Database

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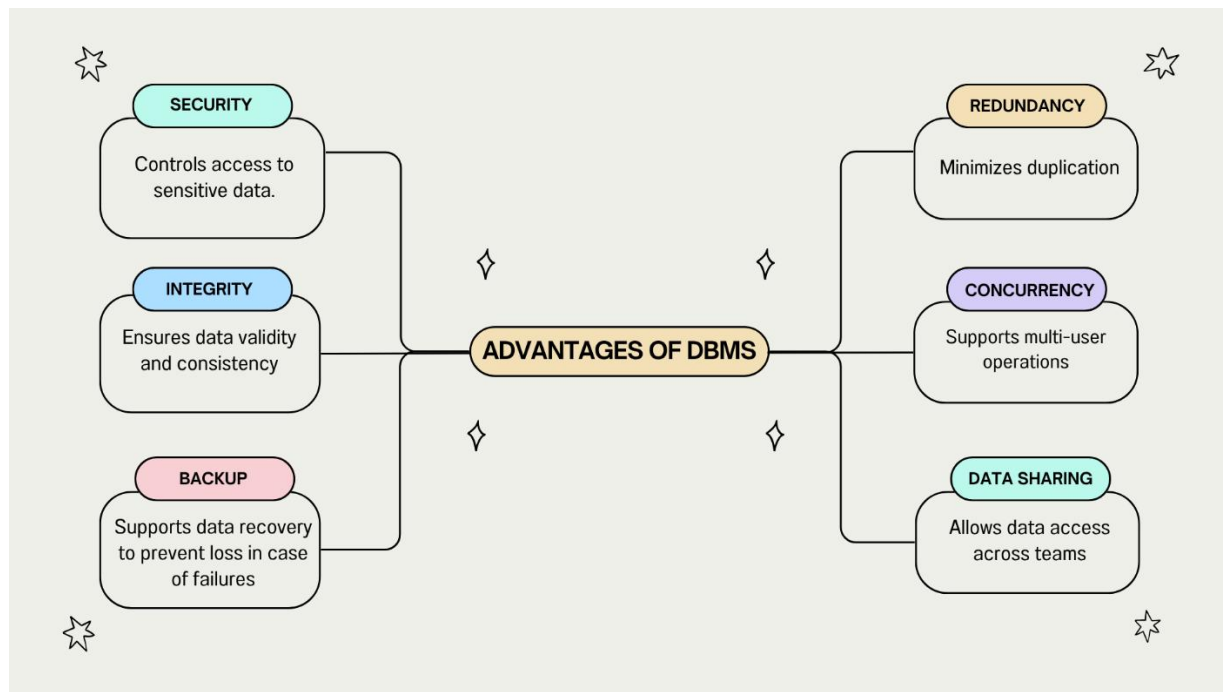**Date:** 16/6/2025

Contents

Flat File Systems vs. Relational Databases

	Flat File Systems	Relational Databases
Structure	Data stored on table with rows of information.	Data is stored in many tables with rows and columns that recognize relationships between different pieces of information.
Data Redundancy	High redundancy. The same data might be stored in multiple places.	Low redundancy. It uses normalization which is the process of organizing the attributes of the database.
Relationships	No relationship	Data is stored in the form of tables which are related to each other using primary key and foreign key.
Example Usage	List of contacts Csv files Log files.	Banking system Hospital system Shopping website
Drawbacks	Data redundancy Security	High cost Complexity Scalability

DBMS Advantages

SECURITY
Controls access to sensitive data.

INTEGRITY
Ensures data validity and consistency

BACKUP
Supports data recovery to prevent loss in case of failures

ADVANTAGES OF DBMS

REDUNDANCY
Minimizes duplication

CONCURRENCY
Supports multi-user operations

DATA SHARING
Allows data access across teams

Roles in a Database System

System Analyst

A systems analyst manages and improves computer systems for organizations or their clients. They evaluate how well a company's existing IT system functions and create strategies to address any weaknesses or issues. After identifying the necessary improvements, they can outline the new requirements and updates for the systems. Systems analysts help in implementing these upgrades and may keep track of their performance to possibly introduce additional features.

Database Designer

A database designer is responsible for designing, developing, executing, and maintaining a company's data management systems. One of their key responsibilities is to form relationships between various data elements and provide a logical structure to the data. They design database schemas and create databases for various company projects, manage the creation of new users, define roles and privileges, grant appropriate access, and assist application development teams in seamlessly connecting to the databases.

Database Developer

A database developer specializes in designing, implementing and maintaining databases in an organization, facilitating easier data storage, retrieval and updates

Database Administrator (DBA)

developing and maintaining databases, ensuring data security, turning performance, backing up data, and providing training and support to users. DBAs also are responsible for designing databases and overseeing their construction in larger organizations.

Application Developer

Building software applications that interact seamlessly with the database. They are responsible for establishing secure and efficient connections between the application and the database, integrating SQL queries to manage data, and designing user interfaces that allow users to interact with database. Additionally, they ensure input validation, implement security measures such as authentication and authorization, and handle errors to maintain data integrity. Application developers also test and debug application database interactions and work on performance optimization to ensure the system runs smoothly and efficiently.

BI (Business Intelligence) Developer

Transforming raw data into meaningful insights that support strategic decision-making. They design, develop, and maintain data models, dashboards, and reports using data from various databases. They work closely with stakeholders to understand business requirements and translate them into analytical solutions, using tools such as Power BI and Tableau. Additionally, they ensure data accuracy and optimize queries for performance.

Types of Databases

Relational vs. Non-Relational Databases

	Relational Databases	Non-Relational
Structure	Table based	Key value
Schema	fixed	Flexible
example	MySQL	MongoDB Cassandra
Use case	Banking system	Big data – sensor data

Centralized vs. Distributed vs. Cloud Databases

	Description	Use case
Centralized Database	A Centralized Database is a type of database that is stored, located as well as maintained at a single location only.	Small businesses
Distributed Database	consists of multiple databases that are connected with each other and are spread across different physical locations.	Global applications
Cloud Database	a database service that is deployed, accessed, and managed within a cloud computing environment, such as a public, private, or hybrid cloud.	Online store

Cloud Storage and Databases

Cloud Storage is a mode of computer data storage in which digital data is stored on servers in off-site locations. The servers are maintained by a third-party provider who is responsible for hosting, managing, and securing data stored on its infrastructure. The provider ensures that data on its servers is always accessible via public or private internet connections. Cloud Storage enables organizations to store, access, and maintain data so that they do not need to own and operate their own data centers. Cloud Storage is scalable, allowing organizations to expand or reduce their data footprint depending on need.

Advantage	Disadvantage
Security	Internet Dependency
Cost-Effective	Vulnerability
High availability	Privacy Concerns

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