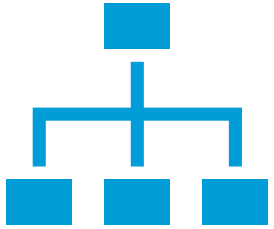
DATABASE APPROACH VS FILE-BASED SYSTEM

Faculty of AI & MMG

Data Management



Data Management Basics:

Definition: Process of storing, organizing, and retrieving data.

Importance: Critical for decision-making, operations, and analysis.

Two Approaches:

File-Based System.

Database Approach.

Manual File Systems

Organizations historically relied on manual, paper-based systems for handling business tasks.

Papers were organized using file folders and filing cabinets to facilitate data use.

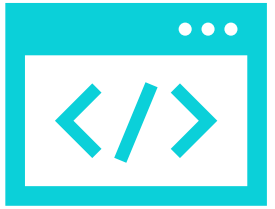
Analogy: Think of a library where each book is manually cataloged without digital tools.

Manual Systems – Strengths and Limitations

Strengths:

Worked well for small collections of data.

Adequate for simple reporting and minimal data requirements.



Limitations:

Lack of scalability as data volume grew.

Increased complexity in tracking data for large organizations.

Manual errors and inefficiencies.

The Need for Technological Advancements

Challenges in Manual Systems:

- Difficulty meeting **complex reporting requirements**.
- Time-consuming to **organize and retrieve** information.
- Lack of **real-time access to updated data**.

Technological Shift:

- Organizations sought help from computer technology to address these limitations.
- Computer-based systems offered efficiency and scalability for growing data needs.

File-Based System

Definition:

A system where data is stored in individual files.

No centralized data control.

Structure:

Data stored in text or binary files.

Each application manages its files independently.

File-Based System

A decentralized approach where each application manages its own set of files.

Data redundancy is high as the same data might be stored in multiple files.

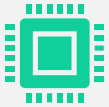
Updates to one file do not propagate automatically to other related files, leading to inconsistencies.

Security is limited to file-level permissions, making it difficult to enforce strict access controls.

Characteristics of File-Based Systems

Decentralization: Files managed separately for each application.

Data Redundancy: Same data stored across multiple files.



Data Dependency: Application logic tied to file structure.

Advantages and Disadvantages of File-Based Systems

Advantages:

- Simple and Easy to Implement.
- Cost-Effective.
- Suitable for Small-Scale Applications.

Disadvantages:

- Data Redundancy.
- Data Inconsistency.
- Poor Security.
- Limited Querying Capability.

Database Approach

Definition:

- Centralized system for managing and controlling data using a DBMS.

Structure:

- Centralized repository for all data.
- Supports multiple views of data.

Database Approach

Centralized system where all data is managed through a Database Management System (DBMS).

Reduces redundancy and ensures consistency through data integrity constraints.

Allows multiple views of data, catering to the needs of different users and applications.

Provides security measures like role-based access, ensuring only authorized users access specific data.

Simplifies data management with SQL for advanced querying and reporting.

Characteristics of Database Approach

Centralized Data Management: All data stored in a single location.

Data Independence: Applications are not tied to the data structure.

Elimination of Redundancy: Redundant data is minimized through normalization.

Advantages and Disadvantages of Database Approach

Advantages:

- Data Integrity and Consistency.
- Improved Security.
- Scalability.
- Advanced Querying.

Disadvantages:

- Cost.
- Complexity.
- Dependency on DBMS.

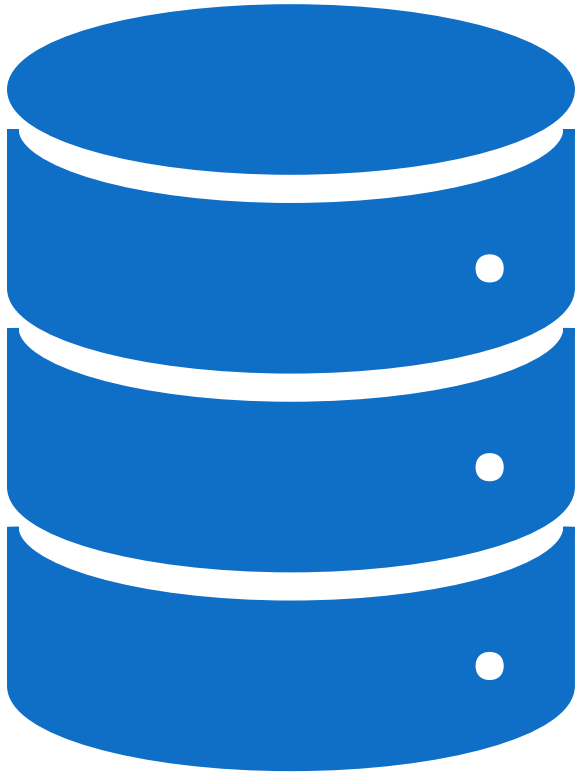
Comparison: File-Based vs Database Approach

File-Based System:

- Decentralized, High Redundancy, Limited Security, Basic Querying.

Database Approach:

- Centralized, Minimal Redundancy, Advanced Security, SQL Support.



Comparison: File-Based vs Database Approach

- **Flexibility:** The database approach is more adaptable to changing requirements compared to the rigid structure of file-based systems.
- **Querying Capabilities:** File-based systems require application-specific code for data retrieval, while databases support powerful query languages.
- **Scalability:** Databases are designed to scale with increasing data size and user demands, unlike file-based systems.

Examples

File-Based System Example:

- Small retail store maintaining customer and sales data in separate files.

Database Approach Example:

- E-commerce platform with centralized customer and order data.

Why Shift to Database Approach?

- Data Centralization: Simplifies management and reduces redundancy.

- Data Security: Role-based access ensures safety.

- Enhanced Querying: Facilitates decision-making.

- Long-Term Scalability: Suitable for growing businesses.

Conclusion

File-based systems are suitable for small-scale applications with limited complexity.

Database approach provides robust, secure, and scalable solutions.

Choice depends on the application’s scale and requirements.