



Database Search and Reporting

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1. Introduction:

Objective overview:

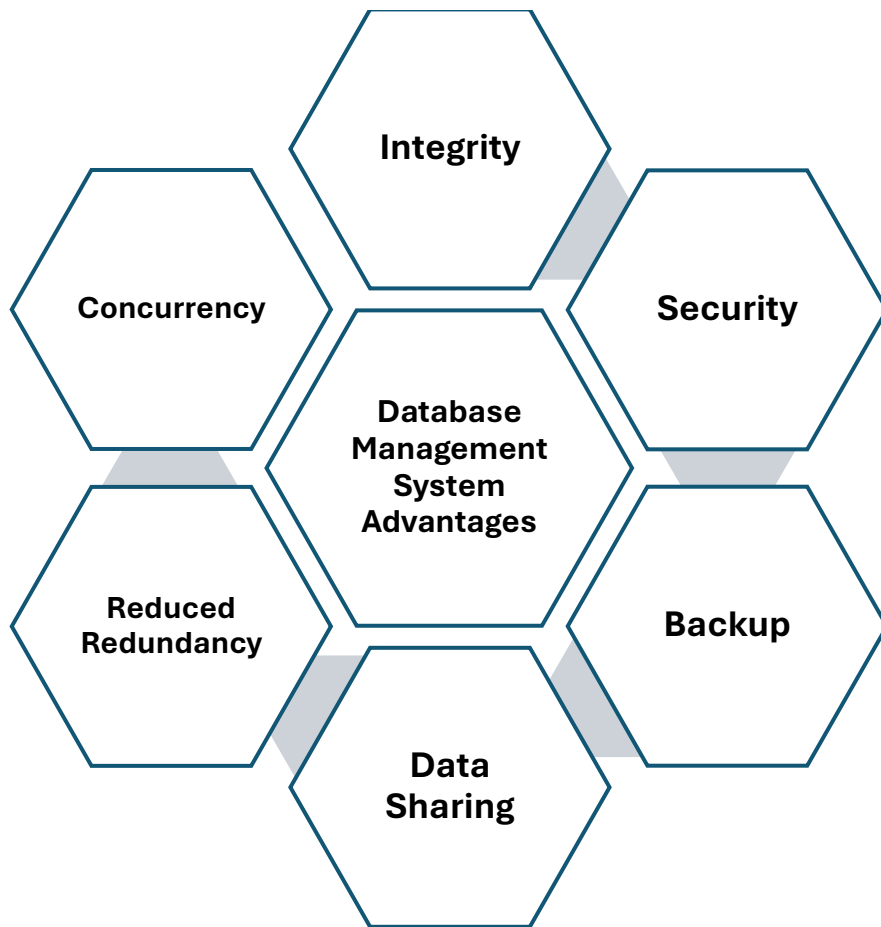
This report covers the important roles in database projects, basic database principles, a structured comparison of various systems, the benefits of Database Management Systems (DBMS), and different database types including their relationship to cloud storage.

2. Comparison Assignment: Flat File Systems vs. Relational Databases

Feature	Flat File Systems	Relational Databases (RDBMS)
Structure	Typically, simple text formats like CSV or TXT. Data is stored in basic tables or standalone files without clear links.	Highly structured format with data organized into rows and columns across related tables using defined keys.
Data Redundancy	Data is often repeated across files, leading to inconsistencies and inefficient storage.	Redundancy is minimized through normalization and relational design, ensuring consistency and efficient storage.
Relationships	Relationships aren't clearly defined and must be handled within the application logic.	Relationships are clearly defined using primary and foreign keys, supporting complex data structures and integrity.
Example Usage	Best for small-scale applications like configuration files, log storage, or simple datasets.	Suited for enterprise systems, e-commerce sites, banking apps, and other use cases requiring structured, relational data.
Drawbacks	Poor data integrity and consistency	- Setting up and maintaining the system can be complicated- Large-scale implementations often need a dedicated database expert - Scaling to handle massive or unstructured data can be difficult.

3. DBMS Advantages – Mind Map (Textual Representation)

A Database Management System (DBMS) provides several key benefits compared to conventional file systems for data management.



- **Integrity:** Data validation and consistency rules.
- **Security:** Access control and encryption.
- **Backup:** Disaster recovery.
- **Data sharing:** Centralized repository and controlled access.
- **Reduce redundancy:** Single source and consistency.
- **Concurrency:** Multi-user access.

4. Roles in a Database System 🧑🏫

- **System Analyst:** Acts as a contact between business users and technical teams. They gather user requirements and analyze current systems to identify improvements, converting business needs into technical specifications.
- **Database Designer:** Converts requirements into database structures. They create ER diagrams, define schemas (conceptual, logical, and physical), and ensure the design supports performance and data integrity.
- **Database Developer:** Builds the database based on the design. They write scripts to create and manage database objects (tables, views, triggers) and implement logic through procedures and functions.
- **Database Administrator (DBA):** Manages the database environment. Their responsibilities include setup, security, performance change, backups, and ensuring continuous availability.
- **Application Developer:** Develops applications that interact with the database. They write application code to manipulate data, relying on the database structure and logic provided by designers and DBAs.
- **BI Developer:** Specializes in analytics and reporting. They perform ETL processes, design dashboards and reports, and help organizations make informed decisions using visualized data.

5. Types of Databases

Relational vs. Non-Relational Databases:

Attribute	Relational Databases (SQL)	Non-Relational Databases (NoSQL)
Description	Data is organized in tables with rows and columns; relationships are defined using primary and foreign keys; uses SQL.	Data is stored in flexible formats like documents, key-value pairs, graphs, or wide-columns; schema-less or flexible schema.
Characteristic	ACID compliant, strong consistency, rigid schema, ideal for structured data.	Flexible schema, horizontal scalability, eventual consistency (in many cases), support unstructured/semi-structured data.
Examples	MySQL, PostgreSQL, Oracle Database, Microsoft SQL Server	MongoDB (Document), Cassandra (Column-Family), Redis (Key-Value), Neo4j (Graph)
Use Case	<ul style="list-style-type: none">- E-commerce: orders, inventory, transactions- Banking: account and transaction management- ERP: finance, HR, supply chain	<ul style="list-style-type: none">- MongoDB: CMS, mobile apps, real-time analytics- Cassandra: messaging, IoT, analytics- Redis: caching, sessions- Neo4j: social networks, fraud detection

Centralized vs. Distributed vs. Cloud Databases

Attribute	Centralized Database	Distributed Database	Cloud Database
Description	All data is stored and accessed from a single server or location.	Data is spread across multiple connected computers or nodes, often in different locations.	Hosted on cloud platforms and managed by providers like AWS, Azure, or Google Cloud.
Characteristic	Easy to manage, cost-effective to set up, but has a single point of failure.	Offers high availability, fault tolerance, better performance, and scalability.	Scalable on demand, pay-per-use pricing, managed services, resilient with disaster recovery.
Use Case	Small to mid-sized businesses, department-level systems, single-server web apps.	Global organizations, large web platforms, real-time systems, content delivery networks.	Startups, variable workloads, globally accessed apps, backup/recovery-focused deployments.

6. Cloud Storage and Databases

Cloud Storage and Its Role in Database Functionality

Cloud storage is a data storage model where information is kept in virtualized pools hosted by third-party providers across multiple servers. Users access this storage via the internet without managing physical infrastructure.

How it supports databases:

- **Scalability:** Easily adjust storage size based on demand without hardware changes.
- **Reliability:** Data is redundantly stored across various locations, reducing the risk of loss.
- **Accessibility:** Enables global data access and remote database connectivity.
- **Cost Efficiency:** Pay-as-you-go model eliminates hardware costs and lowers maintenance expenses.
- **Backup & Recovery:** Supports automated backups and rapid data restoration in case of failures.

Advantages and Disadvantages of using cloud-based database

Advantages

- Scalable and Elastic
- Highly Available & Durable
- Managed Services
- Cost-Effective
- Global Access with Low Latency
- Strong Security Features

Disadvantages

- Vendor Lock-in
- Security Responsibility
- Performance Variability
- Complex Cost Management
- Internet Dependent
- Egress Fees

Advantages and Disadvantages of using cloud-based database details:

Advantages

- **Scalable & Elastic:** Resources can be adjusted automatically based on demand.
- **Highly Available & Durable:** Redundancy and failover ensure continuous service and data protection.
- **Managed Infrastructure:** Cloud providers handle updates, backups, and maintenance.
- **Cost-Efficient:** Pay-as-you-go model reduces upfront costs and allows usage-based billing.
- **Global Accessibility:** Databases can be deployed close to users, lowering latency.
- **Strong Security:** Providers offer encryption, compliance support, and advanced protection.

Disadvantages

- **Vendor Lock-In:** Switching providers can be difficult and expensive.
- **Security Responsibility:** Users must still manage data protection and compliance.
- **Performance Fluctuations:** Shared resources can lead to inconsistent speed.
- **Cost Complexity:** Billing can be unpredictable without careful monitoring.
- **Internet Dependence:** Access requires a stable connection.
- **Egress Costs:** Transferring data out of the cloud can be expensive.

7. Conclusion

This report summarizes key concepts in database systems, comparing flat file systems with relational databases and exploring different types like relational, non-relational, centralized, distributed, and cloud-based databases. It outlines the main roles in database projects and the benefits of using DBMS, such as improved data integrity, security, and efficiency.

Cloud-based databases are highlighted for their scalability, availability, and cost-effectiveness, though challenges like vendor lock-in and internet dependence are noted. Overall, the report helps guide the selection of appropriate database solutions based on specific business and technical needs.