

Database Management System

Approach to Data Management - from files to Database

A file is a collection of records or documents dealing with an organization, person, area or subject.

File based system

Advantages -

- File based system was the first method to store data in computers. The data was stored and retrieved sequentially from the disk.
- File based systems are an early attempt to computerize the manual filing systems.

Drawbacks -

- Data Redundancy and Inconsistency
- Unanticipated queries
- Data Isolation
- Concurrent Access Anomalies
- Security Issues
- Integrity Issues
- Recovery Issues

DBMS was introduced to overcome the limitation of file based system.

DBMS - is the system that works on a database which is a static storage.

The user interacts with database through DBMS.

Database Management largely involves:

- Storage of Data
- Manipulation of the Data
- Access restriction for unauthorized users

Relational Database Management System (RDBMS)

- Relational databases connect the information (Data) in different files by using common information elements or a Key field.
- Information (Data) is stored in different tables in relational databases, each having a Key field which is used to uniquely identify each row.
- Key fields can be used to connect one table of information to another.

Example -

	first_name	last_name	Social Security No
1.	John	smith	010-22-7432
2.	John Neha	Gupta	003-63-0037

DOB	SSN
6/12/82	010 2 2 9432
5/9/40	003-63-0037

Address	SSN
12 cross	01022-7432
268 M Avenue	003-63-0037

Advantages -

- The database server and application tools can be easily installed and upgraded.
- RDBMS permits multiple database users to access a database simultaneously.
- Authorization and privilege control features in an RDBMS permit the DBA to restrict access to authorized users and grant privileges to individual users desired from the types of DB tasks they need to perform.

- Supports data Independence
- Reduces redundancy of information

Disadvantage

- Searching of data or information can take extra time as compared to other methods.

Basics of ERM & Normalization

Entity Relationship Modeling

ER model is a way of graphically representing the logical relationships of objects in order to create a database.

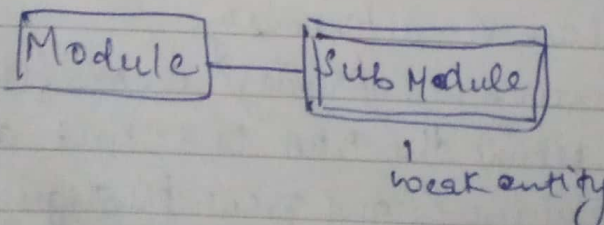
Creation of ER diagram is the first step in designing a database.

- ⇒ An ER model is a graphical representation which contains entities or 'items', relationships among the entities and attributes of the entities and relationships.

3 basic elements in ER model -

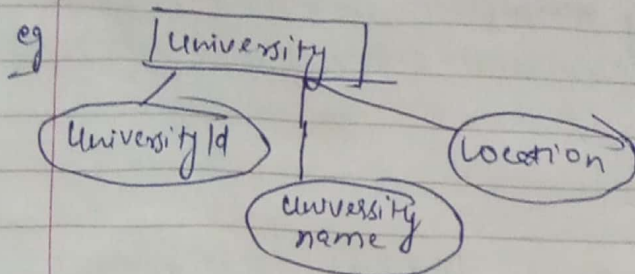
- 1) Entities: Any objects or items
- 2) Attributes: The attribute is nothing but a property of an entity
- 3) Relationships: The links between various entities

Weak Entity - If an entity depends on another existing entity then it is called a weak.

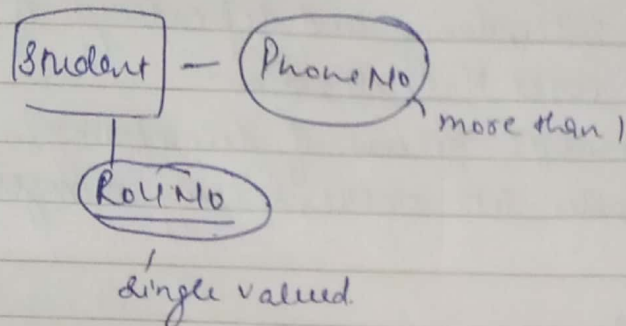


Attributes

- Represent properties or details of an entity.
- Represented by oval
- A line is used to link an attribute to its entity.



Multivalued attribute



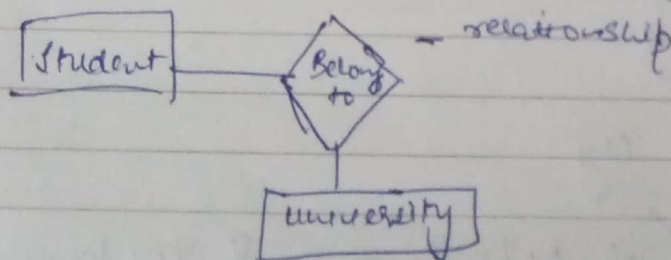
Relationships

The association b/w two or more entities is called as a relationship.

- Each relationship has a name, a set of entities that participate in it, a degree and a cardinality ratio.

Degree - No. of entities that participate in that relationship.

eg. Lecturer teaches students (degree = 2)



Cardinality Ratio

→ 1 to Many (lecturer teaches many students)

Many to Many (Each student takes many modules)

To make ER diagram we need to identify -
Entities, Attributes, Relationships,
Cardinality ratios

Normalization

The database design technique that is used to organize tables in a manner that reduces redundancy and dependency of data is called Normalization.

- It is a scientific process of decomposing complex tables into smaller & easily manageable tables.

Advantages

- Smaller, simpler and well-structured relations.
 - Avoids duplication of data, reduce redundancy.
 - Provides data integrity.
 - Helps to avoid update anomalies. That is, it isolates data so that additions, deletions & modifications of a field can be made in just one table.
- The changes are then propagated to the rest of the database through defined relationships.
- Saved storage space.

Primary Key

Composite Key

Functional Dependency - If you know one attribute, you can get another attribute.

eg - StudentID & Name
is dependent is dependent

1st Normal form

To move from unnormalized form to 1st normal form all multivalued attributes (called repeating group) should be removed.

Rule -

- Each column in a table should contain single value
- Each record needs to be unique

2nd Normal Form

Partial functional dependencies must be removed. If 2 attributes of a table are combined to form a composite key, then the non-key attributes of that table must depend on both the attributes of the composite key.

2NF Rules -

- Table should be in 1NF
- The single column must be used as Primary Key.

Foreign Key - refers to the primary key of another table. It helps to connect two tables. It need not have to be unique & required for referential integrity.

Transitive Functional dependencies

When changing a non-key column might cause any of the other non-key columns to change, it is called TFD.

e.g. Lectures hours is dependend on Designation

Page No. _____
Date _____

3NF - states that all column references in the referenced data that are not dependent on the primary key should be removed. Only Foreign Key columns should be used to reference another table, and the other columns from the parent table should not exist in the reference table.

Rules -

- The Table should be in 2NF
- The table has no transitive functional dependencies