Basics of Database Management System (DBMS)

What is Data?

In simple words, data can be facts related to any object in consideration. For example, your name, age, height, weight, etc. are some data related to you. A picture, image, file, pdf, etc. can also be considered data.

Hierarchy of Data

Data are logically organized into:

1. Bits (characters)
2. Fields
3. Records
4. Files
5. Databases

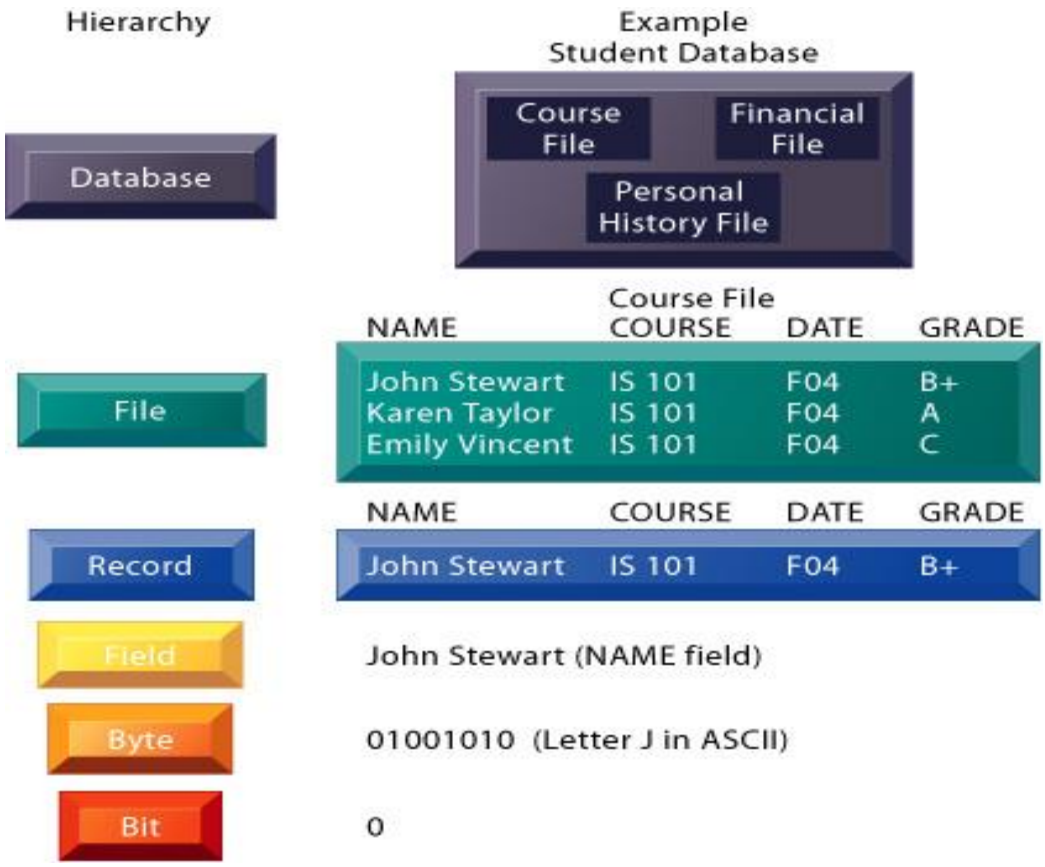
Bit (Character) - a bit is the smallest unit of data representation (value of a bit may be a 0 or 1). Eight bits make a byte which can represent a character or a special symbol in a character code.

Field - a field consists of a grouping of characters. A data field represents an attribute (a characteristic or quality) of some entity (object, person, place, or event).

Record - a record represents a collection of attributes that describe a real-world entity. A record consists of fields, with each field describing an attribute of the entity.

File - a group of related records. Files are frequently classified by the application for which they are primarily used. A primary key in a file is the field (or fields) whose value identifies a record among others in a data file.

Database - is an integrated collection of logically related records or files.



Graph; Hierarchy of Data

What is Database?

Database is an organized collection of interrelated data. It is a systematic collection of data. Databases are used for storing, maintaining and accessing any sort of data. They collect information on people, places or things. That information is gathered in one place so that it can be observed and analyzed. Databases can be thought of as an organized collection of information.

Let us discuss a database example: University uses a database to store data of student, their personal details, their previous academic records, current degree information etc.:

Let us also consider Facebook. It needs to store, manipulate, and present data related to members, their friends, member activities, messages, advertisements, and a lot more.

Database Components

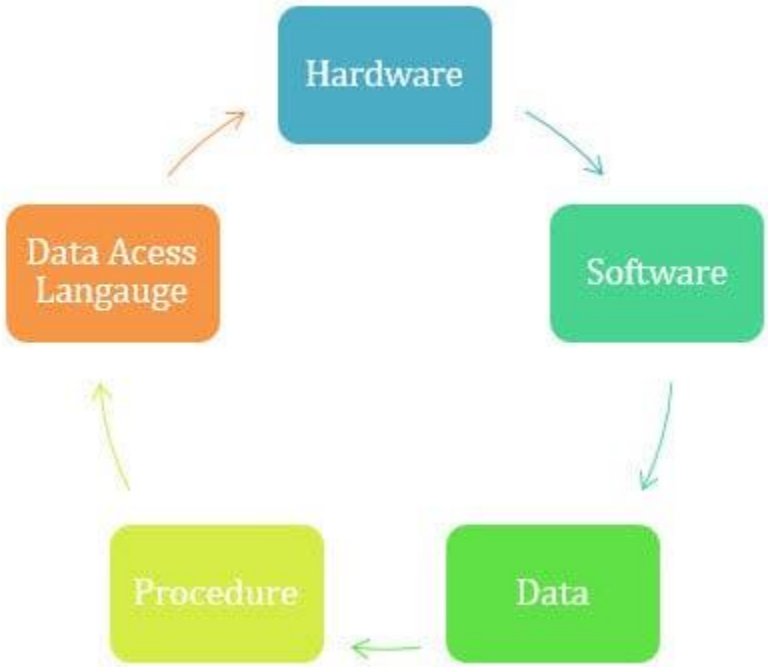
There are five main components of a database:

Hardware:

The hardware consists of physical, electronic devices like computers, I/O devices, storage devices, etc. This offers the interface between computers and real-world systems.

Software:

This is a set of programs used to manage and control the overall database. This includes the database software itself, the Operating System, the network software used to share the data among users, and the application programs for accessing data in the database.



Graph; Database Components

Data:

Data is a raw and unorganized fact that is required to be processed to make it meaningful. Data can be simple at the same time unorganized unless it is organized. Generally, data comprises facts, observations, perceptions, numbers, characters, symbols, images, etc.

Procedure:

Procedure are a set of instructions and rules that help you to use the DBMS. It is designing and running the database using documented methods, which allows you to guide the users who operate and manage it.

Database Access Language:

Database Access language is used to access the data to and from the database, enter new data, update already existing data, or retrieve required data from DBMS. The user writes some specific commands in a database access language and submits these to the database.

What is a Database Management System (DBMS)?

Database Management System (DBMS) is a collection of interrelated data and a set of programs to access, manipulate, report and represent those data. The collection of data, usually referred to as the database, contains information relevant to an enterprise. The primary goal of a DBMS is to provide a way to store and retrieve database information that is both convenient and efficient. Database system is designed to manage large bodies of information.

Advantages of DBMS

- **Controls Database Redundancy:** All the data is stored in one place, and that recorded in the database and hence controls the redundancy in the database.
- **Improved Data Sharing:** An advantage of the database management approach is, the DBMS helps to create an environment in which end users have better access to more and better-managed data. Such access makes it possible for end users to respond quickly to changes in their environment.
- **Increased End-user Productivity**: The availability of data, combined with the tools that transform data into usable information, empowers end users to make quick, informed decisions that can make the difference between success and failure in the global economy.
- **Minimized Data Inconsistency:** Data inconsistency exists when different versions of the same data appear in different places. The probability of data inconsistency is greatly reduced in a properly designed database.

- **Better Data Integration:** Wider access to well-managed data promotes an integrated view of the organization's operations and a clearer view of the big picture. It becomes much easier to see how actions in one segment of the company affect other segments.
- **Improved Data Security:** The more users access the data, the greater the risks of data security breaches. Corporations invest considerable amounts of time, effort, and money to ensure that corporate data are used properly. A DBMS provides a framework for better enforcement of data privacy and security policies.

Disadvantage of DBMS

- DBMS software and hardware cost is high.
- DBMS system works on the centralized system, i.e.; all the users from all over the world access this database. Hence any failure of the DBMS, will impact all the users.
- Setup of the database system requires more knowledge, money, skills, and time.
- Because of its complexity and functionality, it uses large amount of memory. It also needs large memory to run efficiently.
- The complexity of the database may result in poor performance.

Applications of DBMS

Databases are widely used. Some representative applications are:

- ✓ **Banking:** For customer information, accounts, loans and banking transactions.
- ✓ **Airlines/Railways/Road Transport:** For ticket reservation, schedules and routes.
- ✓ **Universities:** For student information, courses and grades (education management).
- ✓ **Credit Card Transaction:** For purchases on credit card, monthly statement generation
- ✓ **Telecommunication:** For keeping records of call made, generating monthly bills, maintaining balances on prepaid calling cards, storing information about the communication networks.
- ✓ **Finance:** For storing information about holdings, sales, and purchases of financial instruments such as stocks and bonds.7. Sales: For customer, product and purchase information.
- ✓ **Manufacturing:** For management of supply chains and for tracking production of items in factories, inventories of items in warehouses/stores and order for items.

- ✓ **Human Resources:** For information about employees, salaries, payroll taxes and benefits and for generation of pay checks.
- ✓ **Social Media:** For keeping records of user activity.
- ✓ **Games:** For saving user's progress.

DBMS Software

For Personal Computers;

1. Microsoft Access
2. FoxPro
3. dBase

For Organization Use;

1. Oracle
2. Microsoft SQL Server
3. IBM DB2/DB2UDB
4. Informix
5. Sybase
6. MySQL
7. Ingress
8. Postgre SQL