

→ A data model is a conceptual representation of data structures and how data is stored, organized and manipulated.

It defines:

- Entities (things to be stored)
- Attributes (details about entities)
- Relationships (connections between entities)

Purpose:

To provide a blueprint for designing a database that ensure data consistency, accuracy and efficiency.

Types of model

- ① Hierarchical
- ② Network
- ③ Relational
- ④ Entity Relationship
- ⑤ object-oriented.

What is E-R (Entity - Relationship) Modeling? Modeling is a high-level data model technique used to define the data elements and their relationships in a system.

Components of E-R Modeling:

- ① Entity - A real-world object (e.g., student, teacher)
- ② Attribute - Properties of entities (e.g., Student-Name, Roll No.)
- ③ Relationship - Association between entities (e.g., student enrolls in course).

Symbols Used:

- Rectangles : Entities
- Ellipses : Attributes
- Diamonds : Relationships

To create an E-R Diagram (ERD) which helps in database design by visually representing data and its relationships before implementation.

⇒ A Database Management System (DBMS) is software that allows to create, store, manage and retrieve data from a database efficiently.

It provides an interface between the user and the database ensuring data is organized, secure, and easily accessible.

Features of DBMS over file system

Feature	File System	DBMS
① Data Redundancy	High (same data stored in multiple files)	Reduced through Normalization
② Data Integrity	Difficult to enforce	Easy to maintain with constraints
③ Data Security	Basic or none	Strong security with access control
④ Data consistency	May lead to inconsistency	Maintains consistency across tables.

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⑤ Backup & Recovery

Manual and complex
Automatic & reliable feature

⑥ Data sharing

limited

Multi-user access support

⑦ Data independence

High C
changes in
structure do
not affect
application

Conclusion

DBMS overcomes the limitations of traditional file systems by offering better data management, integrity, security, and ease of use, making it ideal for modern applications.

⇒ There are ~~three~~ four main types of DBMS
 (book answer) ~~but~~ ~~is~~ ~~is~~ ~~is~~
 (in notes)

① Hierarchical DBMS

Data is organized in a tree-like structure.

(Parent - child relationship)

Example :- One department (Parent) has many employee (children)

Advantages :- Fast data retrieval

limitation : Rigid structure; difficult to reorganize

② Network DBMS

Data is organized in graph-like structure

Example : A student can enroll in many courses, and each course can have many students.

Advantages : More flexible than hierarchy model

limitation : complex design and maintenance

③ Relational DBMS (RDBMS)
Data is stored in tables (rows and columns)

Example : MySQL, Oracle, PostgreSQL

Advantages :- easy to use, supports SQL, flexible, and widely used.

④ Object-oriented (OODBMS)

Data is represented as objects, similar to object-oriented programming.

Example :-

Advantages :- Good for complex application, like CAD, multimedia, etc

Limitation :- less popular and harder to implement than RDBMS.