Data models

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Data models **describe how a database's logical structure is represented.** In a database management system, data models are essential for introducing abstraction.

Data models specify how data is linked to one another, as well as how it is handled and stored within the system.

A **Data Model** in Database Management System (DBMS), is the concept of tools that are developed to summarize the description of the database.

The various types of data models are
➢ Hierarchical data model

➢ Network data model

➢ ER data model

➢ Relational data model

➢ Object oriented data model

- A hierarchical model represents the data in a tree-like structure in which there is a single parent for each record. To maintain order there is a sort field which keeps sibling nodes into a recorded manner.

- These types of models are designed basically for the early mainframe database management systems, like the Information Management System (IMS) by IBM.

- This model structure allows the one-to-one and a one-to-many relationship between two/ various types of data. This structure is very helpful in describing many relationships in the real world; table of contents, any nested and sorted information.

- The hierarchical structure is used as the physical order of records in storage. One can access the records by navigating down through the data structure using pointers which are combined with sequential accessing.

- Therefore, the hierarchical structure is not suitable for certain database operations when a full path is not also included for each record.

- Data in this type of database is structured hierarchically and is typically developed as an inverted tree. The "root" in the structure is a single table in the database and other tables act as the branches flowing from the root. The diagram below shows a typical hierarchical database structure.

- The network database model was created to solve the shortcomings of the hierarchical database model. In this type of model, a child can be linked to multiple parents, a feature that was not supported by the hierarchical data model. The parent nodes are known as owners and the child nodes are called members.
- The network data model can be represented as −
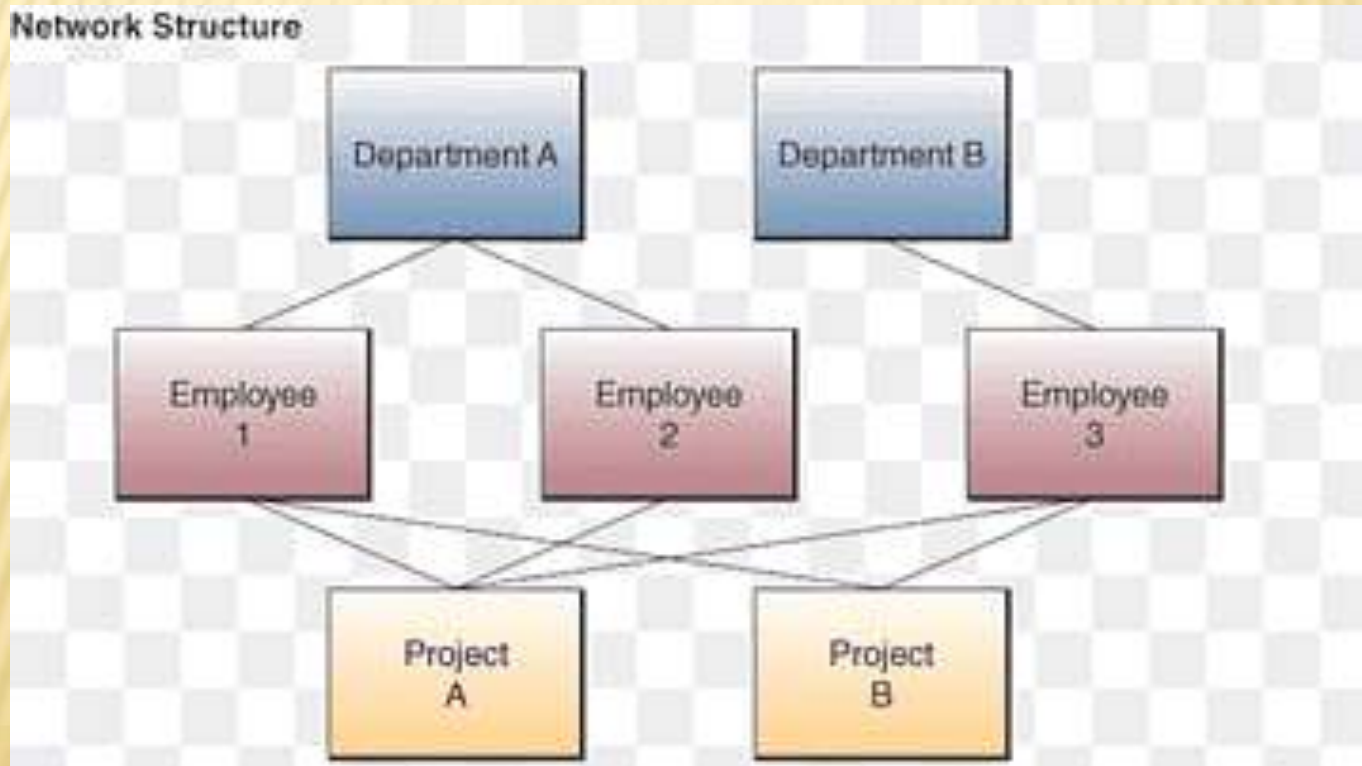
❑ Entity relationship (ER) models are based on the real-world entities and their relationships. It is easy for the developers to understand the system by simply looking at the ER diagram. ER models are normally represented by ER-diagrams.

❑ Components
ER diagram basically having three components:

➢ **Entities** – It is a real-world thing which can be a person, place, or even a concept. For Example: Department, Admin, Courses, Teachers, Students, Building, etc. are some of the entities of a School Management System.

➢ **Attributes** – An entity which contains a real-world property called an attribute. For Example: The entity employee has the property like employee id, salary, age, etc.

➢ **Relationship** – Relationship tells how two attributes are related. For Example: Employee works for a department.

An entity has a real-world property called attribute and these attributes are defined by a set of values called domain.

❑ Relational data model is the primary data model, which is used widely around the world for data storage and processing. This model is simple and it has all the properties and capabilities required to process data with storage efficiency.

❑ Concepts

Tables – In relational data model, relations are saved in the format of Tables. This format stores the relation among entities. A table has rows and columns, where rows represents records and columns represent the attributes.

Tuple – A single row of a table, which contains a single record for that relation is called a tuple.

Relation instance – A finite set of tuples in the relational database system represents relation instance. Relation instances do not have duplicate tuples.

Relation schema – A relation schema describes the relation name (table name), attributes, and their names.

Relation key – Each row has one or more attributes, known as relation key, which can identify the row in the relation (table) uniquely.

Attribute domain – Every attribute has some pre-defined value scope, known as attribute domain.

❑ Object oriented data model is based upon real world situations. These situations are represented as objects, with different attributes. All these object have multiple relationships between them.

❑ Elements of Object oriented data model

❖ Objects

The real world entities and situations are represented as objects in the Object oriented database model.

❖ Attributes and Method

Every object has certain characteristics. These are represented using Attributes. The behaviour of the objects is represented using Methods.

❖ Class

Similar attributes and methods are grouped together using a class. An object can be called as an instance of the class.

❖ Inheritance

A new class can be derived from the original class. The derived class contains attributes and methods of the original class as well as its own.

THANK YOU....