



DATA:

- Raw facts and Figures are called data.
- Such as alphabets (A-Z , a-z), digits(0-9) or special characters.

INFORMATION:

- Organized meaningful data is called information.
- Information that is useful to one person is not necessarily useful to another person.

DATABASE:

Database is a collection of related data.

DATABASE MANAGEMENT SYSTEM:

Database management system is a software designed to store, retrieve and manage data in a database.

RELATION DATABASE MANAGEMENT SYSTEM:

- RDBMS is a software which is used to store data in a structured format using table or columns and rows.
- In this kind of system data is managed and stored in rows and columns which is known as tuples and attributes.



FILE SYSTEM VS DBMS

File System	DBMS
File system is a software that manages and organizes the files in a storage medium within a computer.	DBMS is a software for managing the database
Redundant data can be present in a file system.	In DBMS there is no redundant data.
It doesn't provide backup and recovery of data if it is lost	It provides backup and recovery of data even if it is lost.
There is no efficient query processing in file system.	Efficient query processing is there in DBMS.
There is less data consistency in file system.	There is more data consistency because of the process of normalization.
It is less complex as compared to DBMS.	It has more complexity in handling as compared to file system.
File systems provide less security in comparison to DBMS.	DBMS has more security mechanisms as compared to file system.
It is less expensive than DBMS.	It has a comparatively higher cost than a file system.

SCHEMA:

- Schema represents the logical view of the entire database.
- A database schema defines its entities and the relationship among them.
- It describes both the organization of data and the relationships between tables in a given database.

STUDENT

Rollno	Name	address



A database schema can be divided into two categories:

➤ **Physical Database schema:**

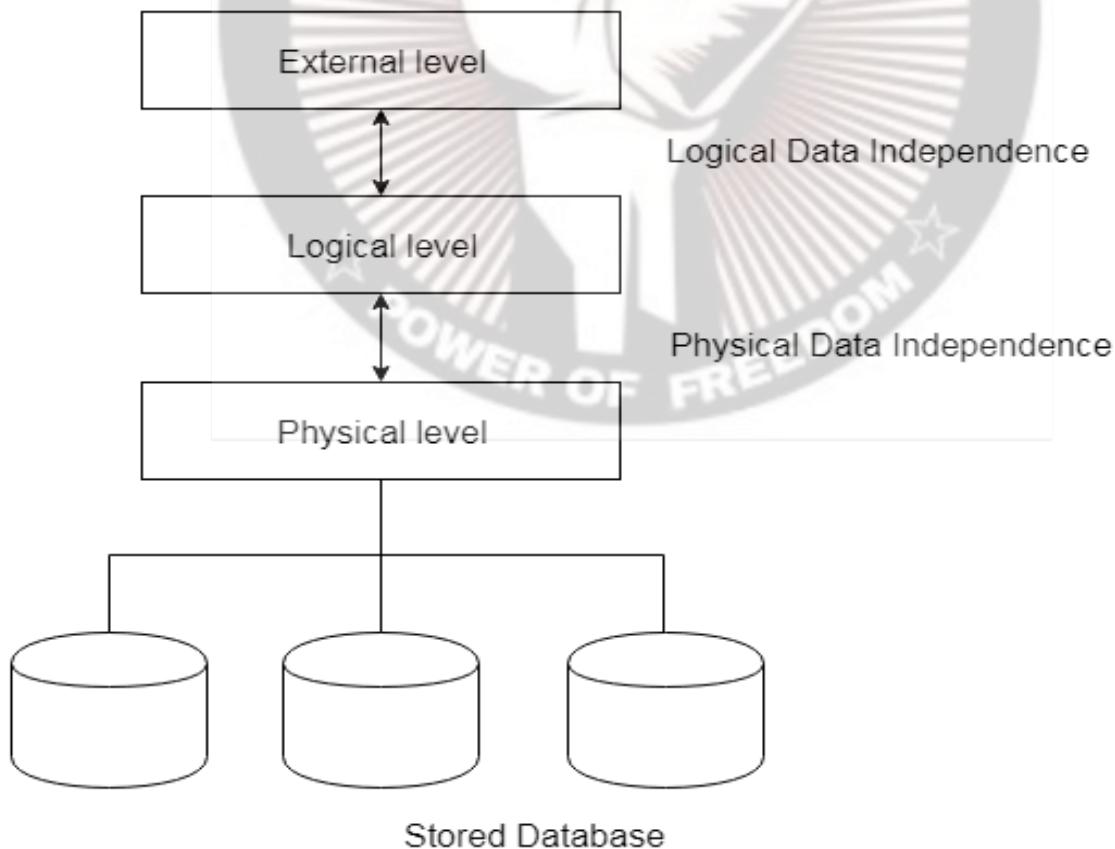
- It defines how the data will be stored in a secondary storage.
- The design of a database at physical level is called physical schema.

➤ **Logical Database schema:**

- This schema defines all the logical constraints that need to be applied on the data stored.
- Design of Database at logical level is called logical level is called logical schema.
- Programmer and DBA work out this level.

DATA INDEPENDENCE:

Data independence refers characteristic of being able to modify the schema at one level of the database system without altering the schema at the next higher level.





There are two types of data independence:

1. Logical Independence:

- Logical data independence refers characteristic of being able to change the conceptual schema without having to change the external schema.
- If we do any changes in the conceptual view of the data, then the user view of the data would not be affected.
- Logical data independence occurs at the user interface level.

2. Logical 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.

DATABASE ADMINISTRATOR (DBA):

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.

They are responsible and in charge for authorizing access to database, coordinating, capacity, planning, installation, and monitoring uses and for acquiring and gathering software and hardware resources as and when needed. Their role also varies from configuration, database design, migration, security, troubleshooting, backup, and data recovery.



Importance of Database Administrator (DBA):

- Database Administrator manages and controls three levels of database like internal level, conceptual level, and external level of Database management system architecture and in discussion with comprehensive user community, gives definition of world view of database. It then provides external view of different users and applications.
- Database Administrator ensures held responsible to maintain integrity and security of database restricting from unauthorized users. It grants permission to users of database and contains profile of each and every user in database.
- Database Administrator also held accountable that database is protected and secured and that any chance of data loss keeps at minimum.

DATA MODEL:

Data models define how the logical structure of a database is modeled. Data Models are fundamental entities to introduce abstraction in a DBMS. Data models define how data is connected to each other and how they are processed and stored inside the system.

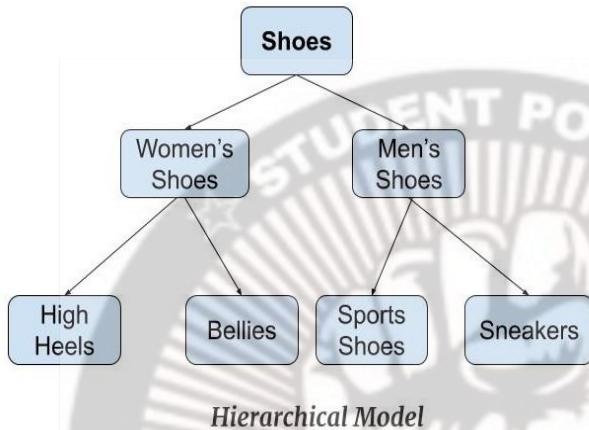
1. **Hierarchical Model**
2. **Network Model**
3. **Entity-Relationship Model**
4. **Relational Model**
5. **Object-Oriented Data Model**



Hierarchical Model:

Hierarchical Model was the first DBMS model. This model organizes the data in the hierarchical tree structure. The hierarchy starts from the root which has root data and then it expands in the form of a tree adding child node to the parent node.

Example: We can represent the relationship between the shoes present on a shopping website in the following way:



Advantages of Hierarchical Model

- It is very simple and fast to traverse through a tree-like structure.
- Any change in the parent node is automatically reflected in the child node so, the integrity of data is maintained.

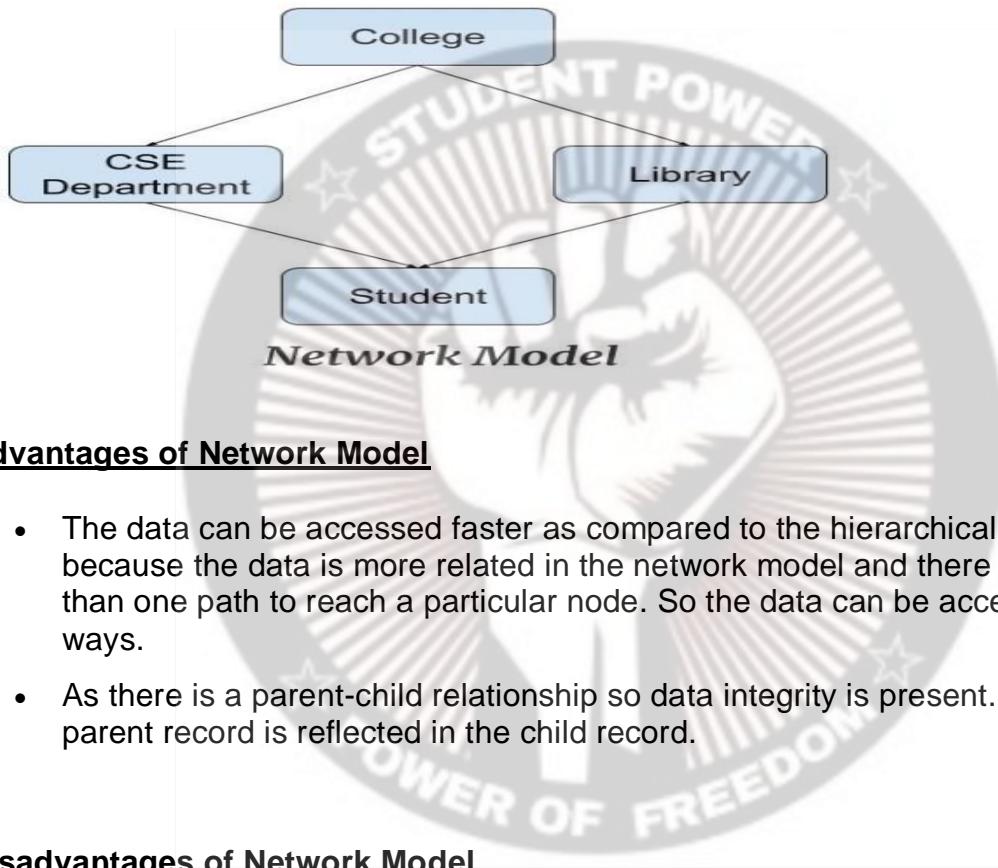
Disadvantages of Hierarchical Model

- Complex relationships are not supported.
- As it does not support more than one parent of the child node so if we have some complex relationship where a child node needs to have two parent node then that can't be represented using this model.
- If a parent node is deleted then the child node is automatically deleted.



Network Model

This model is an extension of the hierarchical model. It was the most popular model before the relational model. This model is the same as the hierarchical model, the only difference is that a record can have more than one parent. It replaces the hierarchical tree with a graph. **Example:** In the example below we can see that node student has two parents i.e. CSE Department and Library. This was earlier not possible in the hierarchical model.



Advantages of Network Model

- The data can be accessed faster as compared to the hierarchical model. This is because the data is more related in the network model and there can be more than one path to reach a particular node. So the data can be accessed in many ways.
- As there is a parent-child relationship so data integrity is present. Any change in parent record is reflected in the child record.

Disadvantages of Network Model

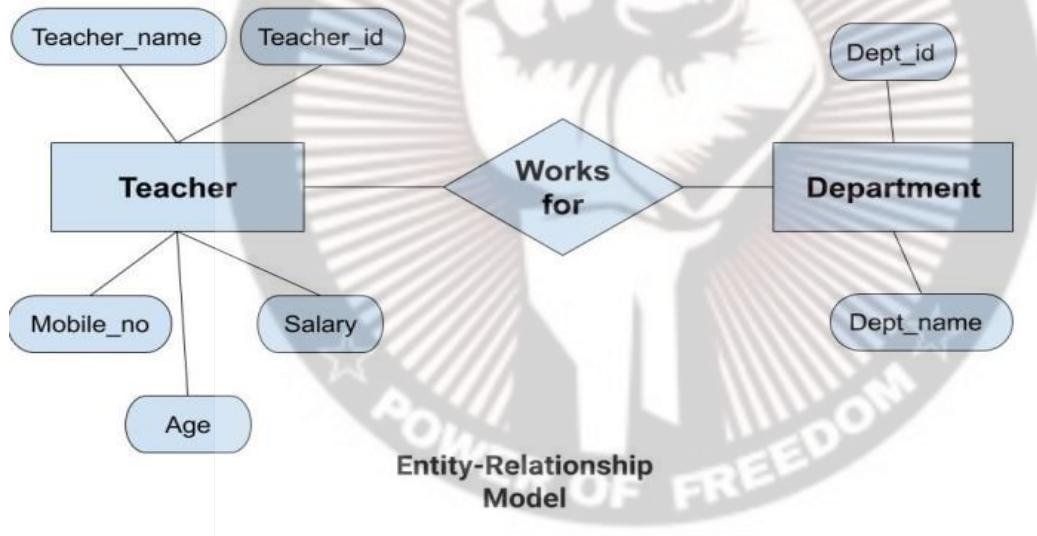
- As more and more relationships need to be handled the system might get complex. So, a user must be having detailed knowledge of the model to work with the model.
- Any change like updation, deletion, insertion is very complex.



Entity-Relationship Model

Entity-Relationship Model or simply ER Model is a high-level data model diagram. In this model, we represent the real-world problem in the pictorial form to make it easy for the stakeholders to understand. It is also very easy for the developers to understand the system by just looking at the ER diagram. ER diagram has the following three components:

- **Entities:** Entity is a real-world thing. It can be a person, place, or even a concept. Example: Teachers, Students, Course, Building, Department, etc are some of the entities of a School Management System.
- **Attributes:** An entity contains a real-world property called attribute. This is the characteristics of that attribute. Example: The entity teacher has the property like teacher id, salary, age, etc.
- **Relationship:** Relationship tells how two attributes are related. Example: Teacher works for a department.





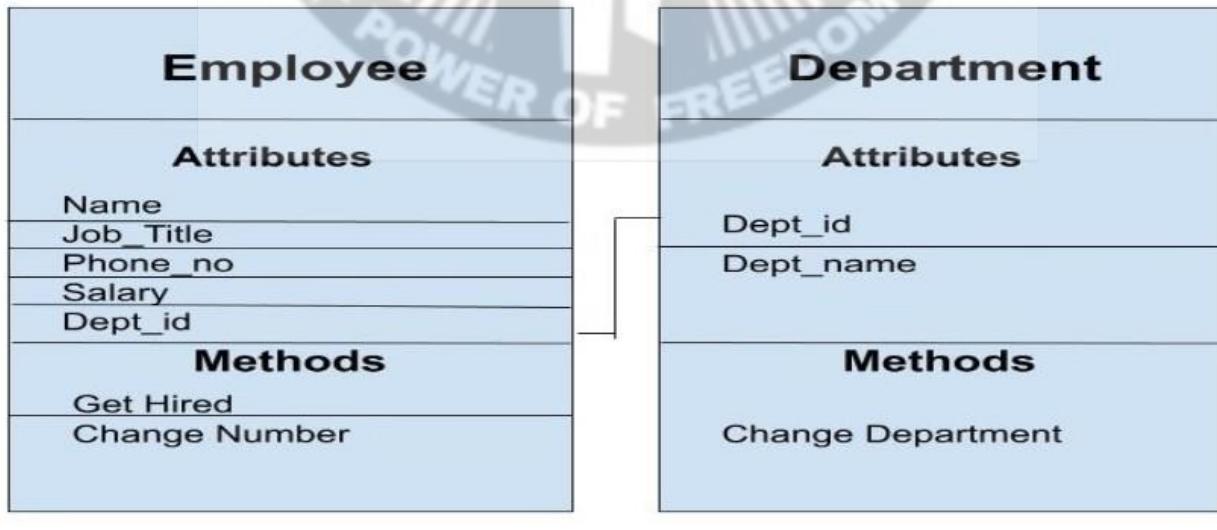
Relational Model

Relational Model is the most widely used model. In this model, the data is maintained in the form of a two-dimensional table. All the information is stored in the form of row and columns. The basic structure of a relational model is tables. So, the tables are also called *relations* in the relational model. **Example:** In this example, we have an Employee table.

rollno	name	age
2	ABC	20
4	CDE	23
5	FGH	34

Object-Oriented Data Model

The real-world problems are more closely represented through the object-oriented data model. In this model, both the data and relationship are present in a single structure known as an object. We can store audio, video, images, etc in the database which was not possible in the relational model.



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