

Detailed overview of SQL Server Always On, covering various aspects such as features, components, prerequisites, and use cases:

Aspect	Details
Feature	SQL Server Always On
Components	<ul style="list-style-type: none">- Availability Groups: Group databases that failover together.- Failover Cluster Instances (FCIs): Instances that provide high availability through clustering.- Listener: A virtual network name that directs client connections to the primary replica.- Availability Replicas: Primary and secondary replicas for high availability and disaster recovery.- Quorum: Ensures cluster nodes agree on the active role of resources (e.g., nodes, disk witness, file share witness).
Editions	<ul style="list-style-type: none">- Enterprise Edition: Full support for Always On Availability Groups and Failover Cluster Instances.- Standard Edition: Supports Basic Availability Groups with limited features (1 database, 2 replicas, manual failover).

Prerequisites	<ul style="list-style-type: none">- Windows Server Failover Clustering (WSFC): Must be configured and validated on each node before setting up Always On.- SQL Server Enterprise Edition: Required for full Always On Availability Group features.- Domain Membership: All servers must be part of the same Windows domain or trusted domains.- Shared Storage (For FCIs): Required for Failover Cluster Instances, such as SAN or S2D (Storage Spaces Direct).
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High Availability (HA) Features	- Automatic Failover: Automatically switches to a secondary replica if the primary fails.
	- Manual Failover: Admin-triggered failover to a secondary replica.
	- Synchronous Commit Mode: Ensures no data loss by requiring acknowledgment from secondary replicas before committing transactions on the primary replica.
	- Asynchronous Commit Mode: Primary replica doesn't wait for secondary acknowledgment, useful for geographically dispersed replicas.
	- Read-Only Replicas: Offload read operations (e.g., reporting) to secondary replicas.
	- Backup on Secondary: Perform backups on secondary replicas to offload the primary replica.
Disaster Recovery (DR) Features	- Multi-Subnet Failover: Support for replicas across different geographical locations, offering robust disaster recovery.
	- Automatic Page Repair: Automatically repairs corrupted pages on the primary replica using copies from the secondary replicas.
	- Flexible Failover Policy: Configurable conditions that determine when a failover should occur.

Monitoring and Management	- Dashboard in SSMS: Provides real-time status of availability groups, replicas, and databases.
	- System Views and DMVs: Dynamic Management Views for monitoring Always On availability groups (e.g., <code>`sys.dm_hadr_*</code> `).
	- Alerts and Notifications: Configurable via SQL Server Agent for proactive monitoring and response.
Networking	- Virtual Network Name (VNN): The listener name that clients connect to.
	- Multi-Subnet Cluster: Support for clusters that span multiple subnets.
	- Client Connectivity: Clients connect via the listener, which directs them to the current primary replica.
Security	- Encryption: Always On uses SSL/TLS for encrypting data in transit between replicas.
	- Kerberos Authentication: Ensures secure communication between cluster nodes and SQL Server instances.

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Use Cases	- High Availability: Provides near-zero downtime for mission-critical applications.
	- Disaster Recovery: Ensures data availability even in the event of site failures.
	- Read-Scale: Distribute read-only workloads across secondary replicas to balance the load.
Limitations	- Basic Availability Groups: Limited to 1 database, 2 replicas, and manual failover (Standard Edition).
	- FCIs with AGs: Combining Failover Cluster Instances with Availability Groups can be complex and requires careful planning.
	- Latency: Synchronous commit mode may introduce latency, especially in geographically dispersed configurations.
Licensing	- Enterprise Edition: Required for full Always On features, including multiple synchronous replicas and read-only replicas.
	- Standard Edition: Limited features with Basic Availability Groups.

This table provides a comprehensive overview of SQL Server Always On, summarizing key concepts, components, features, and considerations. It serves as a quick reference guide for planning, deploying, and managing SQL Server Always On environments.

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