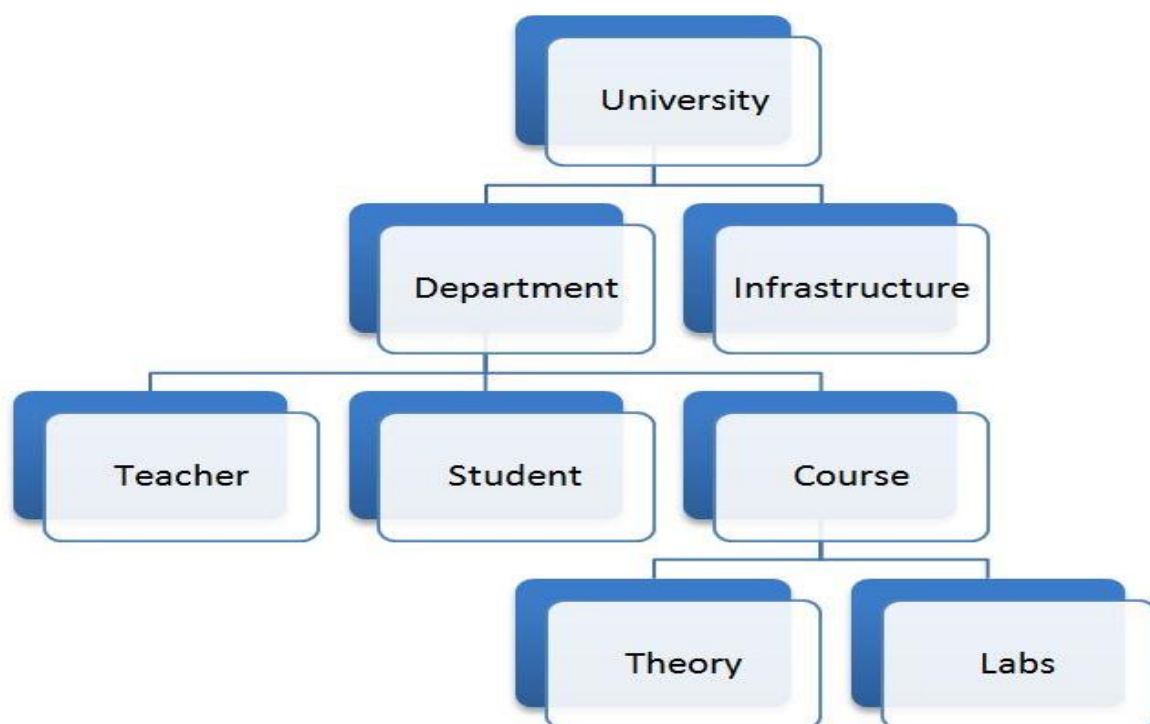
- A data model decides the method of storing data in database.
- Defines the logical structure of a database.
- When the data is stored in the database it needs to be stored in a particular format.
- Therefore, data model decide the structure to store data.
- Data modelling makes it easier for developers, data architects, business analysts, and other stakeholders to view and understand relationships among the data in a database or data warehouse.

**Type of Database Models are:**

- Hierarchical Model
- Network Model
- Entity-relationship Model
- Relational Model

## 7. EXPLAIN HIERARCHICAL MODEL IN DETAIL.

- IBM developed it, in the 1960s.
- It uses **tree structure** to represent data.
- The hierarchy starts from the Root node and expands like a tree, adding child nodes to the parent nodes.
- A parent node contain one or more child node.
- Data are viewed as a collection of tables.
- Support one to one or one to many relationships.



### Advantages:

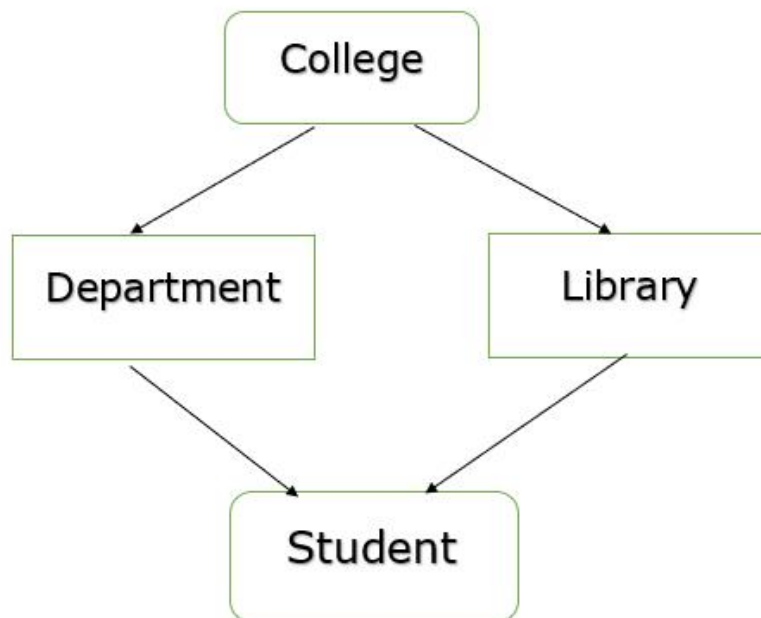
- Simple & Easy to understand.
- Data security.
- Maintain data integrity.

### Disadvantages:

- Top to down traversal approach.
- Complex model.
- One parent per child allowed in hierarchical model.
- Does not support many too many relationships.

## 8. EXPLAIN NETWORK MODEL WITH ADVANTAGES & DISADVANTAGES.

- This is an extension of the Hierarchical model.
- In this model, data organized more like a graph.
- It allowed having more than one parent node.
- It is design to represent objects and their relationships flexibly.
- Each set contains one owner or parent record as well as one or more child or member records.



### Advantages:

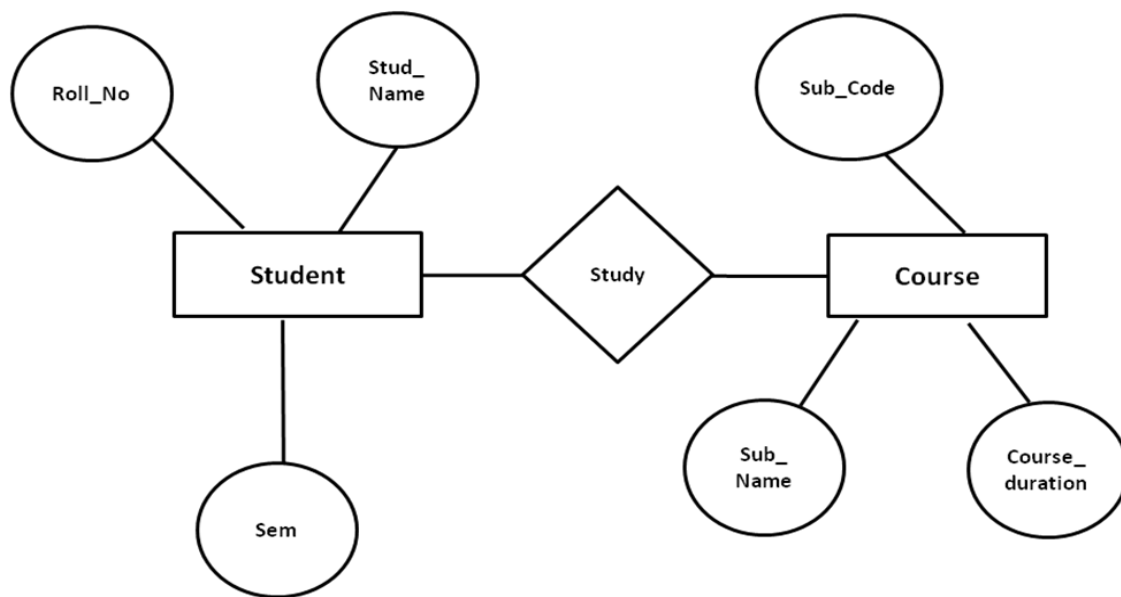
- Conceptually simple and easy to design.
- Data security
- Maintain data integrity
- Support many too many relationships.
- Data access is easier and flexible

### Disadvantages:

- System complexity
- Lack of structural independence

**9. WRITE A DETAIL NOTE ON ENTITY-RELATIONSHIP MODEL.**

- Peter Chen firstly develops ER diagram in 1976.
- It is based on real-world entities & their relationships.
- Used to design a conceptual view of database.
- In terms of DBMS, an entity is a table or attribute of a table in database.

**Advantages:**

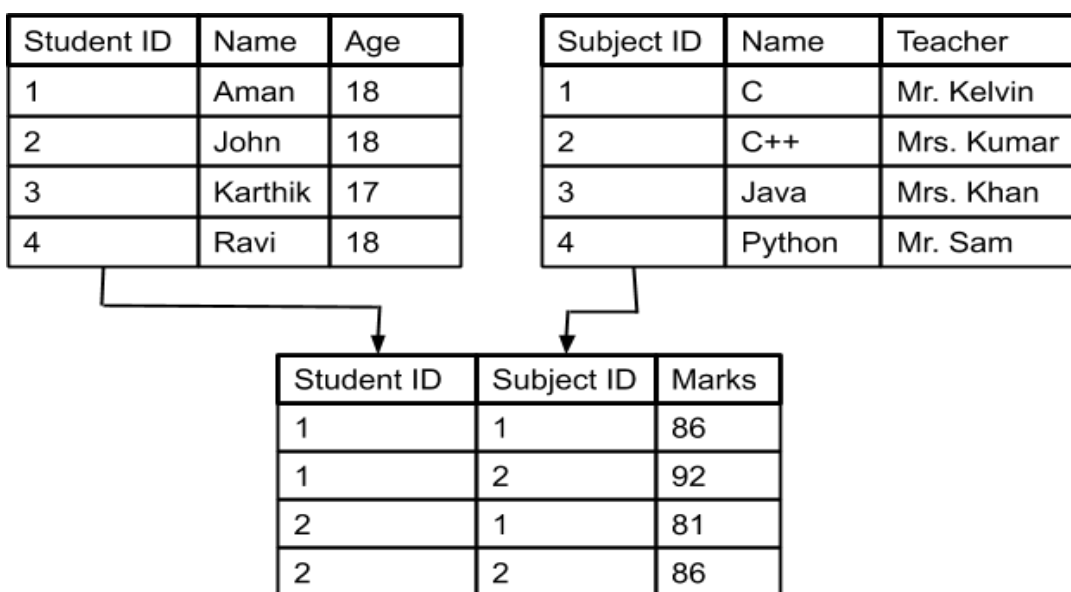
- Easy to understand
- Simple
- More specific to relational database modeling
- Good DBMS support
- Visual representation

**Disadvantages:**

- Limited expressiveness
- Can be ambiguous
- No standards: many versions that can be confusing
- Mostly for relational database only
- Limited constraint representation

**10. EXPLAIN IN DETAIL: RELATIONAL MODEL**

- This data model introduced in 1970's.
- Currently, it is considered as the most widely used data model.
- It represents the database as a collection of relations.
- A relation is nothing but a table of values.
- Data in the form of table
- Each table represents one entity.
- Each row of table represents instances of that entity.

**Advantages:**

- Structural independence
- Conceptual simplicity
- Design , implementation , maintenance and usage ease
- Query capability
- Limits redundancy
- Flexible
- Offers better data integrity

**Disadvantages:**

- Hardware Overhead
- Performance Issue
- Complex to understand when there is more number of tables.