Custom Training

Day 1 - DBMS

DBMS(Database Management System) - is a software system that enables users to efficiently create, manage, and access databases.

Purpose of DBMS:

- Efficiently manage and organize large volumes of data
- Provide mechanisms for data retrieval, storage, and manipulation
- Ensure data integrity, security, and consistency
- Support concurrent access by multiple users

Key Components of DBMS:

- Data: information that is stored, organized and managed
- Database: a collection of related data that is stored in a structured way
- Software: The DBMS software that allows users to interact with databases
- Hardware: The physical equipment on which the DBMS runs

Advantages of using DBMS:

- Centralized data storage and easy access
- Data security and access control
- Data integrity and consistency
- Data independence and abstraction
- Concurrent data and transaction management

Different types of databases - Relational, Object oriented, No SQL, Hierarchical, Graph, Network

MySQL, Oracle, SQL Server

Codd's Rule:

It defines the requirements for a database management system to be considered as relational.

Proposed by Edgar F Codd.

Set of 13 rules (numbered 0 to 12).

Rule 0: Foundation rule

Rule 1: Information rule

Rule 2: The guaranteed access rule

Rule 3: Systematic treatment of null values

Rule 4: Dynamic online catalog based on the relational model

Rule 5: The comprehensive data sublanguage rule

Rule 6: The view updating rule

Rule 7: Relational Operations Rule / Possible for high-level insert, update, and delete

Rule 8: Physical data independence

Rule 9: Logical data independence

Rule 10: Integrity independence

Rule 11: Distribution independence

Rule 12: The nonsubversion rule

Entity Relationship Data Model:

Uses of ER-Diagram:

- Helps in conceptualizing the database.
- Helps in better understanding of the information to be stored in the database.
- Reduces the complexity.
- Helps to describe elements using Entity Relationship Model.
- Allows users to get a preview of the logical structure of the database.

Rectangles: This Entity Relationship Diagram symbol represents entity types.

Ellipses: This symbol represents attributes.

Diamonds: This symbol represents relationship types.

Lines: It links attributes to entity types and entity types with other relationship types.

Primary Key: Here, it underlines the attributes.

Double Ellipses: Represents multi-valued attributes.

Four types of attributes:

- Key Attributes
- Multivalued attributes
- Composite attributes
- Derived attributes

Weak Entity: An entity that relies on another entity.

Relationships:

- One to One Relationships: When a single element of an entity is associated with a single element of another entity.
- One to Many Relationships
- Many to One Relationships
- Many to Many Relationships

ER Modelling: vital tool for designing and conceptualizing complex database structures.

Need for ER modeling:

- Data complexity
- Data redundancy
- Data integrity
- Effective communication
- Query optimization

Normalization (splitting/dividing of larger tables into smaller tables and linking them using relationships)

- Process of organizing the data in database
- Used to minimize the redundancy from a relation or set of relations
- 1nf, 2nf, 3nf, 4nf, 5nf

1NF :

- Most basic form of normalization, which ensures there are no two same entries in a group.
- The most important rule is

1. Each cell should contain a single value.

2. Each record should be unique.

2NF:

- All the subsets of data that can be placed in multiple rows are placed in separate tables.
- Rules:

1. It should be in 1nf already.
2. The primary key should not be functionally dependent on any candidate key.

3NF:

Rules:

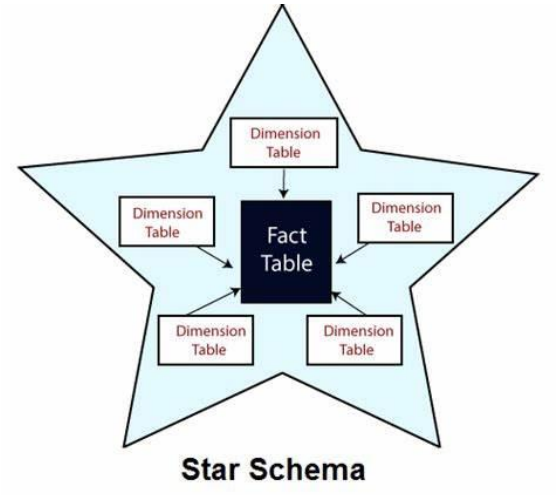
- It should be in 2NF already.
- It should not have any transitive functional dependencies.

Case study

BCNF

Star Schema

- a type of database schema commonly used in data warehousing and business intelligence systems
- Designed to optimize querying and reporting for analytical purposes
- Characterized by a central fact table connected to dimension tables in a star-like structure, hence the name “star schema”



Snowflake:

- Snowflake schema is a type of database schema that extends the star schema by further normalizing dimension table to eliminate redundancy
- The result is a structure that resembles a snowflake with dimension tables linked through multiple levels of relationships.