**Prerequisites to setup SQL Server Alwayson Configuration**

To set up SQL Server **Always On Availability Groups (AGs)**, there are several **pre-requisites** and **prerequisites** to ensure proper configuration. These requirements are related to hardware, software, network, and SQL Server settings. Below is a list of key prerequisites for setting up SQL Server AlwaysOn:

### **1. SQL Server Editions & Licensing**

* **SQL Server Edition**: Always On Availability Groups are only available in **SQL Server Enterprise Edition** (starting from SQL Server 2012). The **Standard Edition** does not support Availability Groups (but supports Basic Availability Groups in SQL Server 2016 and later).
* **Licensing**: Ensure you have the correct licenses for both the primary and secondary replicas. AlwaysOn AGs require licensing for each SQL Server instance participating in the availability group.

### **2. SQL Server Versions**

* Ensure that all instances involved in the AlwaysOn Availability Group are running the **same version** and **patch level** of SQL Server (for example, SQL Server 2017, 2019, etc.).

### **3. Windows Server Failover Clustering (WSFC)**

* **Windows Server Failover Cluster**: AlwaysOn Availability Groups require **Windows Server Failover Cluster (WSFC)**. This feature is built into the Windows Server OS and provides the underlying cluster infrastructure.
  + **Supported Versions**: Ensure the version of Windows Server is supported by your SQL Server version. (e.g., Windows Server 2016 or later for SQL Server 2016+).
  + **WSFC Cluster Nodes**: There must be at least **two** WSFC cluster nodes for a basic AlwaysOn Availability Group configuration.
  + **Shared Storage**: For WSFC, shared storage (such as a SAN or SMB file share) is not required for AlwaysOn Availability Groups, as they use their own database files on each server instance.

### **4. Network Configuration**

* **Static IP Addresses**: Each SQL Server node in the AlwaysOn AG must have a **static IP address** for proper communication between replicas.
* **Network Configuration**: Ensure that all SQL Server instances involved in the AlwaysOn AG can communicate over the network. The network should allow:
  + **TCP/IP** communication between all cluster nodes.
  + **SQL Server ports** (default 1433 for TCP/IP, unless customized).
  + Ensure **DNS resolution** is working across all nodes.
  + **Firewall Configuration**: Open necessary firewall ports for SQL Server and WSFC communication.

### **5. SQL Server Configuration**

* **Enable AlwaysOn Availability Groups**: In SQL Server Configuration Manager, enable the **AlwaysOn Availability Groups** feature for each SQL Server instance that will participate in the availability group. This must be done on each SQL Server instance before configuring AGs.
  + Go to **SQL Server Configuration Manager** > **SQL Server Services** > Right-click the instance > **Properties** > Enable **AlwaysOn Availability Groups**.
  + **Restart SQL Server** after enabling this feature.

### **6. Database Prerequisites**

* **Full Recovery Model**: All databases in the AlwaysOn Availability Group must be using the **Full Recovery Model**.
  + **No Simple Recovery Model**: Databases using the Simple Recovery Model cannot participate in AGs.
* **Backup and Restore**: Each database must have a recent **full backup** and **transaction log backup** taken before the databases are added to the Availability Group. These backups will be restored on secondary replicas.

### **7. Cluster Shared Drives (Optional)**

* **Cluster Shared Volumes (CSV)**: If you plan to use **shared storage** for quorum (in the case of FCIs), ensure the storage is configured as **Cluster Shared Volumes (CSV)**.
  + This step is generally not required for AlwaysOn AGs, as they do not require shared storage for the databases themselves.

### **8. Quorum Configuration**

* **Quorum Settings for WSFC**: Configure the **quorum mode** for the WSFC to support the availability group. For instance, in most setups, a **Node Majority** quorum configuration is used when you have two or more nodes.
  + If you have an **odd number of nodes**, you may use **Node Majority** quorum.
  + For an **even number of nodes**, you might need a **File Share Witness** or **Cloud Witness** for quorum.

### **9. Security and Permissions**

* **Domain Account for SQL Server Instances**: All SQL Server instances in the AlwaysOn Availability Group must run under **domain accounts**. These accounts must have the appropriate permissions to access the cluster and databases.
  + The domain account needs **administrator privileges** on the cluster nodes.
  + The account needs to be part of the **SQL Server sysadmin role**.

### **10. Automatic Failover Requirements**

* **Synchronous-commit Mode**: For automatic failover to work, replicas must be set to **synchronous-commit mode**. This configuration ensures that data is written to both primary and secondary replicas in real-time.
  + **Automatic failover** is only supported when you have at least **two replicas** with **synchronous-commit mode** enabled.

### **11. Backup Strategy for AlwaysOn AGs**

* **Backup Strategy**: Set up a backup strategy to take backups on the **primary replica** and optionally on the **secondary replica** if needed. SQL Server AGs allow backups to be taken from any replica, but it’s typically best practice to take backups from the primary replica.

### **12. Application and Connection Considerations**

* **Connection Strings**: Applications must be modified to use the **AlwaysOn Listener** for connections, which provides a virtual network name (DNS) that redirects connections to the current primary replica.
  + Ensure the **listener name** is configured, and that clients use it for database connections.

### **13. Logins and Users**

* **Login Synchronization**: All logins used by the applications should exist on **all replicas**. SQL Server AlwaysOn does not replicate logins across replicas automatically.
  + You can use **sp\_addlogin** or **Windows Authentication** to ensure logins are synchronized.

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### **14. Testing and Validation**

* **Pre-configuration Validation**: Use SQL Server tools to validate that your environment meets all requirements.
  + Test network connectivity, verify quorum settings, and ensure SQL Server instances are properly configured for AlwaysOn.
  + Use the **SQL Server Management Studio (SSMS)** to validate AG configuration before making changes.

By meeting these prerequisites, you can ensure a smooth configuration process for SQL Server AlwaysOn Availability Groups. These steps prepare your environment for high availability and disaster recovery, ensuring that your SQL Server infrastructure is resilient and performant.