# PART-1

# File Based System

# File Based System

- It is a group of programs that provide specific services.
- Each program is managed in its own way.
- Method of organizing and storing data in separate files, with each application program managing its own data.
- This approach is often used as an alternative to database management systems.
- While simple and relatively inexpensive, it can suffer from data redundancy, inconsistency, and difficulty in data sharing and integration.

# Advantages

- **Simplicity:** Easier to set up and understand than database systems.
- **Lower Cost:** Generally less expensive to implement initially.
- **Faster Processing:** May offer faster access times for small, localized datasets.
- **Suitable for small-scale applications:** Appropriate for simple, single-user or small business applications.

# Disadvantages

- **Data Redundancy:** Data duplication across multiple files and applications is common.
- **Data Inconsistency:** Different versions of the same data may exist in different files, leading to inconsistencies.
- **Difficult Data Sharing:** Sharing data between applications is challenging and often requires custom programming.
- **Lack of Data Integrity:** File-based systems offer limited mechanisms for maintaining data integrity and consistency.
- **Difficult to maintain:** Managing large amounts of data in separate files can be cumbersome and time-consuming.
- **Limited Scalability:** Difficulty in handling large datasets and complex relationships.

# Database

# Database

- **Database:** a set of interconnected data, an organized collection of data, typically stored electronically in a computer system
- **Database Management System (DBMS):** It is the software or system that makes it easy for me to create and maintain the database. It's a software solution designed to efficiently manage, organize, and retrieve data in a structured manner.
- **Database System:** DB + DBMS

# DBMS Advantages

- **Data organization:** A DBMS allows for the organization and storage of data in a structured manner, making it easy to retrieve and query the data as needed.
- **Data integrity:** A DBMS provides mechanisms for enforcing data integrity constraints, such as constraints on the values of data and access controls that restrict who can access the data.
- **Concurrent access:** A DBMS provides mechanisms for controlling concurrent access to the database, to ensure that multiple users can access the data without conflicting with each other.

# DBMS Advantages

- **Data security:** A DBMS provides tools for managing the security of the data, such as controlling access to the data and encrypting sensitive data.
- **Backup and recovery:** A DBMS provides mechanisms for backing up and recovering the data in the event of a system failure.
- **Data sharing:** A DBMS allows multiple users to access and share the same data, which can be useful in a collaborative work environment.

# DBMS Disadvantages

- **Complexity:** DBMS can be complex to set up and maintain.
- **Performance overhead:** The use of a DBMS can add overhead to the performance of an application, especially in cases where high levels of concurrency are required.
- **Scalability:** The use of a DBMS can limit the scalability of an application, since it requires the use of locking and other synchronization mechanisms to ensure data consistency.
- **Cost:** The cost of purchasing, maintaining and upgrading a DBMS can be high.
- **Limited Use Cases:** Not all use cases are suitable for a DBMS, some solutions don't need high reliability, consistency or security.

# Note!

- There is a problem with DBS, which is that sometimes there are two incompatible databases.
- To solve this problem, we use a third barty tool such as:
  - Talend
  - Apache Nifi
  - ETL tools like Informatica or SSIS

# Database Main Component

# Database Main Component

- A database consists of several key components that work together to store, manage, and retrieve data.
- These components include
  - Hardware
  - Software
  - Data
  - Procedures
  - Database access language

# Database Main Component

- **Hardware:**
  - This refers to the physical components of the database system, such as the computers, storage devices (like hard drives), and network infrastructure that support the database.

# Database Main Component

- **Software:**
  - This is the database management system (DBMS) software that controls and manages the database.
  - It provides the interface for users to interact with the data, manage its structure, and ensure its integrity.

# Database Main Component

- **Data:**
  - This is the actual information stored in the database, organized in a structured manner to allow for efficient storage, retrieval, and manipulation.

# Database Main Component

- **Procedures:**
  - These are the rules, instructions, and guidelines that users follow to interact with the database, including how to access, manage, and update data.

# Database Main Component

- **Database Access Language:**
  - This is a programming language, like SQL, that users use to communicate with the database.
  - It allows users to query, update, and manage the data within the database.

# Database Main Component

- **Users:**
  - These are the individuals or applications that interact with the database to store, retrieve, and modify data.
  - They can be categorized into different types, such as end-users, application programmers, and database administrators.

# Another opinon:
# Database Main Component

# Database Main Component

- These components include
  - App:
    - The user use it to interact with the database
  - DBMS:
    - We use it to process queries and acesss stored data
  - DB:
    - It includes 2 types:
      - Stored DB definition (Metadata)
      - Stored DB

# Diference  between Metadata and Stored DB

## Metadata

- it includes the name and details of my data suchas:
  - Table  name
  - Column name
  - Data types
  - Constrains
  - etc..

## Stored DB

- It includes the data itself such as:
  - Baher
  - 22
  - Data Engineer
  - etc...

# Database Users

# Cycle of Creating a database

- **1st step: Analysis and requirements gathering.**
  - It includes business analysis and requirements gathering.
- **2nd step: Database design.**
  - Create database design(Conceptulal Schema)
- **3rd step: Implementation.**
  - Convert the design to a collection of tables and DB objects.
- **4th step: Application development.**
  - Create the UI for the user to interact with.

# Database Users

Analysis and requirements gathering.

V

System Analyst

->

Database design.

V

Database Designer

->

Implementation

V

Database Administrator (DBA)

->

Application development

V

Application Programmer

V

End Users