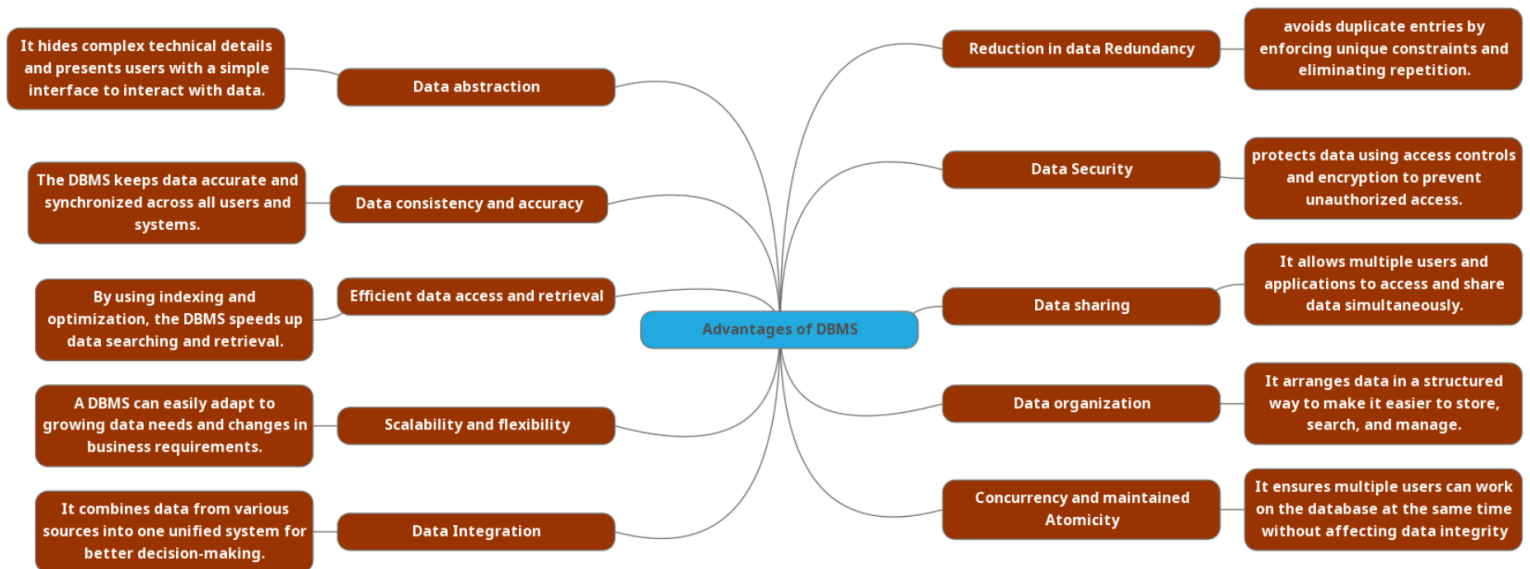# Database Course Documentation

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- difference between a flat file and a relational database?

	Relational Database	Flat File
Definition	Here, every table comprises of two sets of columns recognized as key values as well as stored values, where key values help to relate records among tables in a database.	Flat File Database is naturally self-determining or independent of each other and needs no external architecture to store or state the data for later analysis.They can be simply modified and printed directly, deprived of clarification beyond the file layout.
Data Redundancy	A relational database includes multiple entities or objects. And It helps in data redundancy and develops consistency.	A flat file Database consists of only one file with no structured relationship. And It is simple, easy to apply, and economical, but a problem exists with data redundancy.
Example Usage	For example, SQL, which is a standard interface, is a popular type of Relational Database.	For example, a CSV file is the most mutual type of Flat File Database.
Security	It is more safe than a flat-file database. Also, It includes the entity's attributes with relationships.	It is less safe. Also, it includes files, fields, records, and characters
	Relational Database offers a reporting feature with report generators that filter and shows particular fields.	The Data Warehousing projects apply flat files for importing data but without having any manipulation of data stored, which can simply carry data from the server.
	It is normally initiated in data warehousing operations where uninterrupted record access is necessary.	It is most regularly implemented in any transactional environment where a complete file needs processing.
Drawbacks	This database is basically more difficult with different costs but delivers advanced proficiencies and more resourceful access options.	This database is simple and also free, basically, but it confines the data access to manual procedures or maybe structured programs.

- Advantages of DBMS

It hides complex technical details and presents users with a simple interface to interact with data. — **Data abstraction**

The DBMS keeps data accurate and synchronized across all users and systems. — **Data consistency and accuracy**

By using indexing and optimization, the DBMS speeds up data searching and retrieval. — **Efficient data access and retrieval**

A DBMS can easily adapt to growing data needs and changes in business requirements. — **Scalability and flexibility**

It combines data from various sources into one unified system for better decision-making. — **Data Integration**

Advantages of DBMS

Reduction in data Redundancy — avoids duplicate entries by enforcing unique constraints and eliminating repetition.

Data Security — protects data using access controls and encryption to prevent unauthorized access.

Data sharing — It allows multiple users and applications to access and share data simultaneously.

Data organization — It arranges data in a structured way to make it easier to store, search, and manage.

Concurrency and maintained Atomicity — It ensures multiple users can work on the database at the same time without affecting data integrity

- Roles in a Database System

Role	Responsibilities
System Analyst	Gathers requirements and determines system specifications.
Database Designer	Designs database schema and defines data relationships.
Database Developer	Implements the database, writes SQL scripts, and procedures.
Database Administrator (DBA)	Manages security, backups, performance, and user access.
Application Developer	Develops apps that interact with the database.
BI Developer	Builds dashboards and analytics reports from database data.

Types of Databases

- **Relational vs. Non-Relational**

Feature	Relational (e.g., MySQL)	Non-Relational (e.g., MongoDB)
Data Model	Table-based	Document, Key-Value, Column, or Graph
Schema	Fixed schema	Dynamic schema
Use Cases	Banking, ERP systems	IoT, real-time analytics, web apps

	Advantage	Disadvantages
Hierarchical Databases	• Simple and fast for straightforward, hierarchical data. • Efficient data retrieval when the structure is known in advance.	• Lack of flexibility; changes to the hierarchy structure are difficult to implement. • Not suitable for complex relationships beyond a parent-child structure.
Network Databases	• More flexible than hierarchical models. • Supports many-to-many relationships effectively.	• Complex to design and manage. • Changes to the database schema can be difficult to implement.

Centralized vs. Distributed vs. Cloud

Data Distributed : Data spread across multiple locations	• Global web services	
Cloud Databases: operates in a **virtual environment** hosted on cloud computing platforms. It is designed for storing, managing, and executing data over the internet, providing **flexibility** and **scalability**	• High scalability and flexibility. • Easier to manage and maintain as most of the infrastructure is managed by cloud service providers. • Reduces capital expenditure by offering pay-as-you-go models.	• Reliance on internet connectivity. • Security concerns regarding cloud data storage
Centralized Databases: is a database stored and managed at a **single location**, such as a **central server** or data center.	• **Data Security**: Centralized storage makes it easier to implement robust security measures. • **Reduced Redundancy**: Data duplication is minimized, ensuring efficiency. • **Consistency**: A single data source ensures uniformity across the system.	• **Response Time**: The large size of centralized databases can lead to slower data retrieval times. • **Difficulty in Modifications**: Modifying, deleting, or updating data can be challenging and time-consuming, especially for large datasets.

Cloud Storage and Databases

Cloud Storage: data storage maintained and managed on remote servers accessible via the internet, often used to support and scale database operations.

Advantages of Cloud-Based Databases	Disadvantages or Challenges
• **Easily adjusts to varying workloads.**	**Risk of data breaches or unauthorized access.**
• **Ensures continuous access to data.**	**Hard to migrate between providers.**
• **Managed by providers, reducing admin overhead.** • **Data accessible from anywhere**	**Performance may depend on internet speed.**

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