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Relational Database Management System

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DIGITAL LEARNING CONTENT

CHAPTER-2

Data Models

Data Models

A database model may be a form of data model that determines the logical structure or variety of a database and essentially determines during which manner data is keep, organized, and manipulated.

The most standard example of a info model is:- **relational model**, which uses a table-based format.
Data models outline however data is connected to every alternative and how they're processed and stored inside the system.

Data Model: a group of ideas to explain the structure or variety of a database, and certain constraints that the database should obey.

Data Model Operation

Data Model Operations: The Operations is used for specifying database retrievals and updates by referring to the concepts of the data model. An Operations on the data model may include basic operations and user-defined operations.

Data Model Basic Building Blocks

Entity:-

Anything regarding that information are collected/stored.

An entity is associate degree object that exists and is distinguishable from different objects.

Example: specific person, company, event, plant

An entity set could be a set of entities of the same type that share the same properties.

Example: set of all persons, companies, trees, holidays

Data Model Basic Building Blocks

An entity is represented by a collection of attributes; i.e., descriptive properties possessed by all members of an entity set.

Example:-

teacher = (ID, name, street, city, earnings).

course= (course_id, title, credits).

A set of the attributes type a primary key of the entity set; i.e., uniquely identifying each member of the set.

Data Model Basic Building Blocks

Attribute

- Characteristic of an entity

Relationship

- Describes an association among entities
  - One-to-one (1:1) relationship (1 student enroll for one course)
  - One-to-many (1:M) relationship (1 company many departments)
  - Many-to-one (M:1) relationship (Many seller 1 product)
  - Many-to-many (M:N or M:M) relationship (many books many authors)

Constraint

- A restriction placed on the data

Importance of Data Models

- Data models
  - Representation generally graphical of complex real-world data structures.
  - Facilitate interaction among the designer, the applications programmer and the end user
- End-users have different views and needs for data
- Data model organizes data for various users

Categories of data models

- **Conceptual** (**high-level**, **semantic**) data models:- Provide concepts that are close to the way many users *perceive(distinguish)* data. (Also called **entity-based** or its also called **object-based** data models.)
- **Physical** (**low-level**, **internal**) data models:- Provide concepts that describe details of how data is stored in the computer.
- **Implementation** (**representational/External**) data models:- Provide concepts that fall between the above two, balancing user views with some computer storage details.

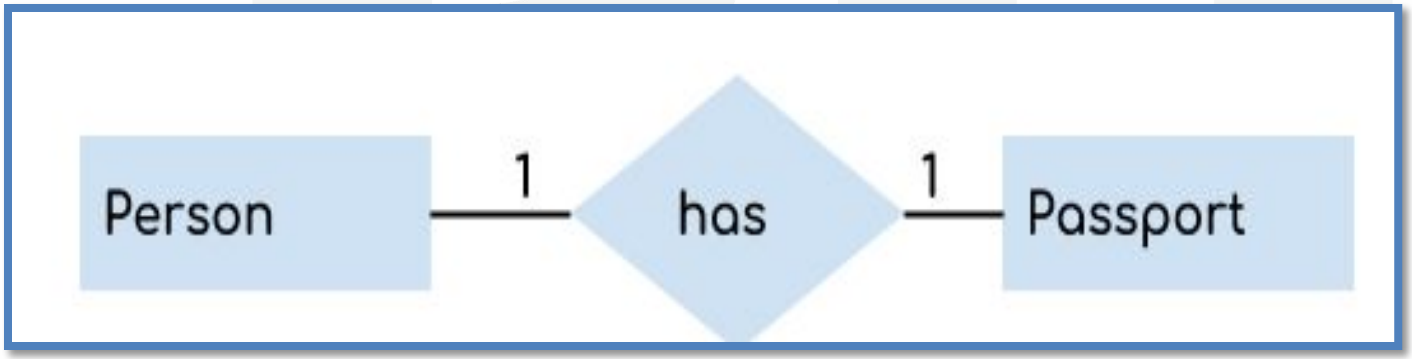
Database Relationship

A relationship is represented by diamond shape in Entity Relational diagram, it shows the relationship among entities. There are four types of relationships:

1. One to One
2. One to Many
3. Many to One
4. Many to Many

One to One Relationship

- When a one instance of an entity is associated with a one instance of another entity then it is called one to one relationship. For eg:- , a person has only one passport and a passport is given to one person.



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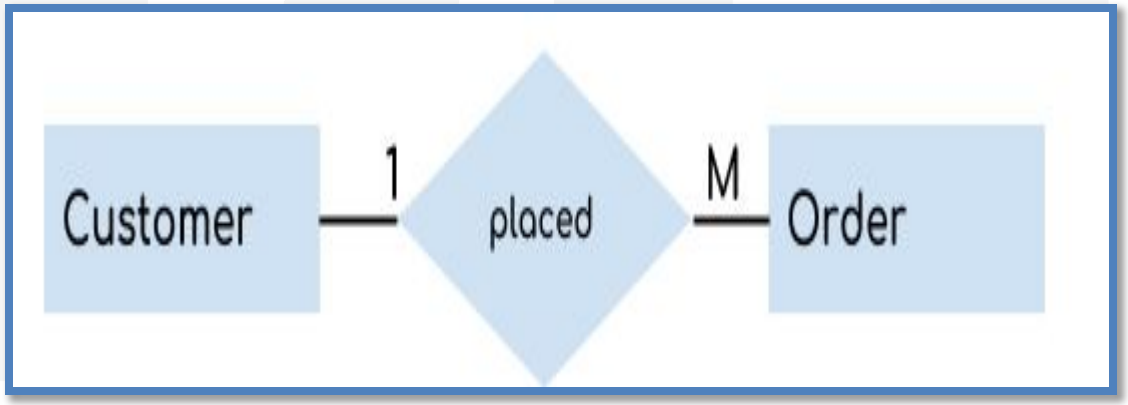
One to Many Relationship

When a one instance of an entity is associated with more than one instances of another entity then it is called one to many relationship. For eg:- a customer can place many orders but a order cannot be placed by many customers.



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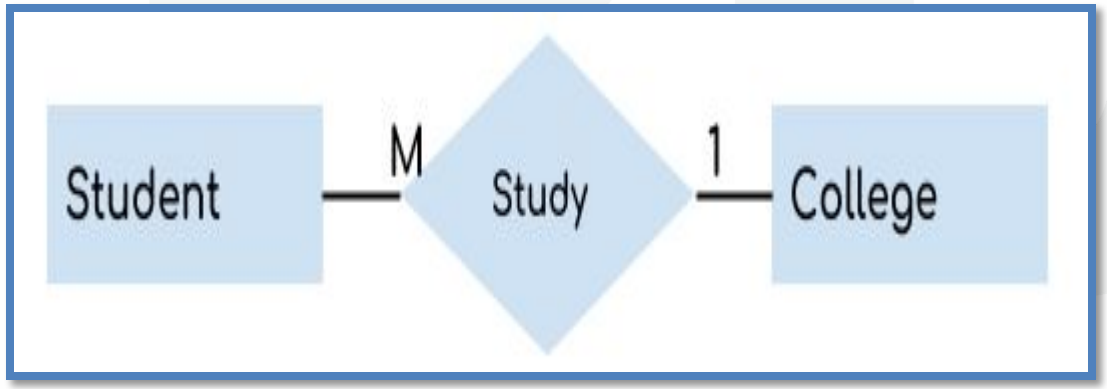
Many to One Relationship

- When more than single instances of an entity is associated with a single instance of another entity then it is called many to one relationship. For eg:– many students can study in a single college but a student cannot study in many colleges at the same time.



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Many to Many Relationship

- When more than single instances of an entity is associated with more than single instances of another entity then it is called many to many relationship. For eg:-, a can be assigned to many projects and a project can be assigned to many students.

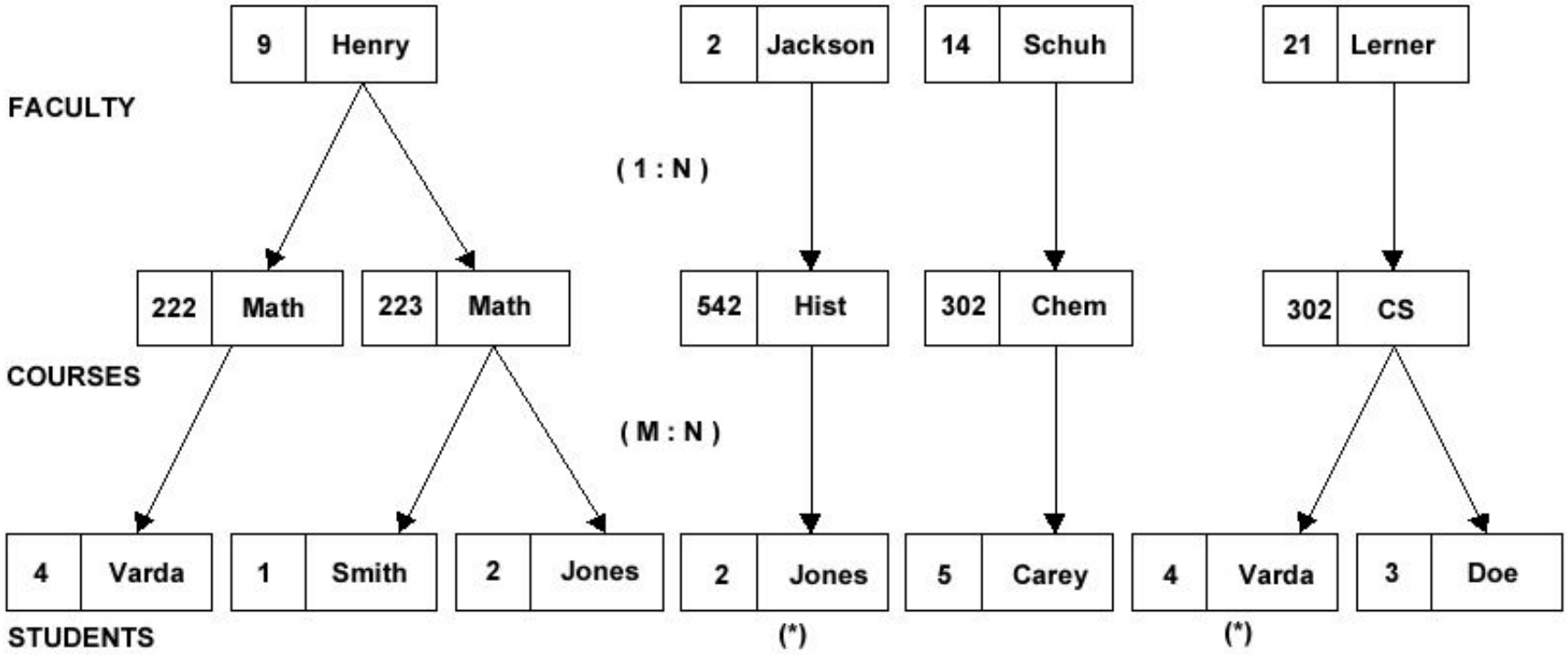
Image from self

Hierarchical Model

- In this model every entity has only single parent but will have many children . At the top of hierarchy there's only 1 entity that is named **Root.**

- A **hierarchical database** model is a data model in which the data is organized into a tree-like structure. ... The hierarchical database model mandates that each child record has only 1 parent, whereas every parent record can have **one or more child** records.

Hierarchical Model

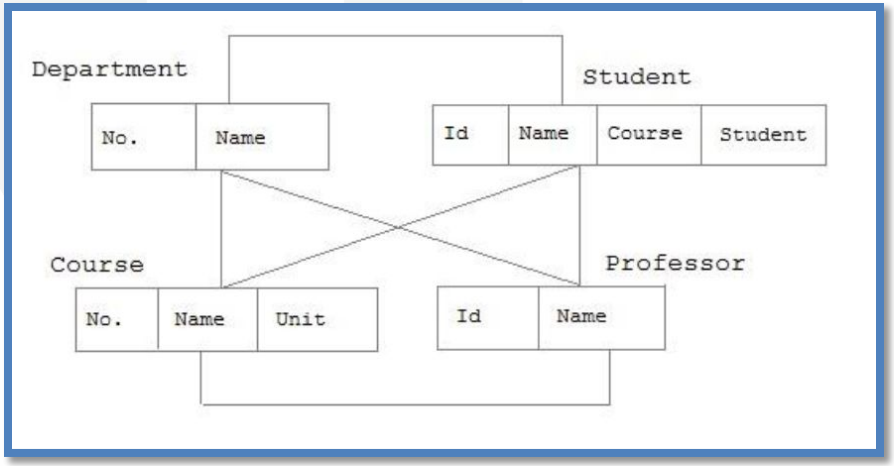


Advantages of Hierarchical Model

- Have many different structures and forms.
- Structures data in an upside-down tree. (Simplifies data overview)
- Manages large amounts of data.
- Express the relationships between information.
- Many children per parent.
- Distribute data in terms of relationships.
- Improve data sharing.

Network Model

- The network model, entities are organised in a graph, in which few entities can be accessed through several path.
- A **network model** is a database **model** that is designed as a flexible approach to representing object and their relationships. A unique features of the **network model** is its schema, which is viewed as a graph where relationship types are arcs and object types are nodes.



Advantages Of Network Model

- The Simple Concept: Similar to the hierarchical model, this model is simple and the implementation is effortless.
- The Ability to Manage More Relationship Types: The network model has the ability to manage one-to-one (1:1) as well as many-to-many (N: N) relationships.
- Easy Access to Data: Accessing the data is simpler when compared to the hierarchical model.
- Data Integrity: In a network model, there's always a connection between the parent and the child segments because it depends on the parent-child relationship.
- The Data Independence: Data independence is better in network models as opposed to the hierarchical models.

Disadvantages Of Network Model

- Data relationships must be predefined.
- Much more complex than the hierarchical date model.
- Users are still require to know the physical representation of the database
- Information can be related in various and complicated ways.
- Lack structural independence.

Relational Model

- The relational data model was introduced in 1970 by Edgar F. Codd. He worked for IBM. All data is represented as simple tabular data structures which the user can access through a high-level non-procedural language. In 1974 IBM proposed a new high-level non-procedural language – SEQUEL (renamed into SQL in 1990).

Advantages Of Relational Model

- Structured independence is promoted.
- Users do not have to know the physical representation of the database.
- Use of SQL language to access data.
- Easier database design.
- Tabular view improves simplicity.
- Support large amounts of data.
- Data independence.
- Multi-level relationships between data sets
- No need to predefined data relationships.

Disadvantages Of Relational Model

- Data anomalies.
- People need training if they want to use the system effectively and efficiently.

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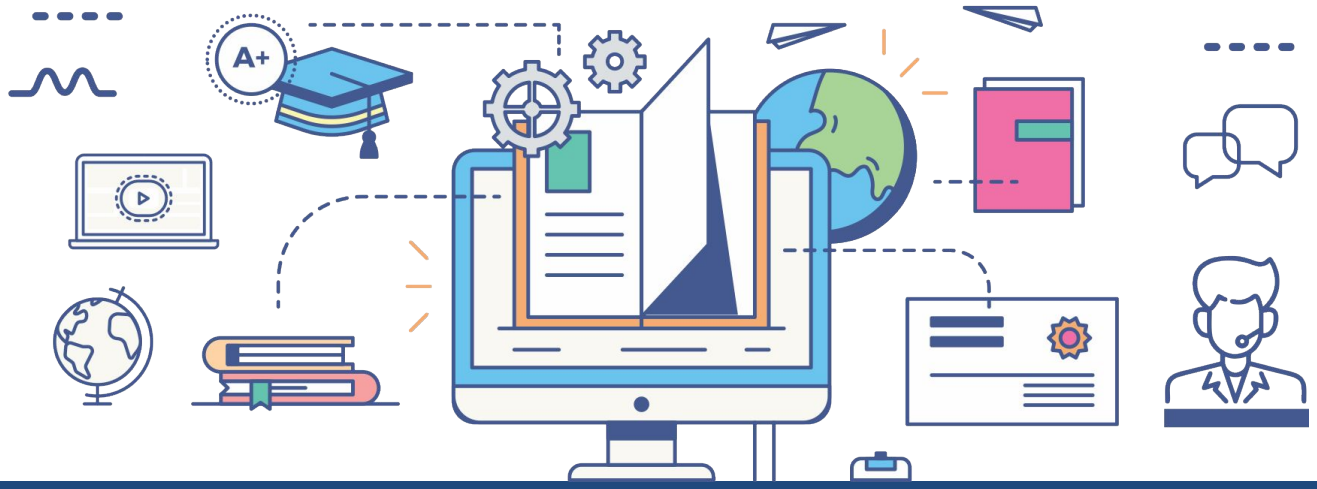

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