Database Management System

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What is Distributed Database?

A **Distributed Database System** (DDBS) is a collection of multiple, logically interrelated databases distributed across a network. Unlike a centralized database, where all data is stored at a single location, a distributed database stores data across different physical locations — which could be on different computers, locations, or even continents — but appears to users as a single, unified system.

Key Terms

- **Distribution:** Data is spread over multiple sites.

- **Autonomy:** Each database site can manage its own operations independently.

- **Scalability:** Systems can easily grow by adding more sites.

- **Fault Tolerance:** If one site fails, the system can continue functioning (to some extend).

Representation
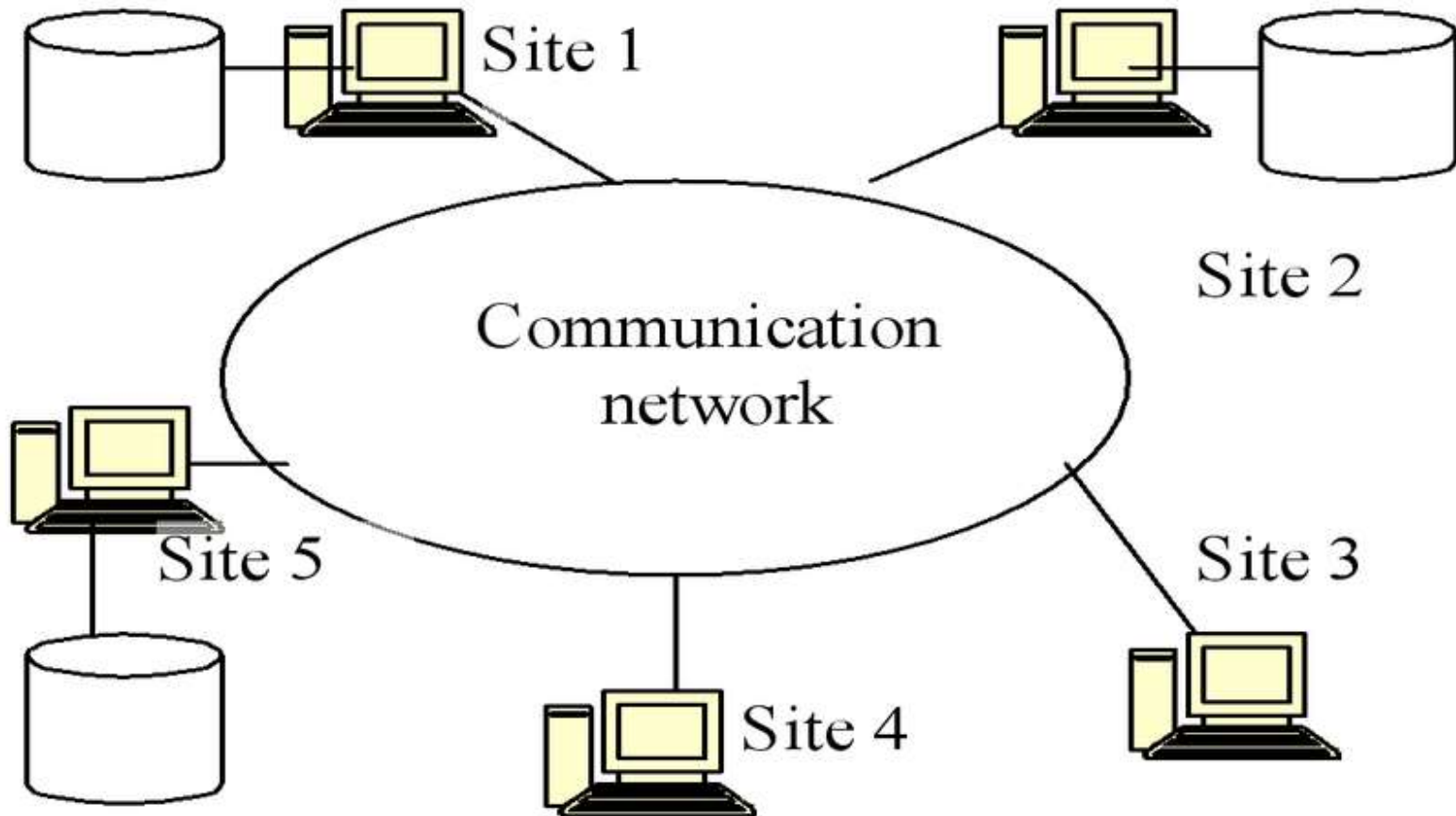
Functions of DDBS

1. It keeps the data stored at a number of sites and the sites are interconnected by a network.

2. **Data Distribution Management:** Handles data **fragmentation** (splitting tables into smaller parts) and data replication (copying data to multiple sites).

3. **Transaction Management:** Ensures that all database transactions are processed reliably across distributed sites and maintains the ACID (Atomicity, Consistency, Isolation, Durability) properties even in Distributed Database.

4. **Concurrency Control :** Manages multiple users accessing and modifying the database at the same time without conflicts and ensures data consistency and prevents issues like deadlocks.

5. **Communication Management:** Handles the exchange of data and control information between different sites over the network.

Advantages of Distributed Database Systems

1. **Improved Reliability and Availability :** If one site fails, the system can continue operating using data from other sites.

2. **Local Autonomy:** Each site can control its own data, making local operations faster and allowing independent decision-making.

3. **Cost Effective:** Using multiple smaller systems can be cheaper than maintaining a single large centralized system.

4. **Modular Growth:** New sites and data can be added without major changes to the overall system structure.

5. **Improved Data Sharing:** Organizations with multiple branches can share up-to-date information easily across all locations.

6. **Enhanced Performance for Distributed Applications:** Applications spread across different locations can interact with nearby databases, leading to better overall performance.