Unit : 1

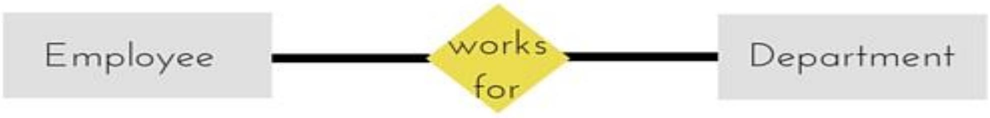
ER Diagram :

ER Diagram is a visual representation of data that describes how data is related to each other.

An ER model is typically implemented as a database. The main components of E-R model are: entity set and relationship set.

1) ER Diagram: Entity

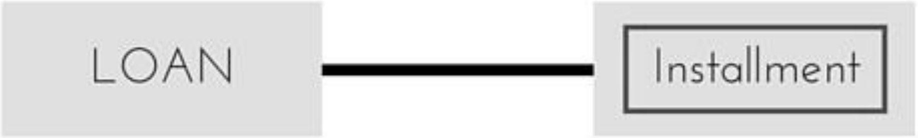
An **Entity** can be any object, place, person or class. In ER Diagram, an **entity** is represented using rectangles. Consider an example of an Organisation- Employee, Manager, Department, Product and many more can be taken as entities in an Organisation.



The yellow rhombus in between represents a relationship.

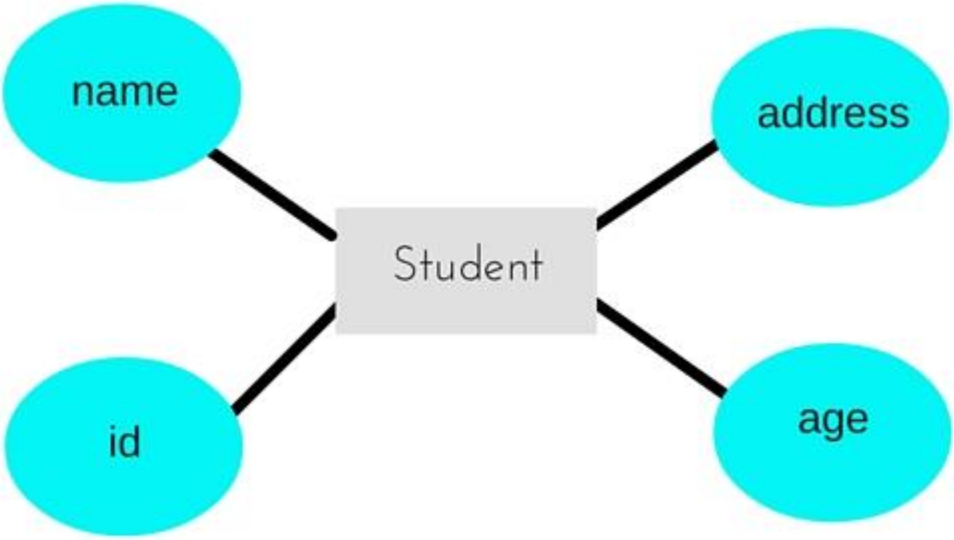
2) ER Diagram: Weak Entity

Weak entity is an entity that depends on another entity. Weak entity doesn't have any key attribute of its own. Double rectangle is used to represent a weak entity.



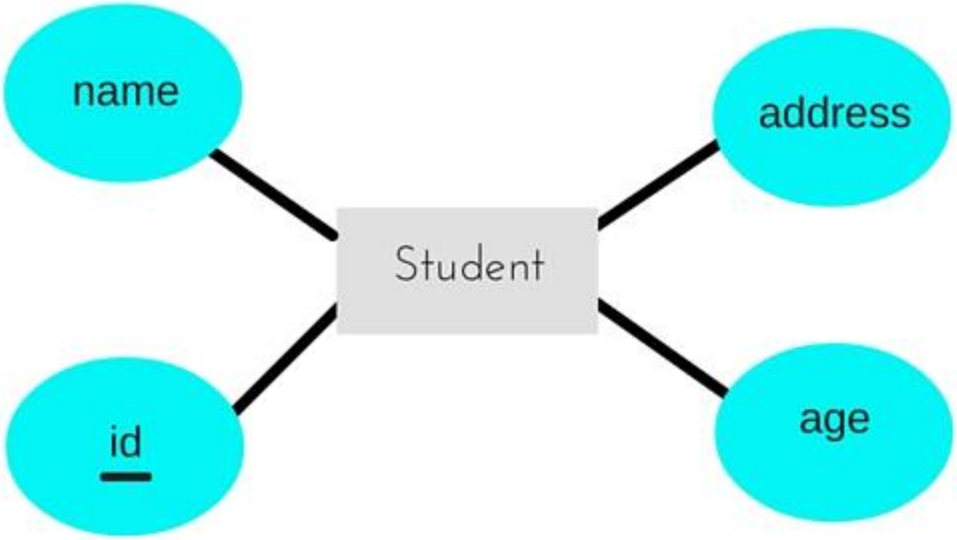
3) ER Diagram: Attribute

An **Attribute** describes a property or characteristic of an entity. For example, **Name**, **Age**, **Address** etc. can be attributes of a **Student**. An attribute is represented using eclipse.



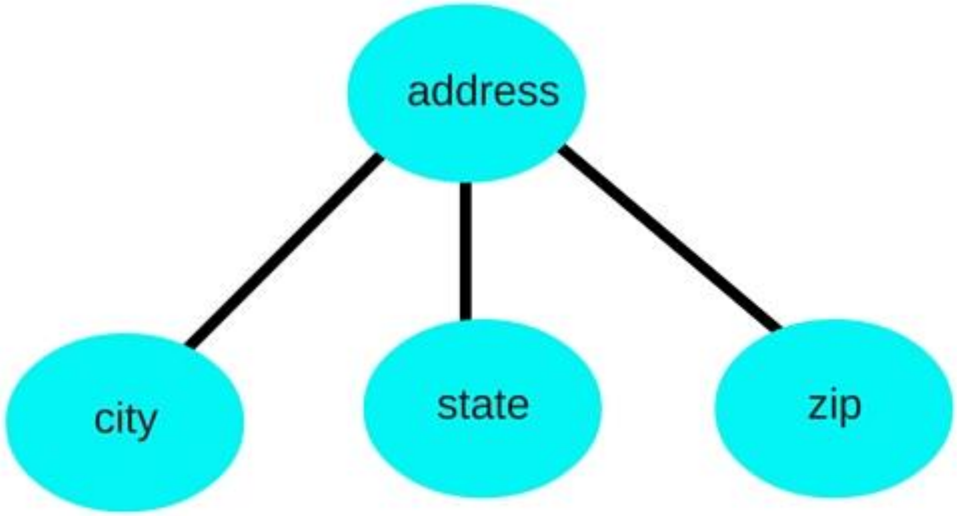
4) ER Diagram: Key Attribute

Key attribute represents the main characteristic of an Entity. It is used to represent a Primary key. Ellipse with the text underlined, represents Key Attribute.



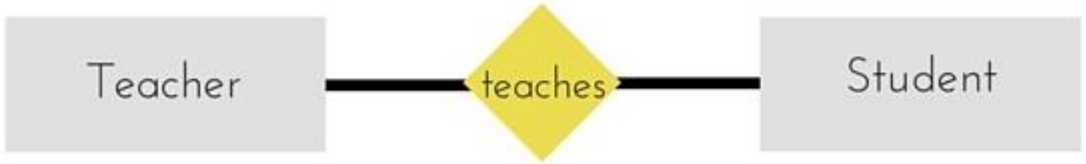
5) ER Diagram: Composite Attribute

An attribute can also have their own attributes. These attributes are known as **Composite** attributes.



6) ER Diagram: Relationship

A Relationship describes relation between **entities**. Relationship is represented using diamonds or rhombus.



DATA MODEL

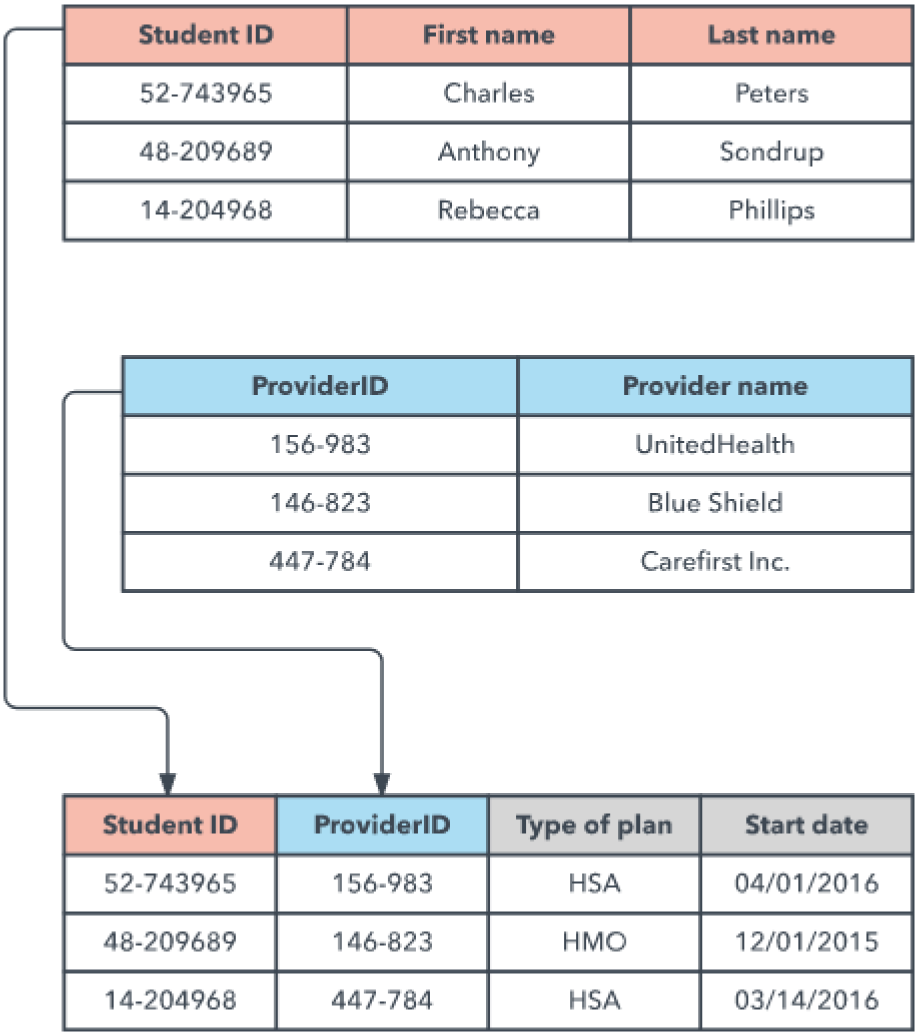
A **Data Model** is a logical structure of Database. It describes the design of database to reflect entities, attributes, relationship among data, constrains etc.

1) Relational model

The most common model, the relational model sort data into tables, also known as relations, each of which consists of columns and rows. Each column lists an attribute of the entity in question, such as price, zip code, or birth date. Together, the attributes in a relation are called a domain. A particular attribute or combination of attributes is chosen as a primary key that can be referred to in other tables, when it's called a foreign key.

Each row, also called a tuple, includes data about a specific instance of the entity in question, such as a particular employee.

The model also accounts for the types of relationships between those tables, including one-to-one, one-to-many, and many-to-many relationships. Here’s an example:



Student ID	First name	Last name
52-743965	Charles	Peters
48-209689	Anthony	Sondrup
14-204968	Rebecca	Phillips

ProviderID	Provider name
156-983	UnitedHealth
146-823	Blue Shield
447-784	Carefirst Inc.

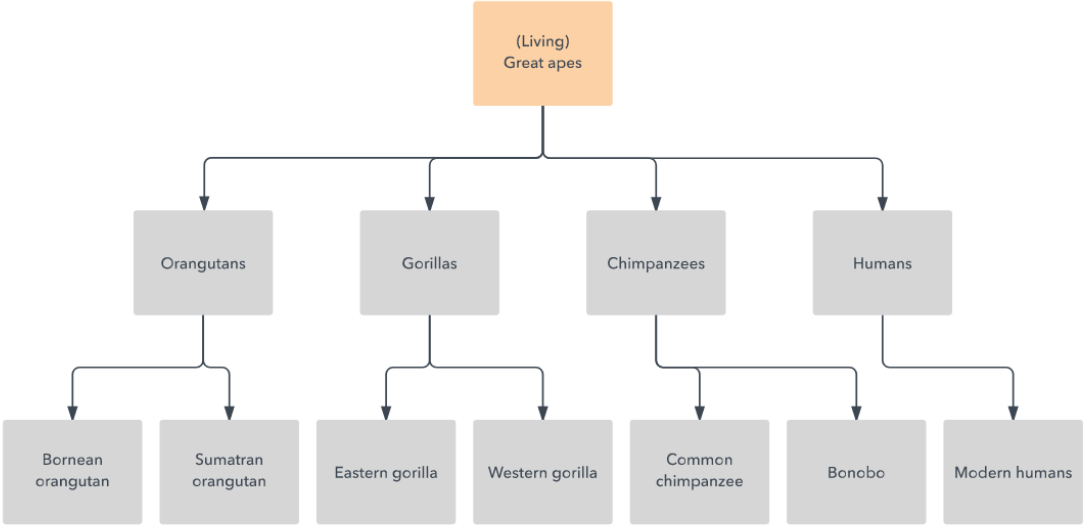
Student ID	ProviderID	Type of plan	Start date
52-743965	156-983	HSA	04/01/2016
48-209689	146-823	HMO	12/01/2015
14-204968	447-784	HSA	03/14/2016

Within the database, tables can be normalized, or brought to comply with normalization rules that make the database flexible, adaptable, and scalable. When normalized, each piece of data is atomic, or broken into the smallest useful pieces.

Relational databases are typically written in Structured Query Language (SQL). The model was introduced by E.F. Codd in 1970.

2) Hierarchical model

The hierarchical model organizes data into a tree-like structure, where each record has a single parent or root. Sibling records are sorted in a particular order. That order is used as the physical order for storing the database. This model is good for describing many real-world relationships.

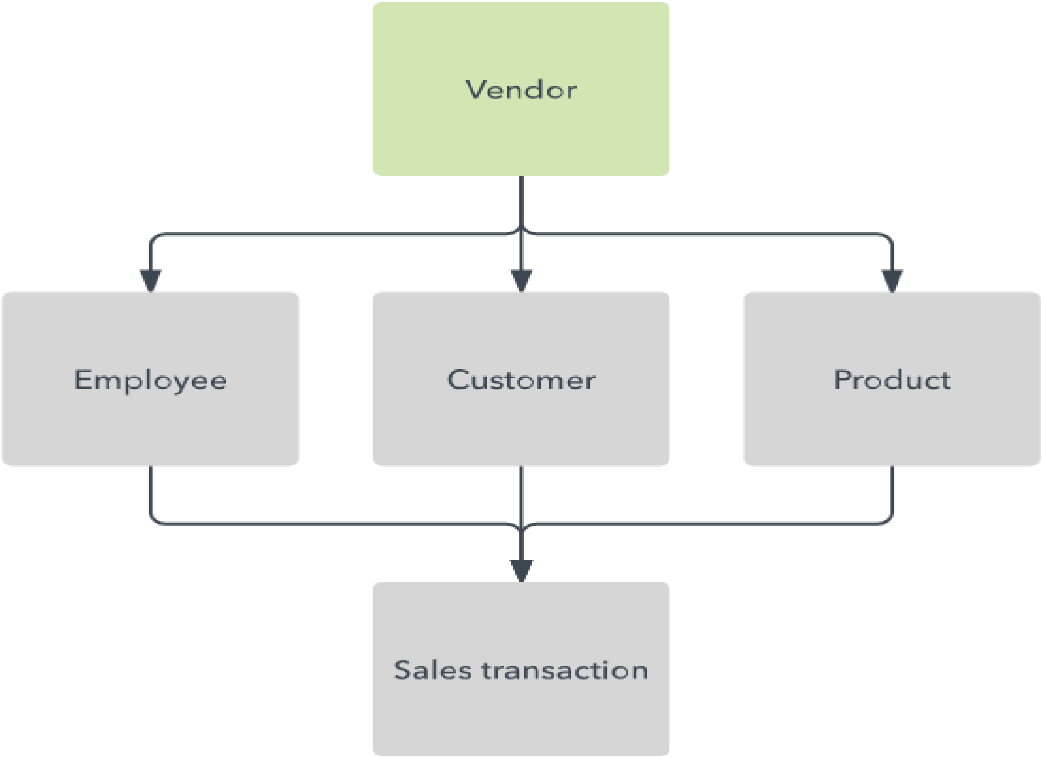


This model was primarily used by IBM’s Information Management Systems in the 60s and 70s, but they are rarely seen today due to certain operational inefficiencies.

3) Network model

The network model builds on the hierarchical model by allowing many-to-many relationships between linked records, implying multiple parent records. Based on mathematical set theory, the model is constructed with sets of related records. Each set consists of one owner or parent record and one or more member or child records. A record can be a member or child in multiple sets, allowing this model to convey complex relationships.

It was most popular in the 70s after it was formally defined by the Conference on Data Systems Languages (CODASYL).



Hierarchical Data Model	**Network Data Models**	**Relational Data Models**
Supports One-Many Relationship	Supports both one to many and Many to Many relationship	Supports both one to many and Many to Many relationship
Because of single parent-child relationship, difficult to navigate through the child	It establishes the relationship between most of the objects, hence easy to access compared to hierarchical model	It provides SQL, which makes the access to the data simpler and quicker.
Flexibility among the different object is restricted to the child.	Because of the mapping among the sub level tables, flexibility is more	Primary and foreign key constraint makes the flexibility much simpler than other models.
Based on the physical storage details	Based on the physical storage details	Based on the logical data view