Database Report
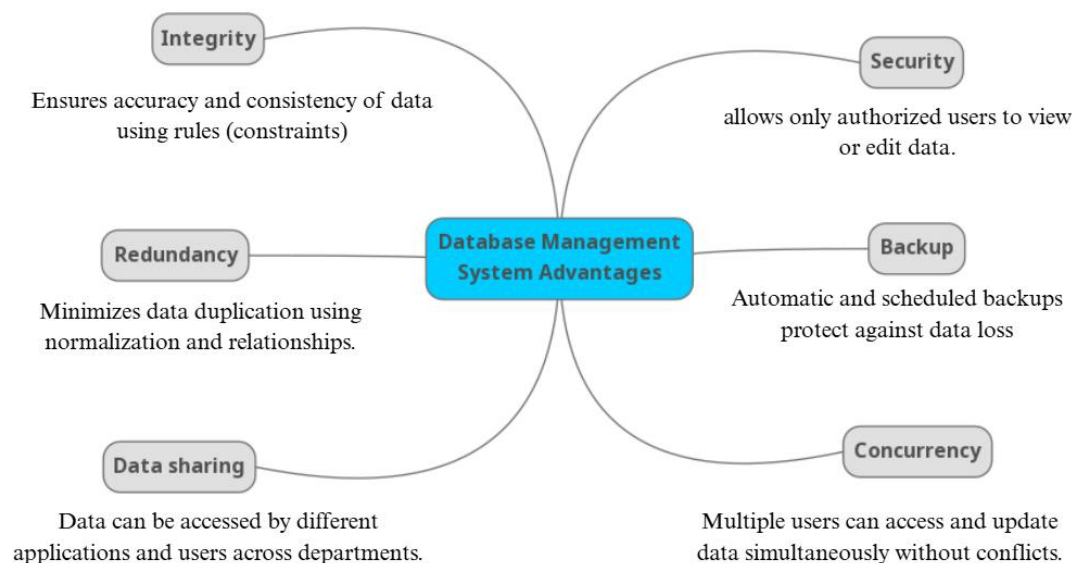
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1. Flat File Systems vs. Relational Databases Comparison

	Flat File Systems	Relational Databases
Structure	Stores data in plain text files/spreadsheets with fields separated by commas or tabs	Organizes data into tables with predefined schemas
Data Redundancy	High redundancy due to lack of central linking	Low redundancy, uses normalization to reduce duplicate data
Relationships	No direct way to enforce relationships between files.	Can define and enforce relationships using foreign keys, joins, and constraints between tables.
Example Usage	Simple address book	Banking systems
Drawbacks	Difficult to manage relationships, prone to data inconsistency and redundancy.	Complex, needs a database management system DBMS

2. Advantages of Using a Database Management (DBMS)

Integrity
Ensures accuracy and consistency of data using rules (constraints)

Security
allows only authorized users to view or edit data.

Database Management System Advantages

Redundancy
Minimizes data duplication using normalization and relationships.

Backup
Automatic and scheduled backups protect against data loss

Data sharing
Data can be accessed by different applications and users across departments.

Concurrency
Multiple users can access and update data simultaneously without conflicts.

3. Roles in a Database System

1. **System analysts:** Bridge between business needs and technical solutions. They gather user requirements and analyze current systems.
2. **Database designers:** Architect the database structure. They design data models, decide on tables, keys, and relationships, and ensure normalization and data integrity.
3. Database developers: Build the database. They write SQL code to create tables, indexes, views, etc.
4. **Database administrator:** Manage and maintain the database system. Perform backups, recovery, and security tasks, and manage user access.
5. **Application developers:** Builds the front-end or back-end application that interacts with the database. They develop user interfaces or APIs.
6. **BI (Business Intelligence) developers:** Design and develop reports, dashboards, and data visualizations.

4. Types of Databases

1. **Relational vs. Non-Relational Databases**
   - Relational databases store data in structured tables with rows and columns, using SQL for querying. They're ideal for applications that require complex queries and strong data consistency, such as banking or inventory systems.
   - Non-relational (NoSQL) databases handle unstructured or semi-structured data like documents or key-value pairs. Examples include MongoDB, which stores JSON-like documents, and Cassandra, which handles large volumes of distributed data. These databases are more flexible and scalable, making them suitable for real-time apps, social platforms, and IoT systems.
2. **Centralized, Distributed, and Cloud Databases**
   - A centralized database stores all data in a single physical location, usually on one server. This setup is simple to manage and works well for smaller organizations or local systems but can become a bottleneck if the server fails.
   - Distributed databases spread data across multiple locations or servers. This improves speed, fault tolerance, and scalability, which is why it's used in large systems like telecom networks or multinational businesses.
   - Cloud databases are hosted on cloud platforms and accessed over the internet. They offer on-demand scalability, easy maintenance, and remote access, making them ideal for startups, mobile apps, and modern web services.

5. Cloud Storage and Databases

- **What is Cloud Storage and how does it support database functionality?**

Cloud storage refers to saving data on remote servers that are accessed via the internet, rather than on local devices. It provides scalable, on-demand storage managed by cloud providers like AWS, Microsoft Azure, or Google Cloud. Cloud databases use this storage infrastructure to save and retrieve data just like traditional databases but without needing physical hardware on-site. This allows databases such as Azure SQL or Amazon RDS to be accessed from anywhere, scale automatically, and stay backed up and updated through the cloud platform.

- **Advantages of Cloud-Based Databases**

Cloud-based databases offer many benefits. They are highly scalable, allowing you to increase storage or computing power as needed without downtime. Services like Amazon RDS or Google Cloud Spanner handle maintenance tasks such as backups, updates, and monitoring automatically, reducing the burden on IT teams. They also support global access, making them ideal for applications with users in multiple regions. Additionally, you only pay for what you use, making them cost-effective for startups and growing businesses.

- **Disadvantages of Cloud-Based Databases**

One major concern is data security and privacy, as sensitive information is stored off-site and can be vulnerable if not properly protected. Another challenge is internet dependency—if your connection is unstable, it may affect access or performance. Lastly, performance latency can occur if the cloud servers are located far from users.