

A Historical Perspective

- Data is a collection of facts and figures. The data collection was increasing day to day and they needed to be stored in a device or software which is safer.
- Database Management Systems (DBMS) have been around for several decades, and their history can be traced back to the early 1960s. In the early days, computer systems were designed to manage data in a hierarchical or navigational manner, where data was stored in a tree-like structure. This method of storing data was inefficient and difficult to use, as it required a lot of manual effort to access and manage the data.
- In the late 1960s, The first general-purpose DBMS, designed by Charles Bachman, was called the Integrated Data Store (IDS) which was based on network data model for which he was received the Turing Award (The most prestigious award which is equivalent to Nobel prize in the field of Computer Science.).
- In the late 1970s, Mr Edgar Codd proposed a new data representation framework called the Relational Database Model. Mr Edgar Codd won the 1981 Turing Award for his seminal work. This model was based on the concept of a table, with rows representing individual records and columns representing individual fields within those records. The relational model allowed for more efficient storage and retrieval of data and was easier to use than the hierarchical or navigational models.
- In the late 1980s IBM developed the Structured Query Language (SQL) for relational databases, as a part of R project. This system was designed to manage large amounts of data and was used primarily in corporate and government applications. SQL was adopted by the American National Standards Institute (ANSI) and International Organization for Standardization (ISO).
- In the 1980s, several new DBMS products were introduced, including Oracle, Sybase, and Microsoft SQL Server. These systems were designed to be more user-friendly and to support more advanced data modeling and query languages.
- In the 1990s, object-oriented DBMS (OODBMS) emerged, which were designed to store and manage complex data structures, such as multimedia and other types of non-traditional data. These systems were initially popular in research and academic environments, but their adoption was limited in the commercial sector.

- In the 1991, Microsoft ships MS access, a personal DBMS and that displaces all other personal DBMS products.
- In the 1997, XML applied to database processing. Many vendors begin to integrate XML into DBMS products.
- In the 2000s, web-based applications and cloud computing became more popular, and DBMS systems began to adapt to these new technologies. New DBMS systems were developed to support distributed and web-based applications, including NoSQL databases such as MongoDB and Cassandra.

Today, DBMS systems continue to evolve, with an emphasis on scalability, performance, and support for cloud-based applications. Some of the most popular DBMS systems in use today include Oracle, Microsoft SQL Server, MySQL, PostgreSQL, and MongoDB.

Advantages of Database Management System:

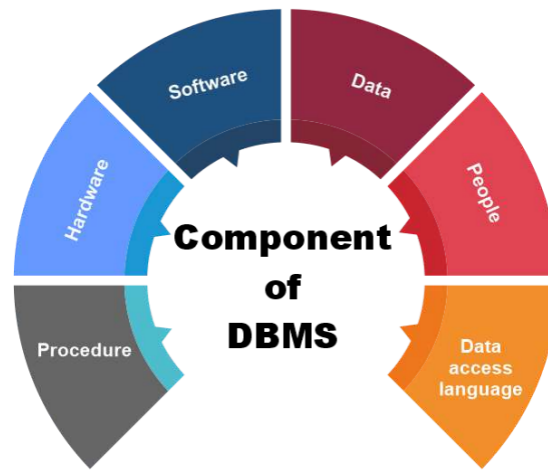
1. DBMS provides an efficient access to store and retrieve data.
2. DBMS provides an abstract view of data independence.
3. DBMS provides facilities for recovering the backup data from software or hardware.
4. DBMS provides availability of updated information for all users.
5. It restrict to the unauthorized access of data. It provides a data security.
6. DBMS provides centralized administration of data.
7. DBMS provides centralized administration of data.
8. It represents the complex relationships of data.

Data Vs Information and Meta Data:

- Data and information are closely related to each other and often used interchangeably. Information is nothing but processed or refined data.
- The term data is anything in a form of Quantity, character or a symbol suitable for use in a computer.
- Information is a data can be put into meaningful and useful content. Information consists of text, image, audio, video, etc.
- Meta data is a data about data. It is a structural component which is describe in the form of tables and their elements.

Components of DBMS

There are many components available in the DBMS. Each component has a significant task in the DBMS. A database environment is a collection of components that regulates the use of data, management, and a group of data. These components consist of



1. Procedure

- In the context of a Database Management System (DBMS), "Procedures" refer to the set of general instructions, rules, and guidelines that dictate how the DBMS is used, managed, and interacted with.

2. Hardware

- When we try to run any database software like MySQL, we can type any commands with the help of our keyboards, and RAM, ROM, and processor are part of our computer system.

3. Software

- The software which provides an easy interface for the user to store, update and delete the data from the database.
- Some examples of DBMS software include MySQL, Oracle, SQL Server, dBase, FileMaker, Clipper, Foxpro, Microsoft Access, etc.

4. Data

- The term data means the collection of any raw fact stored in the database. Here the data are any type of raw material from which meaningful information is generated.
- The database can store any form of data, such as structural data, non-structural data, and logical data.

- The structured data are highly specific in the database and have a structured format. But in the case of non-structural data, it is a collection of different types of data, and these data are stored in their native format.
- The main reason behind discovering the database is to create and manage the data within the database.
- Data is the most important part of the DBMS. Here the database contains the actual data and metadata. Here metadata means data about data.
- For example, when the user stores the data in a database, some data, such as the size of the data, the name of the data, and some data related to the user, are stored within the database. These data are called metadata.

5. People

A Database User is defined as a person who interacts with data daily, updating, reading, and modifying the given data. Database users can access and retrieve data from the database through the Database Management System (DBMS) applications and interfaces.

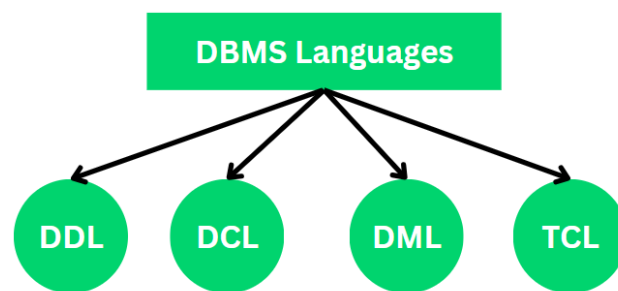
Types of Database Users

- Naive Users: These are users with little to no technical knowledge. They typically interact with systems through a user-friendly interface without needing to understand the underlying database or technical details.
- Online Users: These are users who access systems or databases over a network, usually through the internet or an internal network. They interact with online applications and services in real-time.
- Sophisticated Users: These users have a deeper understanding of the system or database, often using advanced features or querying methods (e.g., SQL) to retrieve or manipulate data. They may have some technical expertise.
- Specialized Users: These are users who have specific roles or functions within an organization, and they may use specialized tools or applications to perform their duties. For example, data analysts, system admins, or financial auditors could fall under this category.
- Application Users: These users interact with a system through specific applications built on top of the database. They might not be concerned with how the database works but use the application for tasks like data entry, reporting, etc.
- DBA - Database Administrator: The DBA is responsible for the maintenance, performance, and security of the database. They have technical expertise and manage all aspects of the database system, ensuring it runs smoothly.

6. Database Access languages

Database Access languages refers to the specific types of commands or instructions used to communicate with a database. It helps users or applications to create, manage, update, and retrieve data from a database.

There are different types of database languages



DDL (Data Definition Language)

- The DDL stands for [Data Definition Language](#), Which is used to define the database's internal structure and Pattern of the Database.
- The DDL is used for creating tables, indexes, constraints, and schema in the Database.
- By using DDL statements we can able to create the architecture of the required database.
- DDL commands are
 - Create: It is used to create objects in the database
 - Alter: It is used to change or alter the structure of the database objects
 - Drop: It is used to delete objects from the database
 - Truncate: It is used to remove all records from a table
 - Rename: It is used to rename the object in the database
 - Comment: It is used for comments on the data dictionary.

DCL (Data Control Language)

- The DCL stands for [Data Control Language](#) means these commands are used to retrieve the saved data from the database
- DCL executes on Transactional DB which means It has rollback parameters. Those are

- Grant: It is used to give user access to the database
- Revoke: It is used to take back access or permissions from the user

DML (Data Manipulation Language)

- The Data Manipulation Language is used to Manipulate the data in the database by using different commands.
- In this we can able to perform Insert new data into Table, Update existing data in the Table, Delete Data from the Table, and other functions we can perform on data by using these DML commands.
- DML commands are
 - Select: It is used to select data from the Table based on the requirements
 - Insert: It is used for Inserting data into an existing table
 - Update: It is used to update data in the Table based on the requirement
 - Delete: It is used to delete data from the Table
 - Merge: It is used for upsets operations
 - Call: It is used to call a structured query language or Java sub-program
 - Lock Table: It can control the concurrency

TCL (Transaction Control Language)

- Transaction Control Language (TCL) instructions are used to handle database transactions.
- These are used to keep track of the modifications that DML statements make.
- TCL commands help a user manage all the transactions taking place in a database.

TCL commands are:

- COMMIT
- ROLLBACK
- SAVEPOINT