Database Replication

- Database replication is the process of **copying data** from one database server to another.
- It follows a **Primary-Secondary** (Master-Slave) architecture:
  1) **Primary (Master)**
     - Handles **write** operations (INSERT, UPDATE, DELETE).
  2) **Secondary (Replica/Slave)**
     - Maintains an **exact copy** of the primary database and handles **read** operations.

Key Features of Database Replication

1) **Redundancy**
   - Ensures a **backup copy** of data on multiple servers.
   - Provides **high availability** in case of failure.
2) **Primary-Secondary Architecture**
   - The **primary database** handles **write** operations:
     - CREATE,
     - UPDATE,
     - DELETE.
   - The **secondary databases** handle **read** operations only:
     - SELECT
3) **Failover Support**
   - If the **primary database fails**,
   - One of the **secondary databases** is **promoted** to become the new **primary** database.
4) **Read Scalability**
   - Read queries are **distributed** across secondary database servers.
   - This **reduces the load** on the primary database.

Purposes of Database Replication

1) **To Improve Read Performance**
   - **Read operations** are usually more frequent than **write operations**.
   - Users expect:
     - **Fast read** queries.
     - **More tolerance** for slow write queries.
   - Reads and writes are **handled separately** on different database servers:
   - One database server is set as the **primary**.
   - Other database servers are set as **secondary** replicas.
   - A **fast connection** is maintained between the primary and secondary databases.
   - Write operations are allowed only on the **primary** database.
   - Read operations are distributed among **secondary** databases.
2) **To Ensure High Availability**
   - If the **primary database fails**,
   - One of the **secondary databases is promoted** as the new **primary**.
3) **For Disaster Recovery**
   - Since a **replica** exists, data can be **easily backed up**.

Benefits of Database Replication

1) **High Availability**
   - Ensures system **uptime** even during failures.
2) **Read Scalability**
   - Read operations are **distributed** among multiple replica databases.
3) **Disaster Recovery**
   - **Prevents data loss** by keeping copies on multiple servers.

Drawbacks of Database Replication

1) **Replication Lag**
   - There can be a **delay** in synchronization between the **primary** and **secondary** databases.
2) **Increased Storage Requirements**
   - Since data is **copied to multiple servers**, more **storage space** is needed.
3) **No Improvement in Write Performance**
   - Only **read performance** is improved,
   - While **write queries** still depend on the primary database.

Example of Database Replication

- For **MySQL**, replication can be set up by modifying the configuration file:
  1) **Configure the Primary Database (Master):**
     - Set up the **primary database** as the **Master**.
  2) **Configure the Secondary Database (Replica):**
     - Set up the **secondary database** as the **Slave**.