# **High Availability and Disaster Recovery**

Disaster recovery for common storage refers to the process of ensuring the availability and integrity of data stored in a centralized storage system in the event of a disaster or unexpected outage. The goal is to minimize data loss and downtime, and to quickly restore access to critical data. Here are some common approaches to implementing disaster recovery for storage:

**Replication:** Replication involves creating an exact copy of data from the primary storage system to a secondary storage system. This can be done synchronously or asynchronously. Synchronous replication ensures that data is simultaneously written to both primary and secondary storage, providing zero data loss but potentially introducing additional latency. Asynchronous replication has a slight delay in data synchronization, allowing for faster primary system performance but with a possibility of minimal data loss in case of a disaster.

**Backup and Restore:** Regular backups of data are taken from the primary storage system and stored in a separate location, such as tape drives, disk-based backup systems, or cloud storage. In the event of a disaster, the backed-up data can be restored onto alternative hardware or storage systems.

**Snapshotting:** Snapshots capture the state of data at a specific point in time. They provide a point-in-time view of the data, allowing for quick recovery to that specific state if needed. Snapshots can be taken periodically or triggered by specific events, ensuring that data is protected and available for recovery.

**High Availability (HA) Clustering:** HA clustering involves deploying redundant storage systems in an active-passive configuration. In this setup, the secondary storage system remains in a standby state, ready to take over in case the primary storage system fails. Automatic failover mechanisms ensure minimal disruption and quick recovery.

**Cloud-Based Storage and Replication:** Leveraging cloud storage providers can offer off-site storage and replication capabilities. Data can be stored in the cloud, and replication mechanisms can be utilized to maintain redundant copies in different geographical regions. In the event of a disaster, data can be retrieved from the cloud and restored onto alternative hardware.

It is important to consider factors such as Recovery Point Objective (RPO) and Recovery Time Objective (RTO) when implementing a disaster recovery solution for common storage. RPO defines the maximum acceptable data loss, while RTO determines the maximum tolerable downtime. The chosen approach should align with the organization's requirements and budget, providing an optimal balance between data protection, availability, and cost-effectiveness.

**1. High Availability (HA) :**  
It is the technology that could be used to provide 100% service availability and 24×7 up-time by using extra and backup components like a copy of the database at the same location.

**Benefits of High Availability :**  
Keeping databases online from the circumstances that might take the primary SQL Server production system offline something like a momentary glitch or an unexpected server reboot.

**Limitation of High Availability :**  
Not useful in circumstances like the physical server running the primary SQL Server instance has a failure or your data center losses power for an extended period due to fire or flood or hurricanes, etc.  
  
  
**2. Disaster Recovery (DR) :**  
It is the technology that could be used to provide 100% service continuity and minimizing the downtime through extra and independent components in a different location.

**Benefits of Disaster Recovery :**  
No system is fully invulnerable. Things happen like the physical server running the primary SQL Server instance has a failure or your data center losses power for an extended period due to fire or flood or hurricanes, etc. It is important to secure that SQL Server database that could be recovered in a timely and efficient manner. Disaster Recovery (DR) is the technology that could be used here.

**Difference between High Availability and Disaster Recovery**

| **Features** | **High Availability (HA)** | **Disaster Recovery (DR)** |
| --- | --- | --- |
| Goal | Service Availability | Service Continuity |
| Process | Automatic | Manual |
| Infrastructure | Single Location | Multiple Location |
| Intention | Retaining Service | Retaining Data |
| Fail-over Clustering | Yes | No |
| Database mirroring | Synchronous | Asynchronous |
| AlwaysON Availability Group | Yes (In Same Location) | Yes (In Different Location) |
| Log Shipping | Yes (In Same Location) | Yes (In Different Location) |
| Replication | Yes (In Same Location) | Yes (In Different Location) |