Data, Database and File System

Data is referred to as the collection of raw facts or figures that can be processed to derive meaning or knowledge. It is a collection of information gathered by observations, measurements, research, or analysis. In simpler terms, data is any fact that can be stored, e.g., "EXY", "12", etc.
Data when processed becomes Information. Information is the knowledge obtained from investigating, studying, or instructing data. For example, "Raj" is just data that can be written in a register, but when assigned to a person, it becomes information, i.e., the name of that man.
Consider the string "orange". Here, it could mean a color or a fruit. This term "orange" is data. However, if we say "color orange" or "fruit orange", it becomes information.
Similarly, "12" could mean age, pocket money, or roll number. Hence, this is data. When we say "Roll number 12," it becomes information.

Database

A database is a structured collection of interrelated data organized in a way that enables efficient storage, retrieval, and manipulation of information. Key characteristics of databases include:
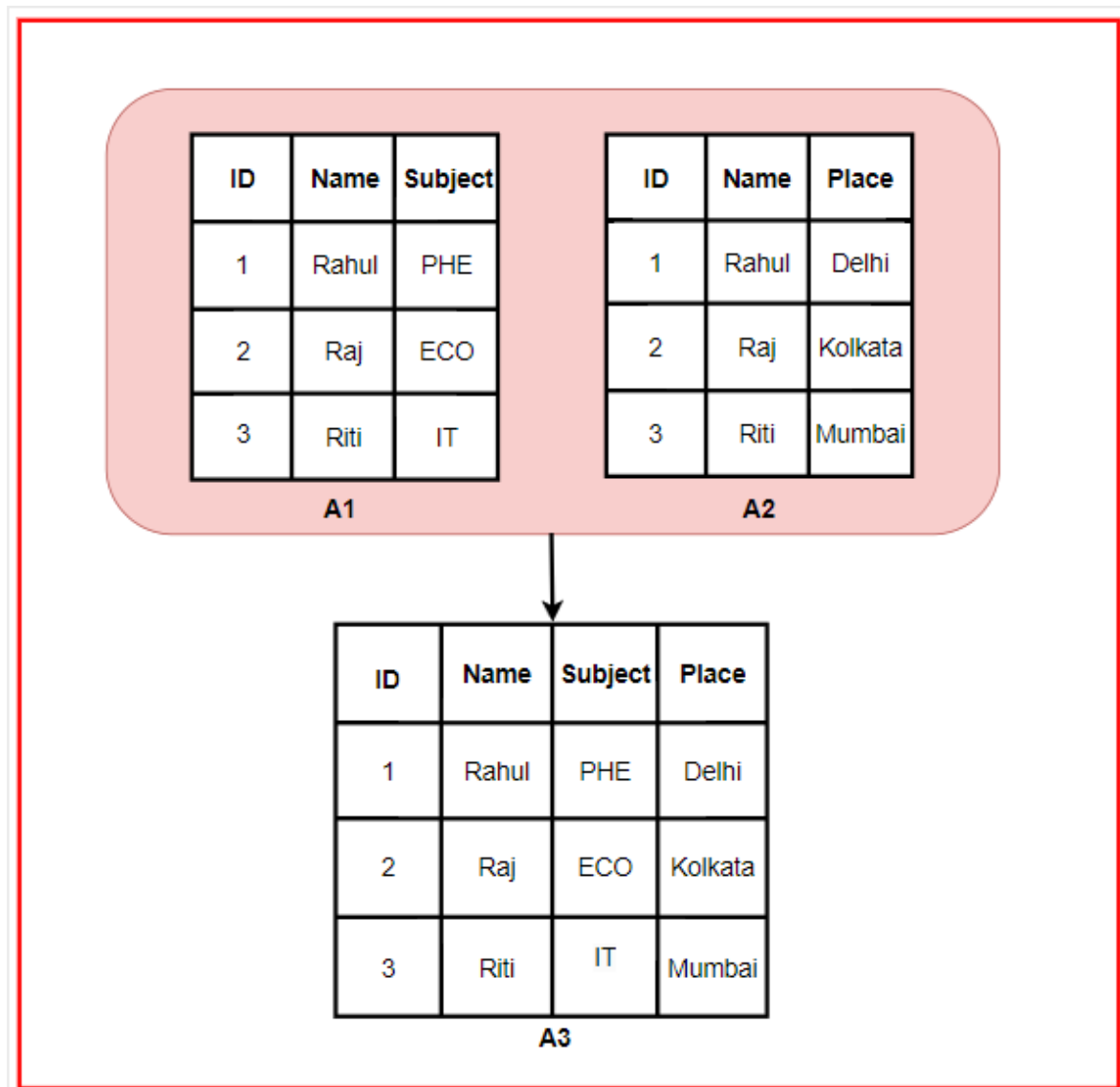
- It is a collection of interrelated data.
- It can be stored in the form of tables.
- It can be of any size.

Examples of databases:
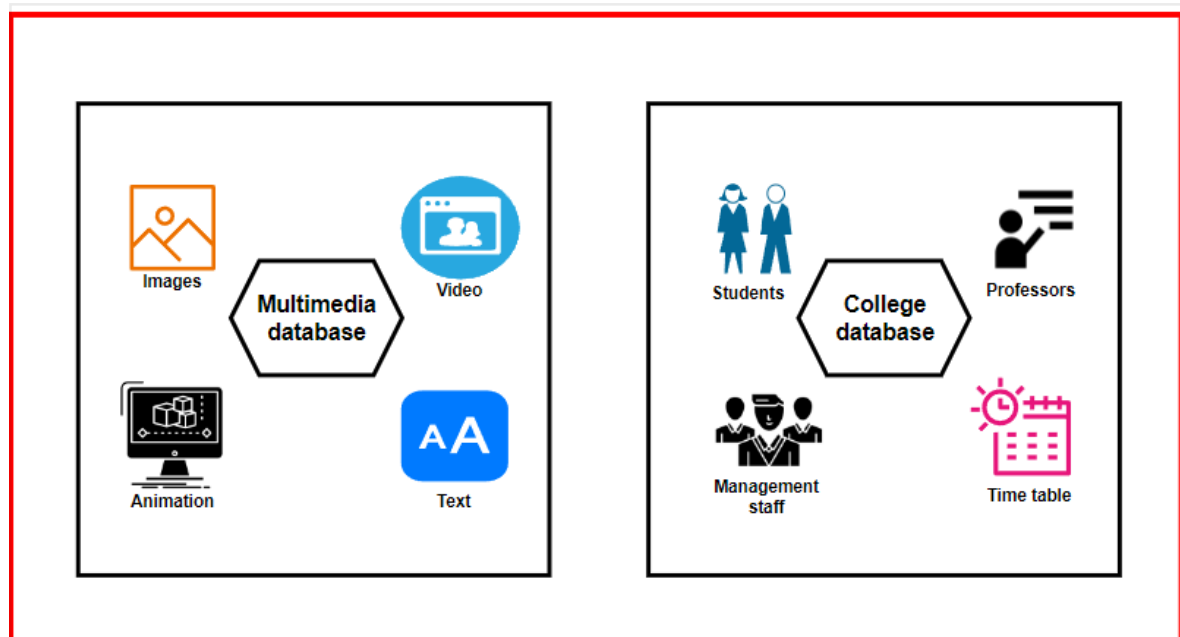
For example, in a multimedia database, the image table would contain information about images like pixels, length, and width. Similarly, the video table would have features like pixels and video length. The image and video tables would be part of the multimedia database.
Similarly, a college database would have tables like professor and student tables that are related to the timetable for class schedules.

Here, we can see that "ID" and "Name" are common columns in both A1 and A2 tables. Hence, it is a collection of related data. When merging A1 and A2, we get an A3 table with columns like ID, Name, Subject, and Place.

File System

A file system is a structure that an operating system uses to manage and organize files on a storage device, such as a hard drive or USB flash drive. It defines how data is organized, accessed, and stored on the storage device. The file system acts as an interface between the user and the data.

Disadvantages of the File System

- **Data Redundancy**: Imagine a company using separate spreadsheets for sales, customer contacts, and inventory. If a customer buys a product, their information might be entered in all three spreadsheets, causing duplication.
- **Poor Memory Utilization**: Due to storing the same information like customer names and phone numbers in multiple spreadsheets, memory resources are poorly utilized.

- **Data Inconsistency**: If a customer's address is updated in the customer contacts spreadsheet but remains unchanged in the sales spreadsheet, it causes data inconsistency.
- **Data Security**: File systems do not ensure controlled access to sensitive data. In DBMS, it is possible to limit access to specific data, which protects against unauthorized access.

Database Management System (DBMS)

A Database Management System (DBMS) is software designed to manage, manipulate, and organize large volumes of data efficiently. It acts as an interface between the database and the users or applications, providing tools for storing, retrieving, updating, and managing data securely.

Real-life Applications of DBMS

- **Banking Systems**: DBMS maintains a centralized and secure database of customer information like personal details and transaction history. For example, banks rely on DBMS to ensure data consistency when handling millions of transactions.
- **Airline Reservation Systems**: Airlines use DBMS to manage flight schedules, seat availability, and reservations. DBMS helps maintain data integrity across thousands of flights and millions of passengers.
- **Education Management Systems**: Schools and universities use DBMS to store and manage student information such as academic records and attendance. For example, when a new student is admitted, their record is added to the database seamlessly.