BCA SEMESTER-IV

Database Management Systems

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Unit :1

Data Models

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Unit : 1 Data Models

Data Model: A set of concepts to describe the *structure* (data types, relationships) of a database, and certain *constraints* that the database should obey.

Data Model Operations: Operations for specifying database retrievals and updates by referring to the concepts of the data model.

Categories of data models

Data Models are categorized into three types such as High-level or conceptual data model, representational or implementation data models and low-level or physical data model

1. Conceptual (**high-level**, **semantic**) data models: Provide concepts that are close to the way many users *perceive* data. (Also called **entity-based** or **object-based** data models.)

2. **Physical** (**low-level**, **internal**) data models: Provide concepts that describe details of how data is stored in the computer.

3. I**mplementation** (**record-oriented**) data models: Provide concepts that fall between the above two, balancing user views with some computer storage details. The various representational data models are as follows

Hierarchical data model :

- This model organizes the data in a tree like structure in which each child node can have only one parent node. The database based on hierarchical data model comprises a set of records connected to one another through links. The link is an association between two or more records. The top of the tree structurk of this model is that the link e consists of a single node that does not have any parent and is called root node.

- Each child node can have only one parent node and a parent node can have any number of child node. Therefore represents only one-to-one and one-to many relationships.
- The main drawback of this model is that the links are hard coded into the data structure. that is permanently established and cannot be modified.

Network Data Model

- The data are also represented by a collection of records and relationships among data are represented by links. However the link in a network data model represents an association between precisely two records.
- In the network data model the data are organized in the form of graphs . The main advantage of the network data model is that a parent node permits the modeling of many-to-many relationships in data.
- The main limitation of the network data model is that it can be quiet complicated to maintain all links, and a single broken link can lead to problems in the database.

Relational Data Model

- Unlike the hierarchical and network model there are no physical links in this model. All the data are maintained in the form of tables consisting of rows and columns
- Each row represents an enitity and a coloumn represnts an attribute of the entity.

- The relationship between the two tables is implemented through a common attribute in the tables and not by physical links or pointers.

Object-oriented Data Model(s) : several models have been proposed for implementing in a database system. One set comprises models of persistent O-O Programming Languages such as C++ (e.g., in OBJECTSTORE or VERSANT), and Smalltalk (e.g., in GEMSTONE). Additionally, systems like O2, ORION (at MCC - then ITASCA), IRIS (at H.P.- used in Open OODB).

Object-Relational Models : Most Recent Trend. Exemplified in ILLUSTRA and UNiSQL systems.

Schemas versus Instances

Database Schema: The *description* of a database. Includes descriptions of the database structure and the constraints that should hold on the database.

Schema Diagram: A diagrammatic display of (some aspects of) a database Schema.

Database Instance: The actual data stored in a database at a *particular moment in time* . Also called **database state** (or **occurrence**).

The **database schema** changes *very infrequently* . The **database state** changes *every time the database is updated* . **Schema** is also called **intension**, whereas **state** is called **extension**.