Database Models

Database Models

A **data model** is a collection of tools that describes how data are represented and accessed. Data models formally define data elements and relationships among data elements for a domain of interest.

data element is an unit of data that has precise meaning or precise semantics.

A data model explicitly determines the structure of data. The main aim of data models is to support the development of information systems by providing the definition and format of data.

If the same data structures are used to store and access data then different applications can share data .

Communication and precision are the two key benefits that make a data model important to applications that use and exchange data. A data model is the medium which project team members from different backgrounds and with different levels of experience can communicate with one another. *(Precision means that the terms and rules on a data model can be interpreted only one way and are not ambiguous)*

There are many deferent models:

1- Flat model.

2- The Entity Relationship model

3- The Relational data model

4- Object Based data model

5- The Network data model

 5- The Hierarchical data model

Flat model

The flat (or table) model consists of a single, two elements, where all members of a given column are assumed to be similar values, and all members of a row are assumed to be related to one another. Columns of the table often have a type associated with them, defining them as character data, date or time information, integers, or floating point numbers.

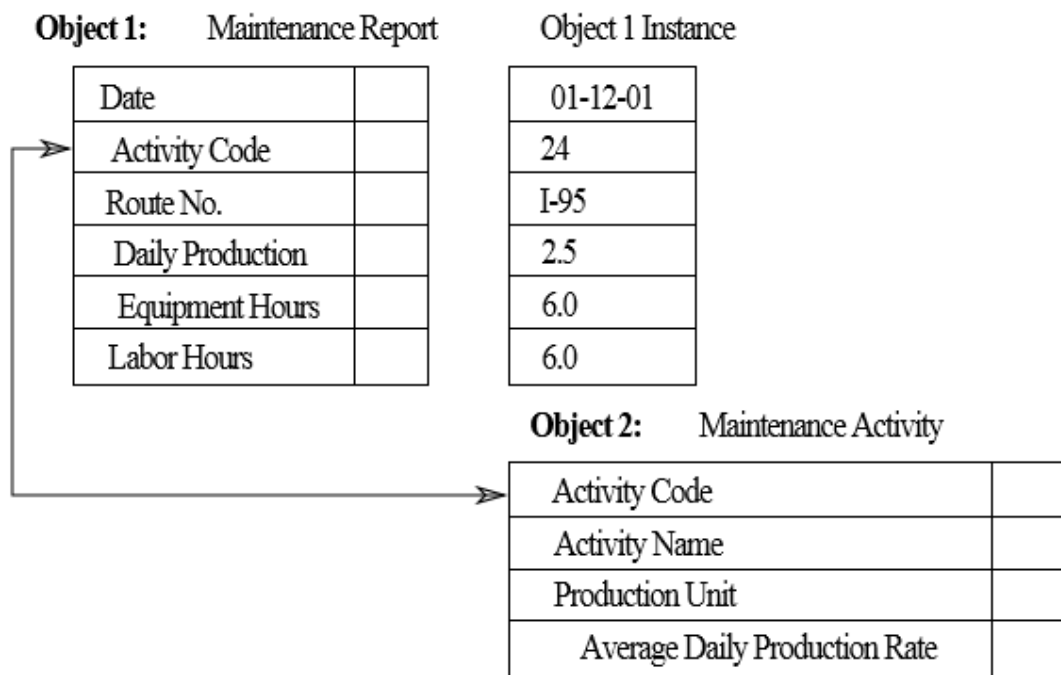|	Route No.	Miles	Activity
Record 1	I-95	12	Overlay
Record 2	I-495	05	Patching
Record 3	SR-301	33	Crack seal

Flat model

Hierarchical model

In a hierarchical model, data is organized into a tree tree-like structure implying a single parent for each record. A sort field keeps sibling records in a particular order. This structure allows one-to-many relationship between two types of data. This structure is very efficient to describe many relationships in the real world; recipes, table of contents, order information.

Hierarchical model

Network model

    The network model expands upon the hierarchical structure, allowing many many relationships in a tree like structure that allows multiple parents.

Network model

Object based data model

An object database (also object-oriented database) is a database model in which information is represented in the form of objects as used in object-oriented programming.

Today's trend in programming languages is to utilize objects, thereby making OODBMS ideal for OO programmers because they can develop the product, store them as objects, and can replicate or modify existing objects to make new objects within the OODBMS

Object 1:   Maintenance Report   Object 1 Instance

Date	
Activity Code	
Route No.	
Daily Production	
Equipment Hours	
Labor Hours	

01-12-01
24
I-95
2.5
6.0
6.0

Object 2:   Maintenance Activity

Activity Code	
Activity Name	
Production Unit	
Average Daily Production Rate	

Object based data model
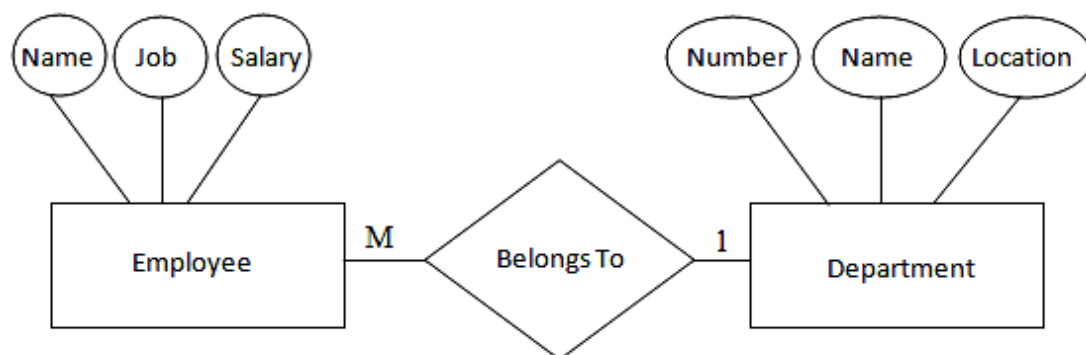
The Entity Relationship model

The entity-relationship model (or ER model) is a way of graphically representing the logical

relationships of entities (or objects) in order to create a database.

In ER modeling, the structure for a database is portrayed as a diagram, called an entity relationship diagram (or ER diagram),

The ER model consists of the following :

• **Entity**: a thing that exists and which can be uniquely identified

    e.g. person, automobile, department, employee

• **Entity Set**: a group of similar entities

    e.g. all persons, all automobiles, all employees

• **Relationship**: association between entities

    e.g. a person is assigned to a department

• **Relationship Set** : set of similar relationships

• **Attribute**: property of an entity or relationship

    e.g. person - name, address

• **Domain**: set of values allowed for an attribute

The entity relationship model

Entities

An entity may be a physical object such as a house or a car, an event such as a house sale or a car service, or a concept such as a customer transaction or order

A relationship captures how two or more entities are related to one another. Relationships can be thought of as verbs, linking two or more nouns.

Examples: an *owns* relationship between a company and a computer.
: a *supervises* relationship between an employee and a department
: a *performs* relationship between an artist and a song,.
: a *proved* relationship between a mathematician and a theorem
Entity sets are drawn as rectangles, attributes are drawn as oval. Entity is connected with anattribute with lines. Diamonds represent relationship among entity set. Figure below shows an ER diagram notation for an attribute (*Grade*) of an entity (*student*)
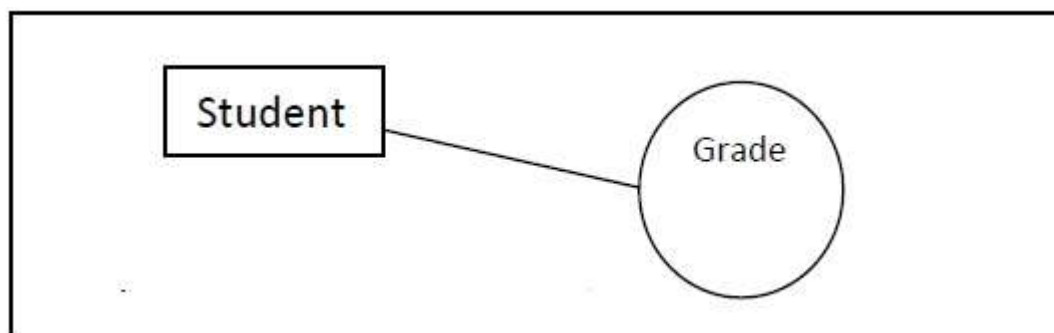
ER Example 1

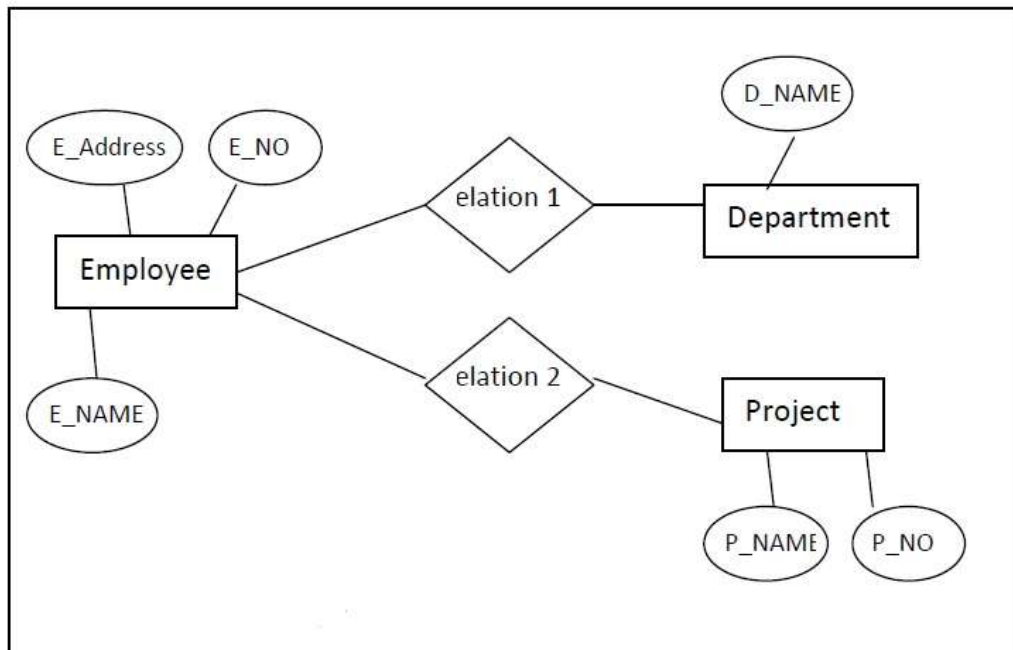Figure below shows the following example :

There are three entity:

1- Employees : E#,ENAME, ADDRESS

2- Departments : D#,DNAME

3-Projects : PNAME

There are two relations that connect the three entities

ER example 2