DATABASE BASICS

Meaning of Database (DB)

Any piece of information can be referred to as a data and the place where this data is stored in a way that it is easily accessible and can also be modified whenever required is known as a Database.

Database Management System (DBMS)

- DBMS is actually a tool or collection of programs that enables us to perform any kind of operation on a data stored in a database.
- Database Management System allows you to store, modify and extract information whenever required. It comprises of 4 essential components namely –
    - **User:** A user may be of any kind like a DB administrator, system developer and an end user.
    - **Database Applications:** It may be departmental, personal computer or an enterprise.
    - **DBMS:** software which allows us to manage the data stored in database
    - **Database**

DBMS Examples

There are many examples of DBMS ranging from small systems that runs on your computer to huge ones used in a Mainframe computer. Let's look at some examples of DBMS listed below!

- MySQL
- PostgreSQL
- Microsoft Access
- SQL Server
- Oracle
- RDBMS (Relational Database Management System)
- dBase
- Clipper
- FoxPro
- FileMaker

Types of DBMS

There are 4 major types of Database Management Systems.

- **Hierarchical Database** - rarely used nowadays, uses one to many relations for data elements.
- **Network Database** - results in complex database structures as it uses many to many relations.
- **Relational Database Management System (RDBMS)** - most popular in the DBMS

market, does not support many to many relations. eg -MySQL, Oracle

- **Object Oriented Database Management System (OODBMS) -** products based on this type of DBMS is still in their infancy, it supports conversion of data in the form of attributes. eg- PostgreSQL

History of Database Management System

- DBMS has evolved a lot since its birth in 1960s
- Beginning with Networking & Hierarchical databases developed by Charles W.Bachman.
- Relational Model was proposed by Ted Codd in 1970.
- Entity - Relational Model defined by Peter Chen in 1976.
- Maturation of Relational Database and SQL took place in 1970.
- Object Oriented Database developed in 1985.
- Finally, first Internet database applications were created in 1995.
- In today's time we use Structured Query Language (SQL), Not only SQL (NoSQL) and Cloud database.

Functions of DBMS

- Manages data dictionaries that stores definition of various data elements and their relationships.
- Provides storage for not only a data but also all related data like procedural codes, data validation and entry forms.
- Transforms and presents data according to the user's expectations.
- DBMS provides data privacy by using security systems in a multi user database interface.
- Allows multiple users to access any data at the same point of time without any discrepancies.
- Ensures easy data recovery and back up in order to protect its integrity.
- It allows users to communicate and transact via emails and many other communication modes.

Purpose of Database Management Systems

- Database Management System is built to overcome the drawbacks of typical file processing systems.
- DBMS has reduced the data inconsistencies and difficulty in accessing data.
- It supports concurrent multiple users and ensures security of data.
- It also solves the integrity problem.

Difference between File system & DBMS

File System

- File system is a collection of data. Any management with the file system, user has to write the procedures.
- File system gives the details of the data representation and Storage of data.

- In File system storing and retrieving of data cannot be done efficiently.
- Concurrent access to the data in the file system has many problems like reading the file while other deleting some information, updating some information.
- File system doesn't provide crash recovery mechanism.eg. While we are entering some data into the file if System crashes then content of the file is lost.
- Protecting a file under file system is very difficult.

DBMS

- It is a collection of data and user is not required to write the procedures for managing the database.
- DBMS provides an abstract view of data that hides the details.
- It is efficient to use since there are wide varieties of sophisticated techniques to store and retrieve the data.
- It takes care of Concurrent access using some form of locking.
- DBMS has crash recovery mechanism, DBMS protects user from the effects of system failures.
- DBMS has a good protection mechanism.

Working with a Database

The DBMS interface presents the user with data and the tools required to work with the data.

- **Creating tables:** The first step in building any database is to create one or more tables. As we know tables hold the raw data that the DBMS will work with.
- **Entering and editing data:** It allows you to create or edit a data entry form. viewing data: The way data appears on screen contributes to how well users can work with it.
- **Querying the database:** A query is a more powerful type of filter that can gather information from multiple tables in a relational database.
- **Sorting records:** Sorting arranges records according to the contents of one or more fields.
- **Generating reports:** A report is printed information that, like a query result, is assembled by gathering data based on user supplied criteria.

Schema

A schema is also known as database schema. It is a logical design of the database and a database instance is a snapshot of the data in the database at a given instant of time. A relational schema consists of a list of attributes and their corresponding domains.

Types of Schemas

It can be classified into three parts, according to the levels of abstraction.

- **Physical/Internal Schema:** Describes the database design at the physical level.
- **Logical/Conceptual Schema/Community User View:** Describes the database design at the logical level.
- **Sub-schemas/View/External Schema:** Describes different views of the database views may be queried combined in queries with base relations, used to define other

views in general not updated freely.