

# Database Management System

## Lecture: 3

### Data Models

One fundamental characteristic of the database approach is that it provides some level of data abstraction so that different users may perceive data at their preferred level of detail. **Data abstraction** generally refers to the **suppression of details of data organization and storage** and **the highlighting of the essential features** for an improved understanding of data.

#### **Data Model:**

Data model is the concept of tools that are developed to summarize the description of the database i.e. data types, relationships and constraints that should hold for the data.

Data models are categorized according to the types of concepts they use to describe the database structure:

#### **1. Conceptual Data Model:**

- provide concepts that are close to the **way many users perceive data**.
- It is this model, that is used in the requirement gathering process i.e. before the database designers start making a particular database.
- **Entity/ Relationship Model(ER Model)** is an example of conceptual data model.

#### **2. Representational Data Model:**

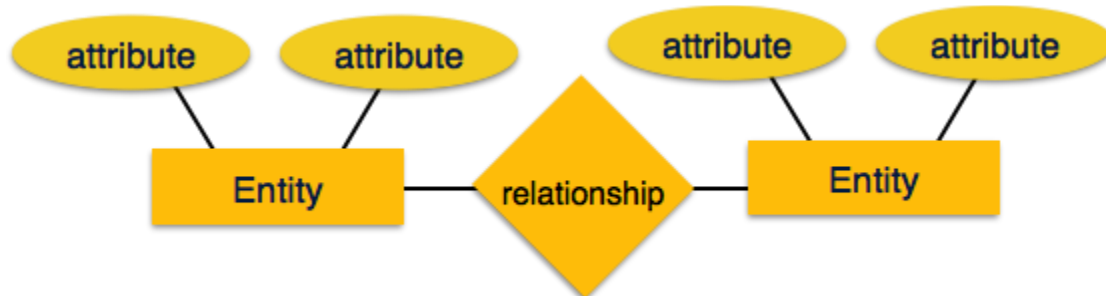
- used to **represent only the logical part of the database** and does not represent the physical structure of the databases.
- The representational data model allows us to focus primarily on the design part of the database.
- **Relational Model** is an example of representational data model.
- Some old legacy data models- the network and hierarchical models are also an example of representational data model.

#### **3. Physical Data Model:**

- provide concepts that describe the details of **how data is stored in the computer**.
- Ultimately all the data in database is stored physically on a secondary storage device such as discs and tapes. This is stored in the form of files, records and certain other data structures. It has all the information of the format in which the files are present and the structure of the databases, presence of external data structures and their relation to each other.

## The Entity-Relationship Model:

The entity-relationship (E-R) data model is based on a perception of a real world that consists of a **collection of basic objects, called entities, and of relationships among these objects.**



- **An entity** is a “thing” or “object” in the real world that is distinguishable from other objects. For example, each person is an entity, and bank accounts can be considered as entities.
- Entities are described in a database by **a set of attributes**. For example, the attributes account-number and balance may describe one particular account in a bank, and they form attributes of the account entity set. Similarly, attributes customer-name, customer street address and customer-city may describe a customer entity.
- **A relationship** is an association among several entities. For example, a depositor relationship associates a customer with each account that she has.

The set of all entities of the same type and the set of all relationships of the same type are termed an entity set and relationship set, respectively.

**The overall logical structure (schema) of a database can be expressed graphically by an E-R diagram.**

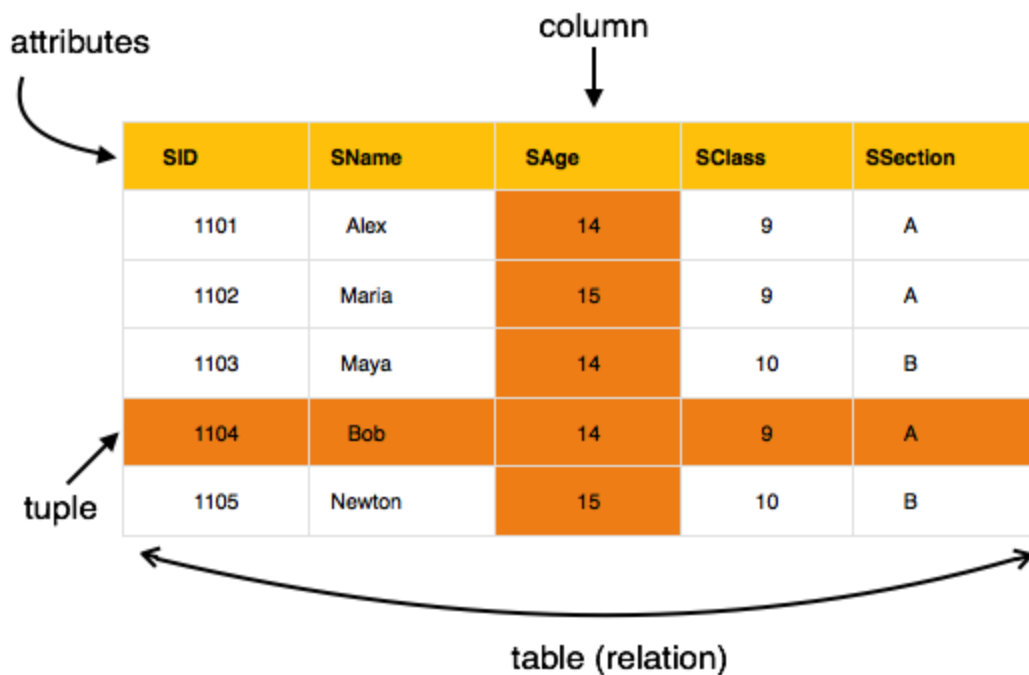
## Relational Model:

A relational model **uses a collection of tables** to represent both data and the relationships among those data.

Each table has multiple columns, and each column has a unique name. The data is arranged in a relation which is **visually represented in a two dimensional table**.

The data is inserted into the table in the form of **tuples (which are nothing but rows)**.

A tuple is formed by one or more than one attributes, which are used as basic building blocks in the formation of various expressions that are used to derive a meaningful information. There can be any number of tuples in the table, but all the tuple contain fixed and same attributes with varying values.



The **relational model** is implemented in database where a relation is represented by a table, a tuple is represented by a row, an attribute is represented by a column of the table, attribute name is the name of the column such as 'identifier', 'name', 'city' etc., attribute value contains the value for column in the row.

Constraints are applied to the table and form the logical schema.