[Data Redundancy]

Types of Data Redundancy

1. **Physical Redundancy**: Storing multiple copies of data on different physical devices.
    - Example: RAID (Redundant Array of Independent Disks) systems
2. **Geographic Redundancy**: Storing data in different physical locations.
    - Example: Cloud storage services with multiple data centers
3. **Logical Redundancy**: Creating multiple instances of the same data within a database or system.
    - Example: Backup tables in a database
4. **Time-based Redundancy**: Creating copies of data at different points in time.
    - Example: Periodic backups or snapshots

Data Redundancy Strategies

1. RAID (Redundant Array of Independent Disks)

RAID is a storage technology that combines multiple physical disks into a single logical unit for data redundancy and performance improvement.

Common RAID levels:

- RAID 1 (Mirroring): Exact copy of data on two or more disks
- RAID 5: Striping with distributed parity
- RAID 10: Combination of mirroring and striping

2. Database Replication

Copies data from one database to another, ensuring consistency and availability.

Types:

- Synchronous Replication (real-time)
- Asynchronous Replication (delayed)
- Near-Real-Time Replication.

3. Cloud Storage

Cloud storage services often provide built-in redundancy across multiple data centers. Examples include:

- Amazon S3 with cross-region replication
- Google Cloud Storage with multi-regional storage
- Microsoft Azure with geo-redundant storage

4. Distributed File Systems

Systems like Hadoop Distributed File System (HDFS) store multiple copies of data across different nodes in a cluster.

5. Backup and Restore

Regularly backs up data to a separate location.

- **Full Backups**: Complete copy of all data
- **Incremental Backups**: Only backing up data that has changed since the last backup
- **Differential Backups**: Backing up all data that has changed since the last full backup