EverExpanse
Empowering Payment Landscape

SQL SERVER 2014

AlwaysOn

Implementation Guide for DBA

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Applies to: SQL Server 2014 Enterprise Edition, Windows Server 2012 R2 Data centre

Summary: This document describes SQL 2014 AlwaysOn HADR multi-subnet implementation in Texas, New Jersey Data Centre environment planning, configuration steps and troubleshooting notes.

INTRODUCTION

When companies plan to migrate SQL Server legacy technology with AlwaysOn 2014 implementation, this document has a detailed explanation of AlwaysOn implementation steps which were performed in multi-subnet environments either Secondary Servers in different regions or countries.
AlwaysOn – High Availability and Disaster Recovery Solution available from SQL Server 2012 onward.

- The application can access one read/write and rest all instances in read mode.
- AG group provides the fastest failover time compared to all other HA (and DR) solutions.

This document provides guidelines to prepare a new SQL Server AlwaysOn environment for implementation. All OS and SQL Server Installations will follow standard guidelines and documentation specific to AlwaysOn Implementations. You can refer to this as an SOP document.
This document explains complete implementation steps that will help any novice DBA to implement and maintain this solution.

ALWAYSON IMPLEMENTATION TASK LIST

Infrastructure Planning

Virtual Machine - Build Request & Configuration

- Request to Build VM Instances along with Storage
- Request to get IP addresses
- SQL Service Account
- Witness Folder

Windows Feature Installation and Configuration

- Fix Patch Update
- Install Failover Clustering Component on all

SQL 2014 Installation and Configuration

- SQL Server Installation on all machine
- Adding user group with SQL Security
- Restore DB Backup
- Always On Availability Group Configuration
- Configure Listener

Testing of Always-On

- Test Application
- Connection Strings

CONFIGURATION AND INSTALLATION STEPS

Infrastructure Planning

In Infrastructure preplanning, first list down all the details listed below – Current details of Network IPs, Hardware Configuration – CPU, Disk, Memory etc. Hardware and OS details should be as per the given minimum requirement of SQL Server 2014 AlwaysOn https://docs.microsoft.com/en-us/sql/database-engine/availability-groups/windows/prereqs-restrictions-recommendations-always-on-availability?view=sql-server-2014
Below is an example to visualize the high-level infrastructure details of your network, Here all the explanations belong to the domain: ImproveSQL.net

Data Center Zone	Texas	New Jersey
IP CIDR Block	20.22.30.187	20.52.30.187
VM Name	ALWSQL01	ALWSQL02
Require additional IPs	2 (1 - Failover Cluster Manager, 1 - AlwaysOn Listener in this subnet)	2 (1 - Failover Cluster Manager, 1 - AlwaysOn Listener in this subnet)
Ports	54001, 1433	54001, 1433
VM Instance Count	1	1
VM Instance Size & RAM	2 core, 16 GB Memory	2 core, 16 GB Memory
Operating System	Windows Server 2012 Datacenter	Windows Server 2012 Datacenter
Feature	Failover Clustering .Net Framework 3.5	Failover Clustering .Net Framework 3.5
OS Disk Space	80 GB	80 GB
Drives & Disk Space	Depends on your database size & Configuration	
Domain Controller Name	ImproveSQL.net	ImproveSQL.net
SQL Server ISO Image	SQL Server 2014 Enterprise Edition	SQL Server 2014 Enterprise Edition
SQL Service Account	ImproveSQL.net\srvAcctAlwaysOn (Normal user in ImproveSQL.net domain)	
Failover Cluster Name	ALWSQL01CL.ImproveSQL.net	
Failover Cluster IP	20.22.30.185	20.52.30.185
Full Back up and Log file Folder Location	\\WINDC\AWLSQL_Witness (with read/write access to srvAcctAlwaysOn user)	
AlwaysOn Listener Name	ALWSQL01LSN.DEV.CDS	
AlwaysOn Listener Port	54001	
AlwaysOn Listener IP	10.22.30.186	10.52.30.186

PS: this specified table is for reference, you can change the details as per your environment and requirements.

Prerequisite Checklist and Verification

1. DBA can use organization standard process to request OS and feature Installation, Open ports and IP requests. Specific to this Texas and New Jersey Environment, the Domain is the same as mentioned above and domain-level communication ports are open.

2. To start ask your System Admin to mount SQL Server 2014 Enterprise Edition ISO image to Install SQL Server.

3. Request to create a shared folder on the network location to store Backup and log files. i.e. \\WINDC\AWLSQL_Witness , allocate free space approx. double of database size. This folder should have Read/Write (Full) Access to the ImproveSQL.net\srvAcctAlwaysOn Service Account.

4. Once VMs are ready, check everything installed and configured properly.
   - Follow our standard checklist first to ensure the VM build is ready.
   - Note down allocated IP Address and requested additional IPs (for Failover Cluster and AlwaysOn Listener)
   - Check OS version and updates, Memory, CPU, and Server manager Initial Configuration like part of the domain, all VMs are reachable.
   - Check Requested Features are installed i.e. .Net Framework 3.5 and Failover Clustering. For more details on feature installation refer last section – Windows Feature Installation
   - Check Drive Mapping and allocated space is correct
   - Check SQL Server Service Account is part of the Local Administrator group of newly created VMs.
   - Verify SQL Service account has read/write access to the requested new shared folder.

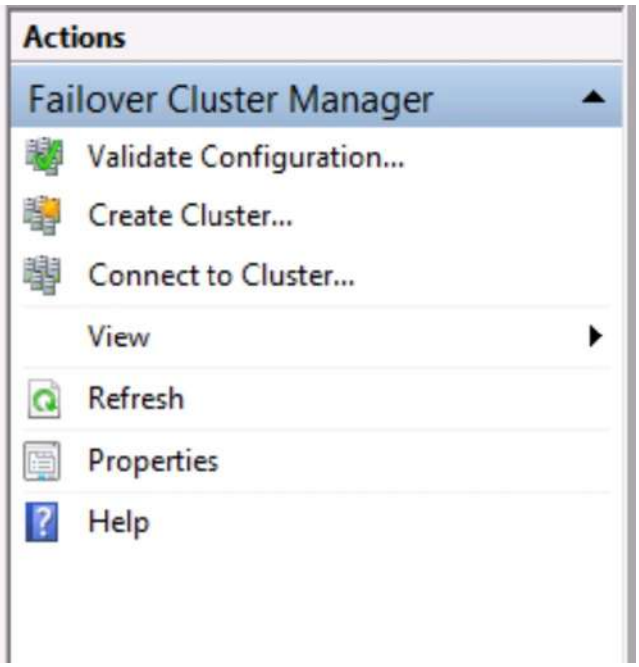
Windows Failover Cluster Configuration

In this section, we are configuring the Windows Failover Cluster. Windows Failover Cluster Manager Configuration requires Domain Administrator rights to create AD Objects, Preferred to Login with Domain Admin Login credentials or ask System Administrator to perform / Run Wizard.

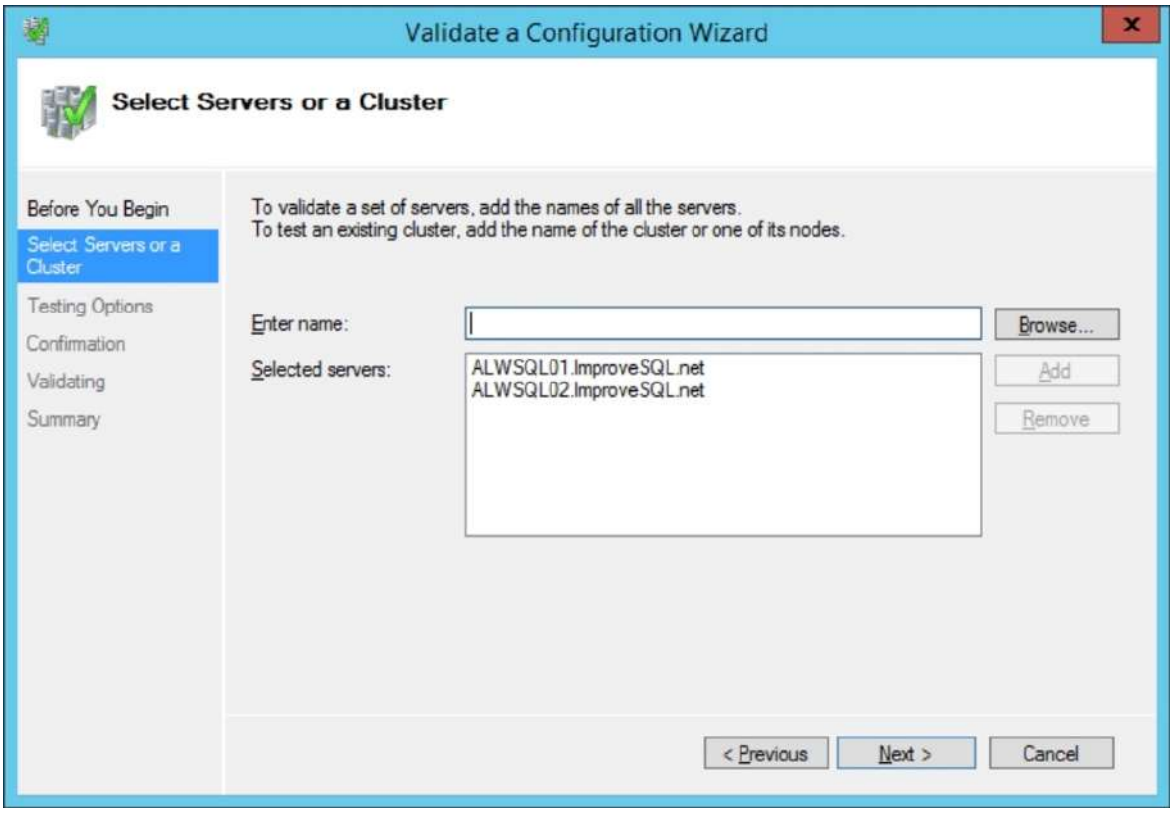
Make sure to keep the Windows 2012 Server Operating system with the latest updates before you proceed to configure failover clustering.

To start failover clustering manager configuration– connect to anyone (preferred Planned Primary AlwaysOn Instance) through a remote desktop i.e. ALWSQL01 , start → Server Manager → Tools → Failover Cluster Manager

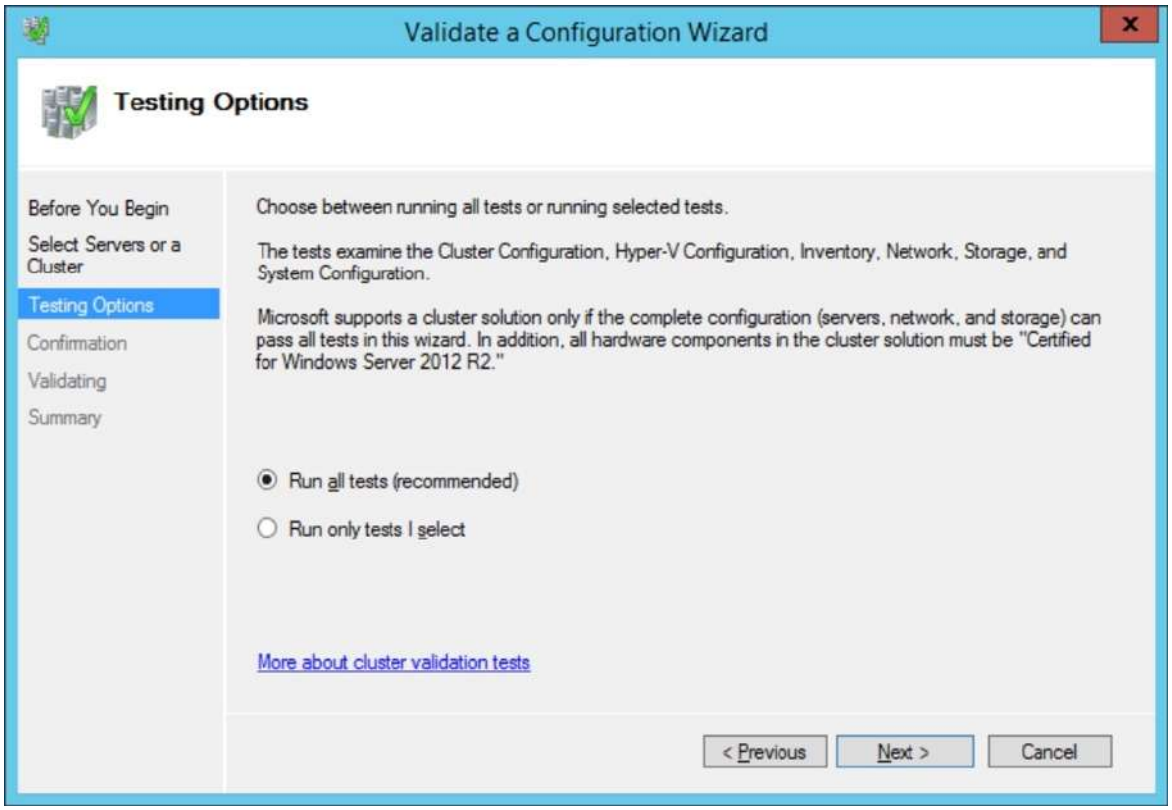
Once the Failover Cluster Manager MMC window opens, on right hand Actions pan choose Validate Configuration Option



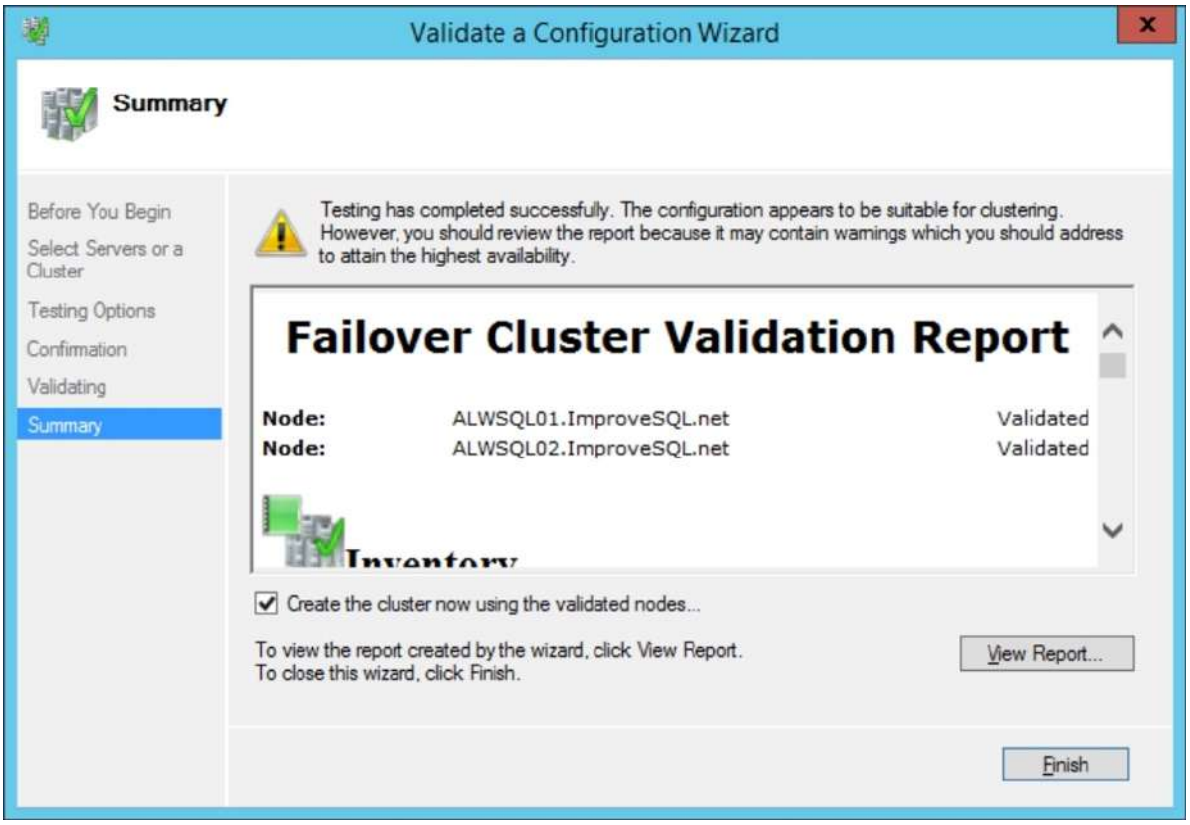
Next → select servers where you can specify server names



Next → choose Run all tests (recommended) option.

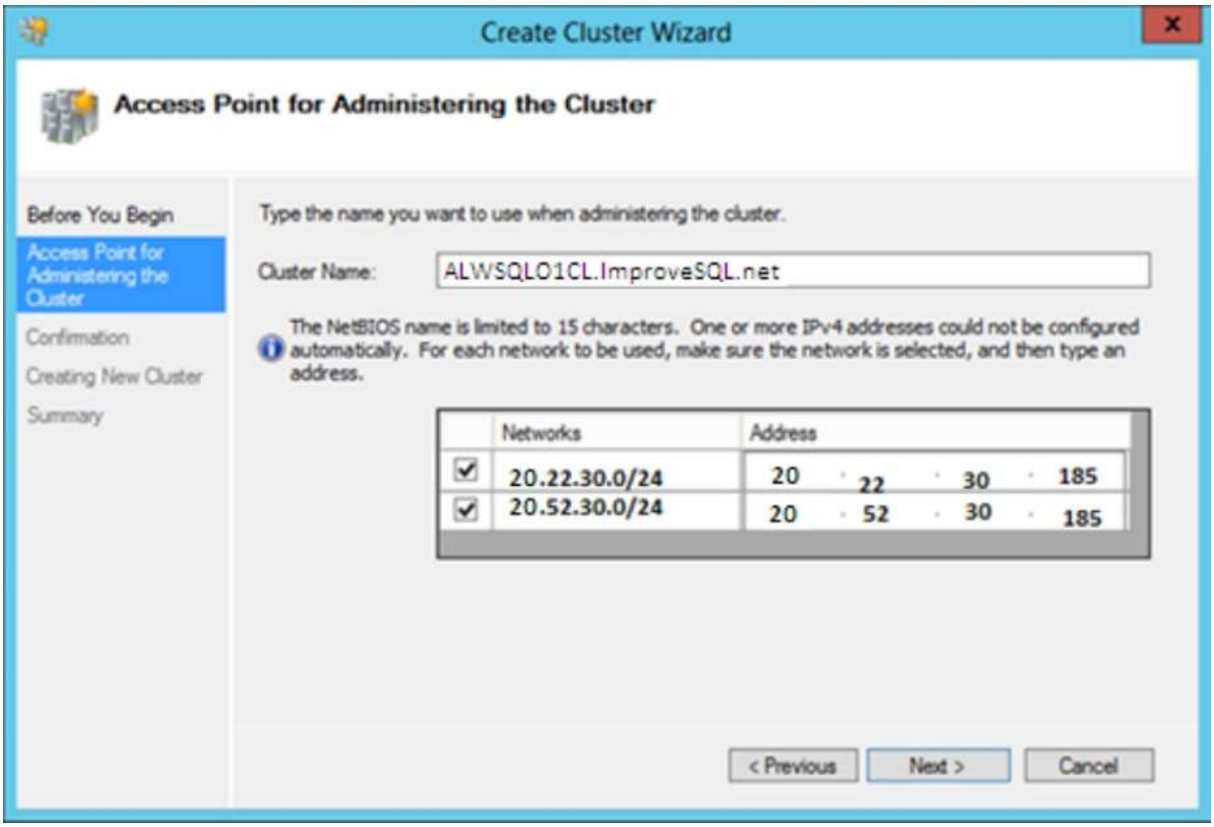


After a successful test, on the summary wizard, there is an option selected automatically to create the cluster now using the validated nodes. It automatically starts cluster wizard.

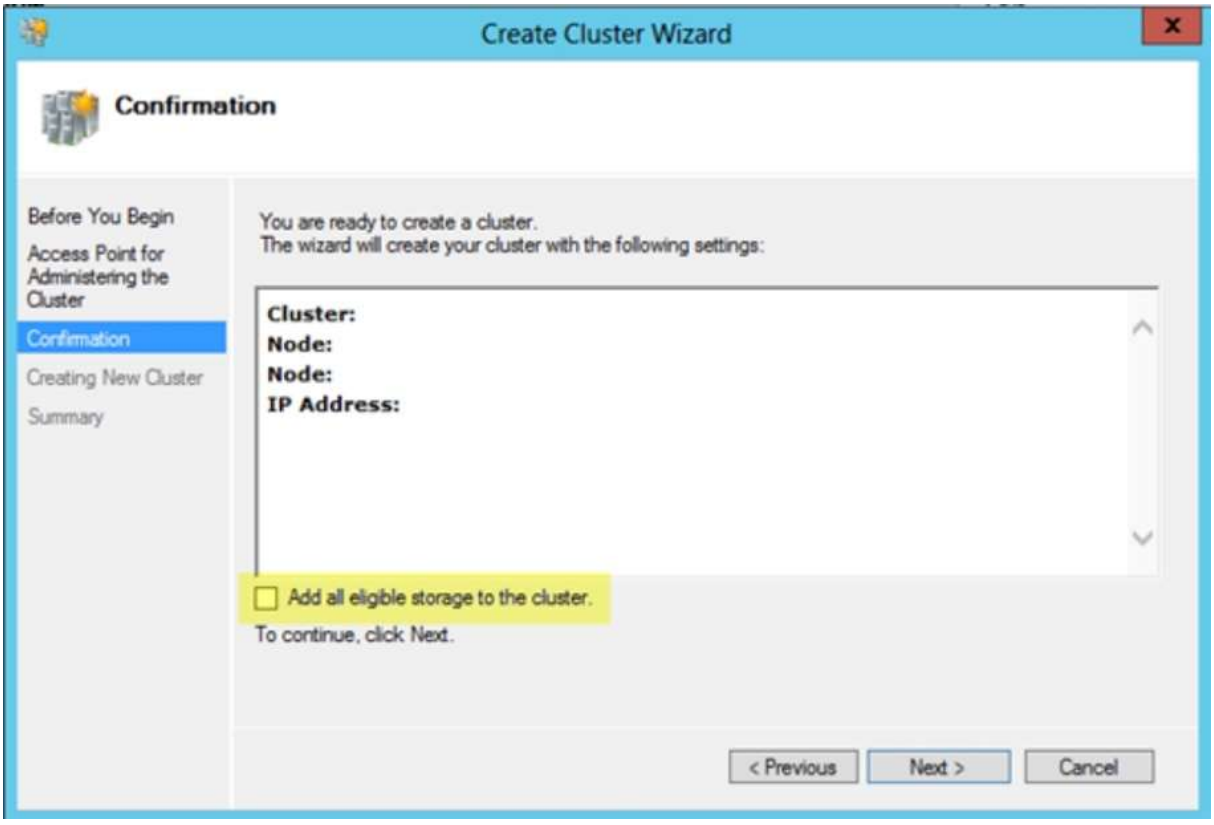


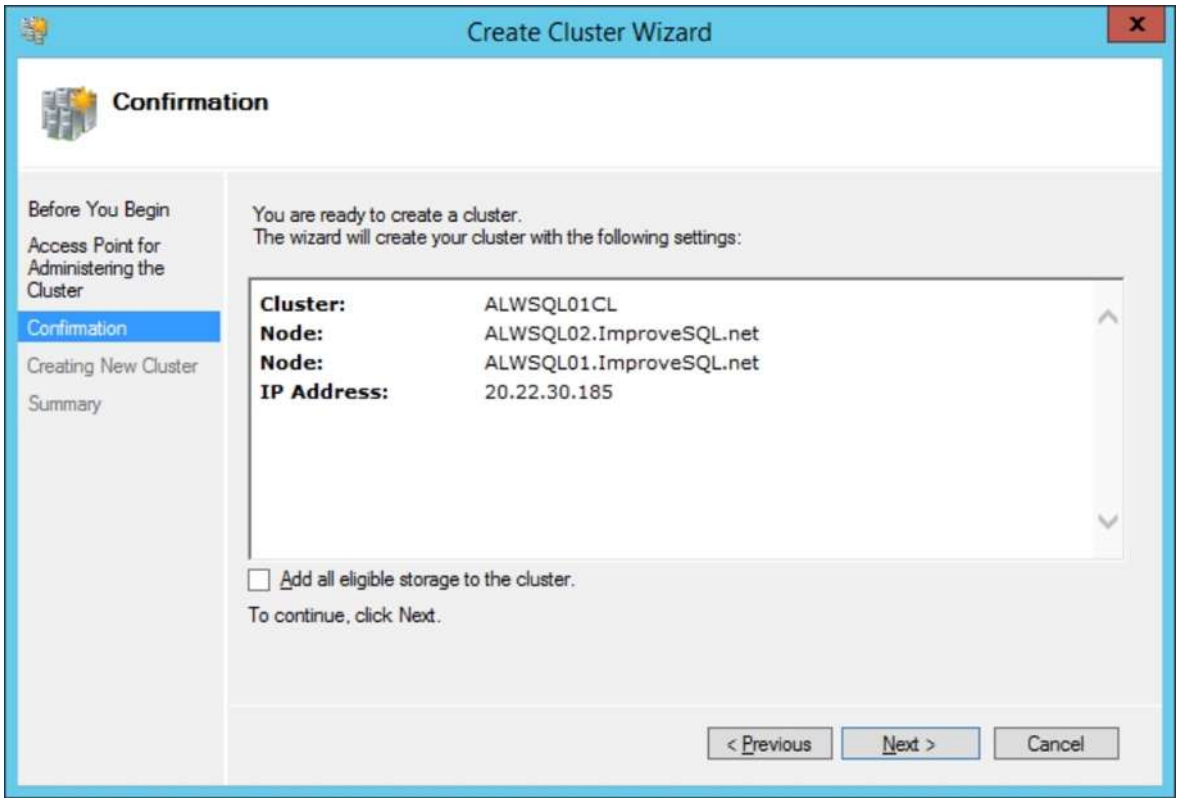
or you can manually as well choose to create a cluster. From Actions pan → Create Cluster

On step Access Point for Administering the Cluster window, you need to specify Failover Cluster Name: **ALWSQL01CL (Specify name without domain name) and failover cluster IPs (20.22.30.185, 20.52.30.185)** defined initially into infrastructure planning section.



Next → on the confirmation window do not check the mark for Add all eligible storage to the cluster.

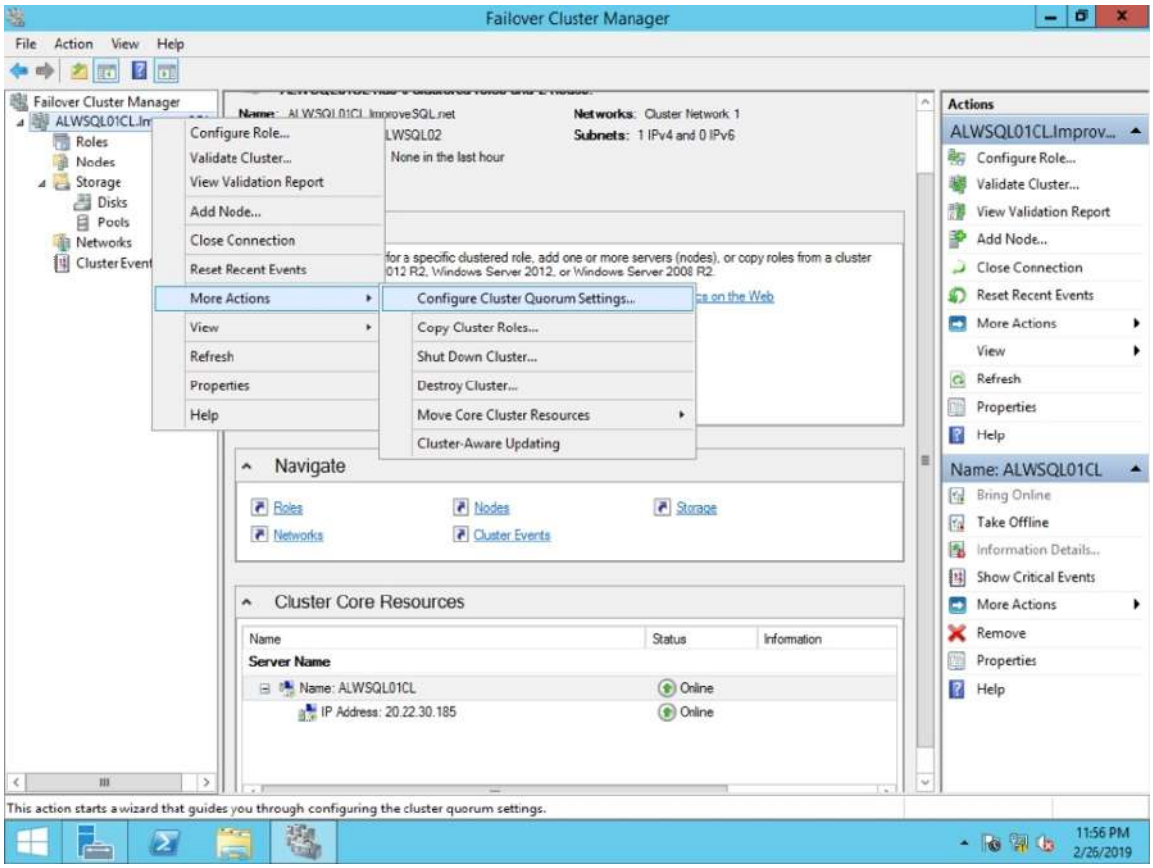




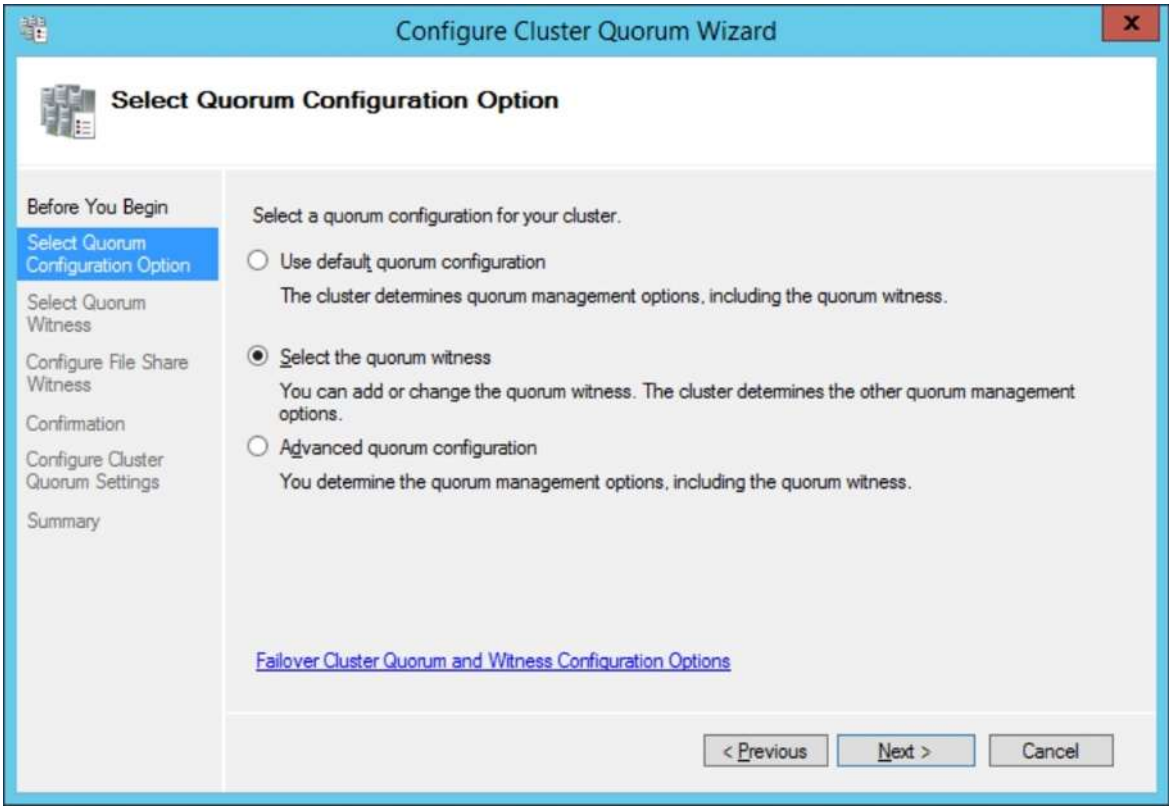
At the end, summary window once you create the cluster successfully click Finish.

CONFIGURE Quorum Witness

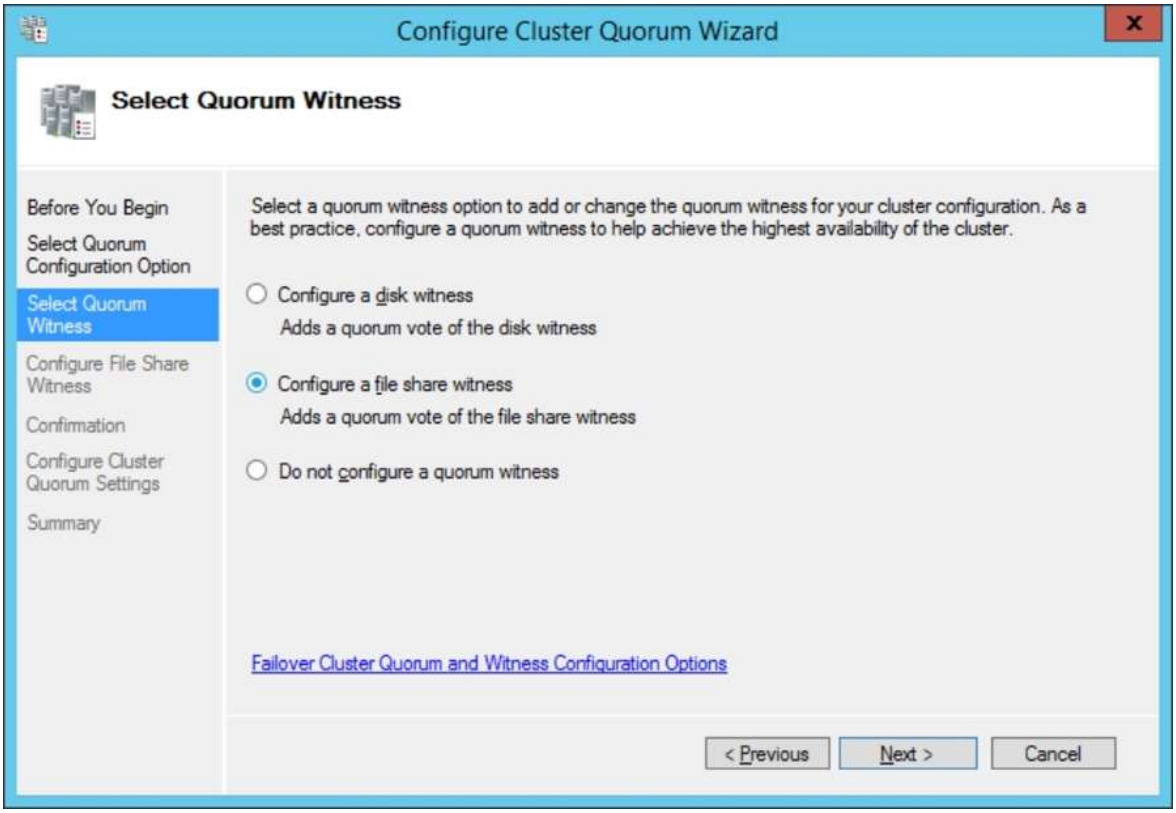
In the Failover Cluster Manager Window–right-click on ALWSQL01.ImproveSQL.net → More Actions → Configure Cluster Quorum Settings.



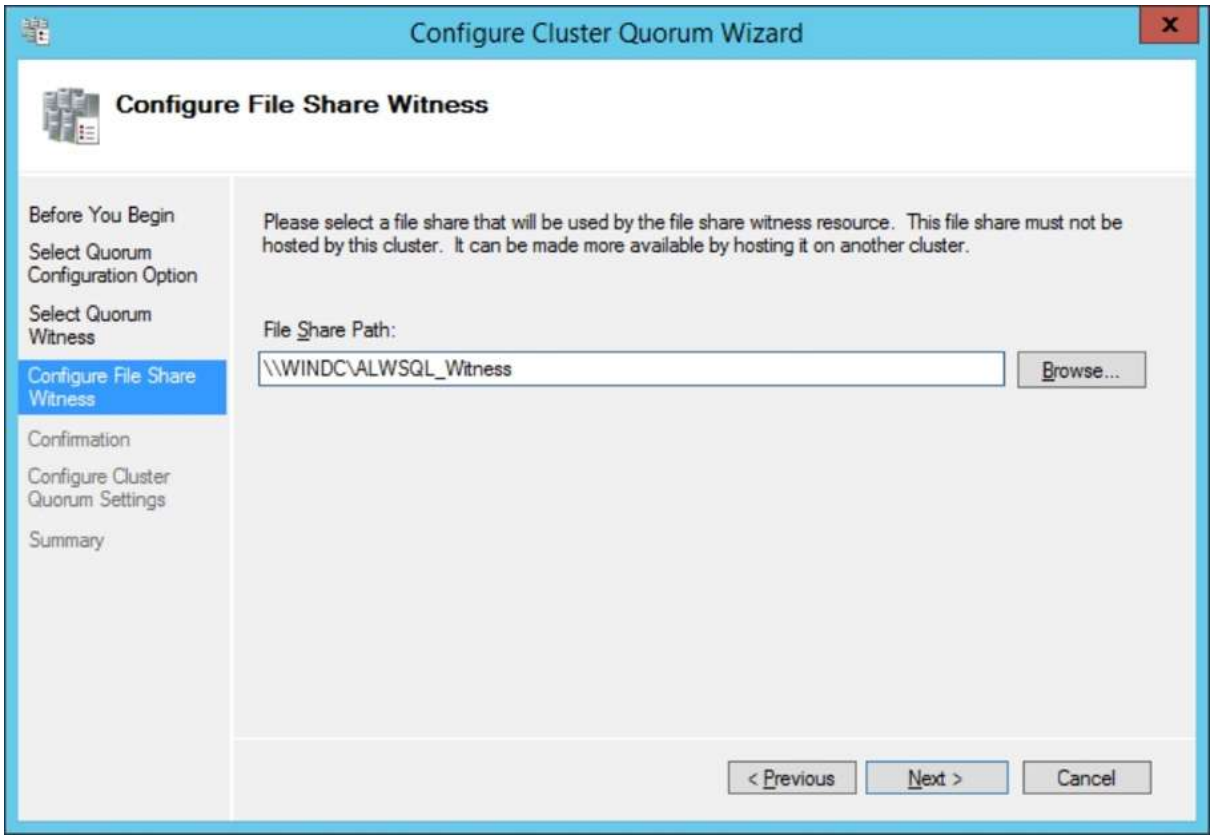
Configure Cluster Quorum wizard will start, Select the Quorum Witness settings → Next to select the Quorum configuration option – choose the Quorum Witness option shown below.



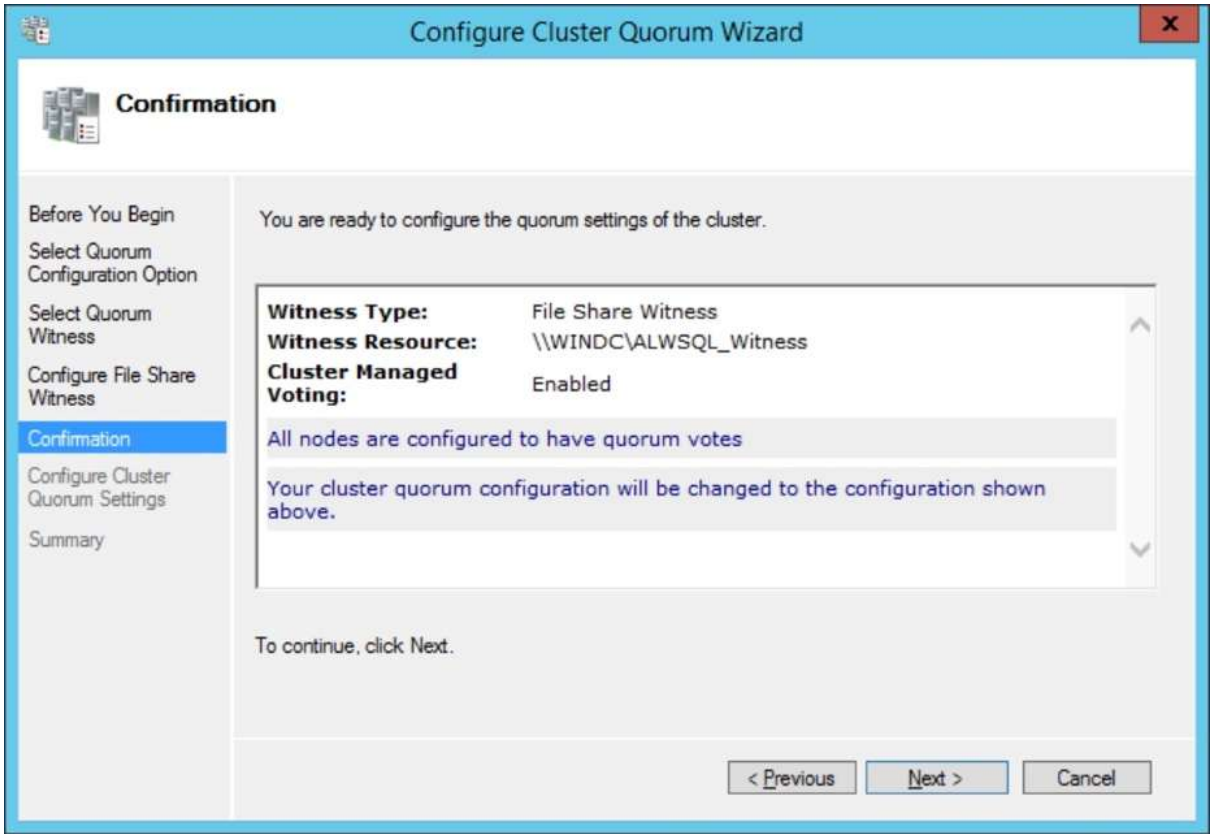
then click next to select the quorum witness window and choose configure a file share witness,



and specify network shared folder



Click Next to Configure, after completion, it will display a confirmation window



Click Next to configure Cluster Quorum Settings

SQL 2014 Installation and Configuration

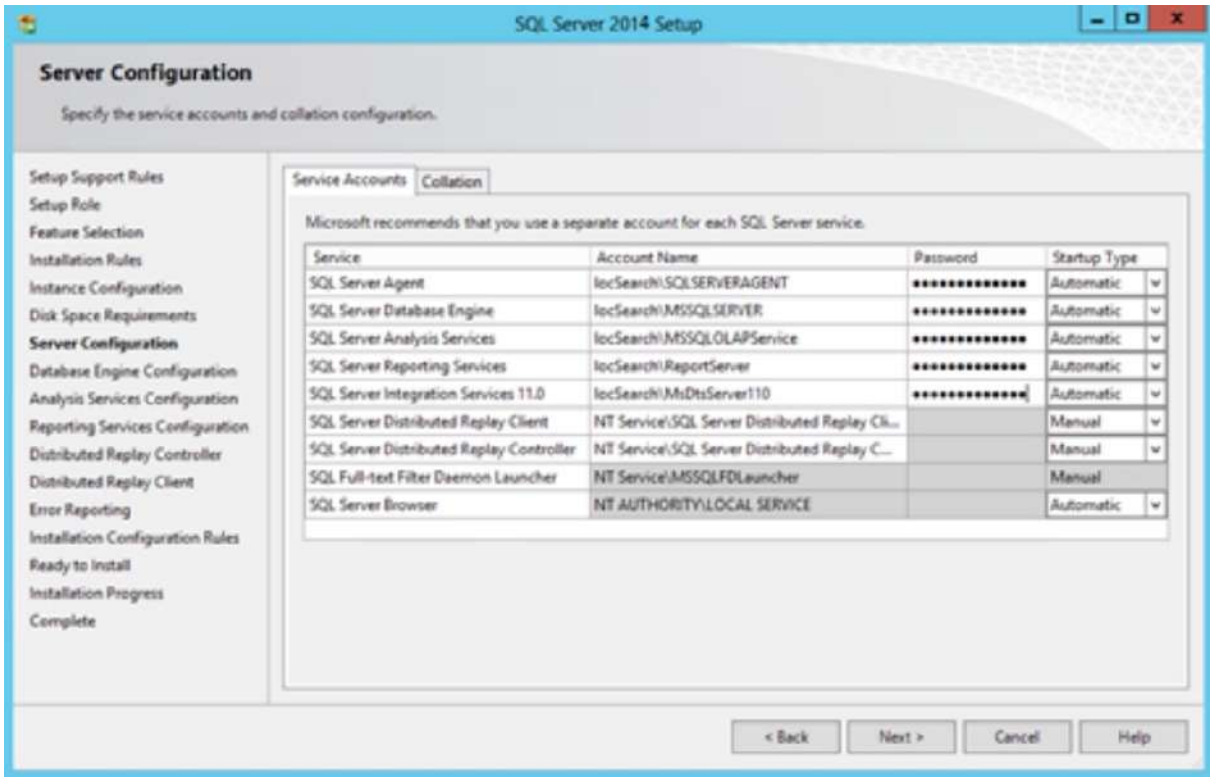
Please refer to our standard SQL Server Installation guide. In addition, there are a few steps that are explained here to configure AlwaysOn.

Start Installation using the Service Account specified in the initial infrastructure planning section.

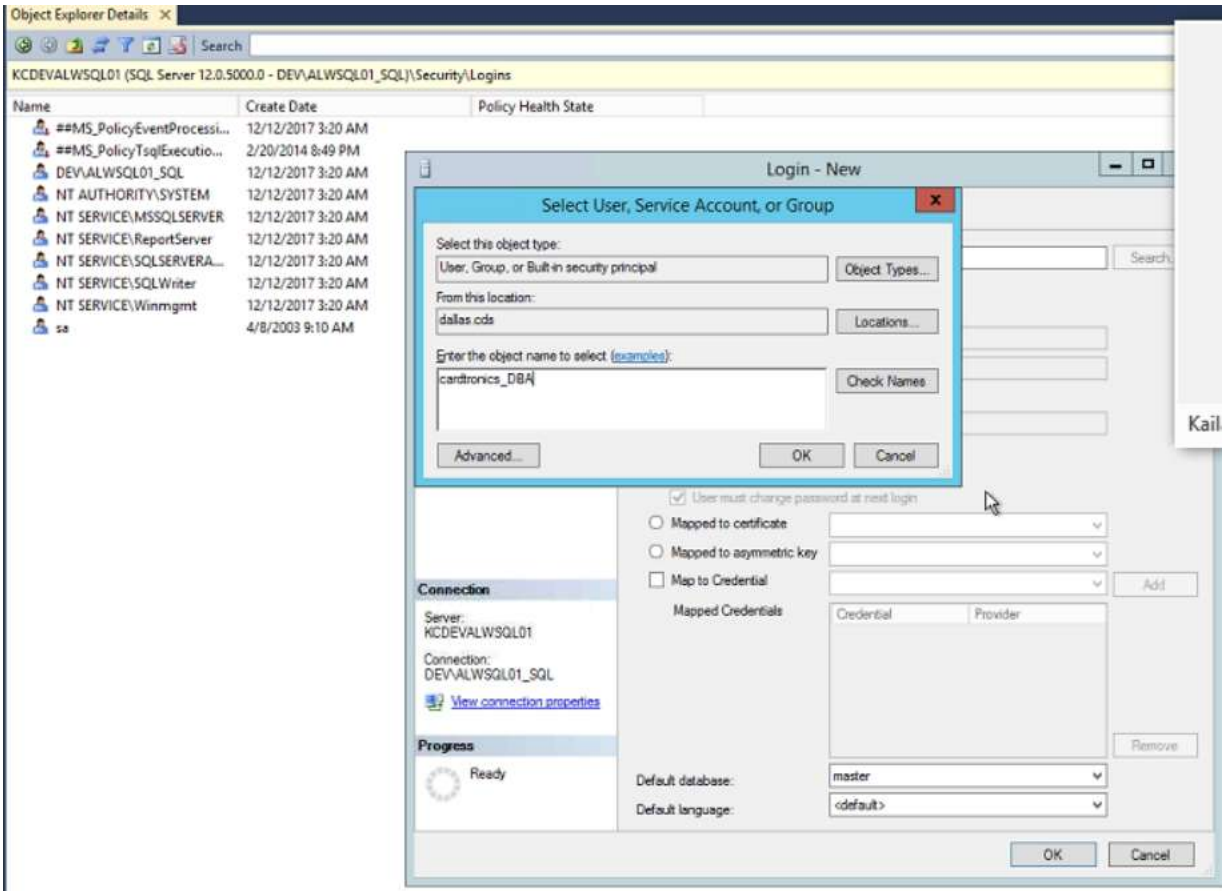
1. Start SQL Server 2014 Installation Setup – choose to Install SQL Server Standalone instances

2. The rest of the steps remained the same as per our standard SQL server installation guide. available on network location M:\Collaboration\Sharing\Operations\ApplicationsAndDatabases\DatabaseDocuments\

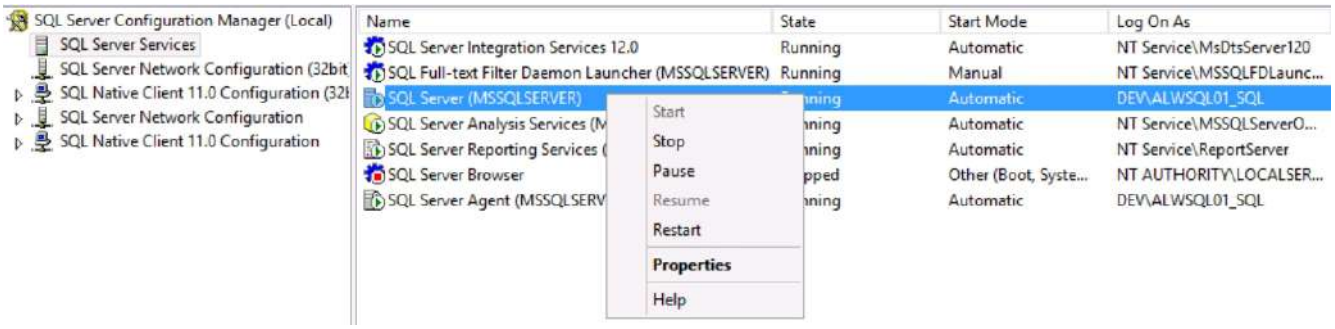
3. Choose the default Instance, and with the Server Configuration step – specify the service account and password for the server configuration step and set the Startup Type of SQL Agent service to Automatic as it is by default 'Manual'.



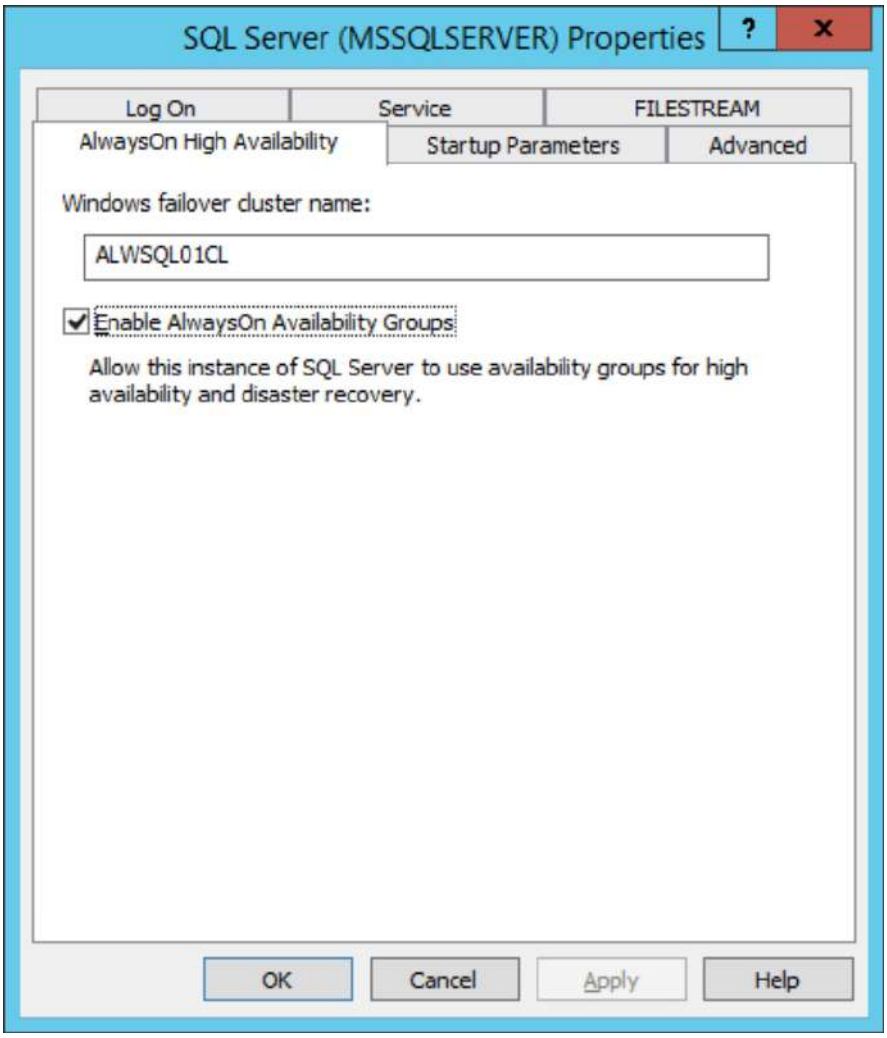
4. With Database Engine Configuration add SQL Server Administration – user group DALLAS\Cardtronics_DBA or
5. After completion of SQL server installation, and server restart, start SQL Server Management Studio and log in.
6. In SQL Server Object Explorer, expand Instance node → Security → Login, then add a new login "DALLAS\Cardtronics_DBA" with sysadmin server roles.



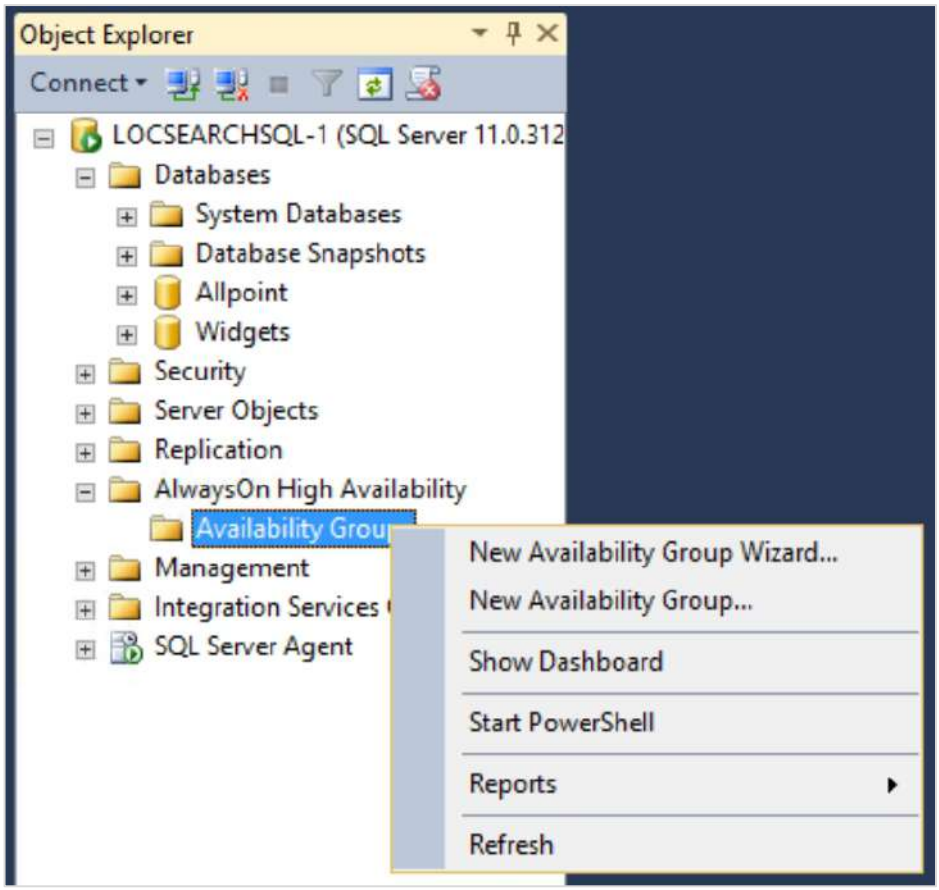
7. Start SQL Server 2014 Configuration Manager → SQL server services → SQL Server (MSSQLSERVER) Properties



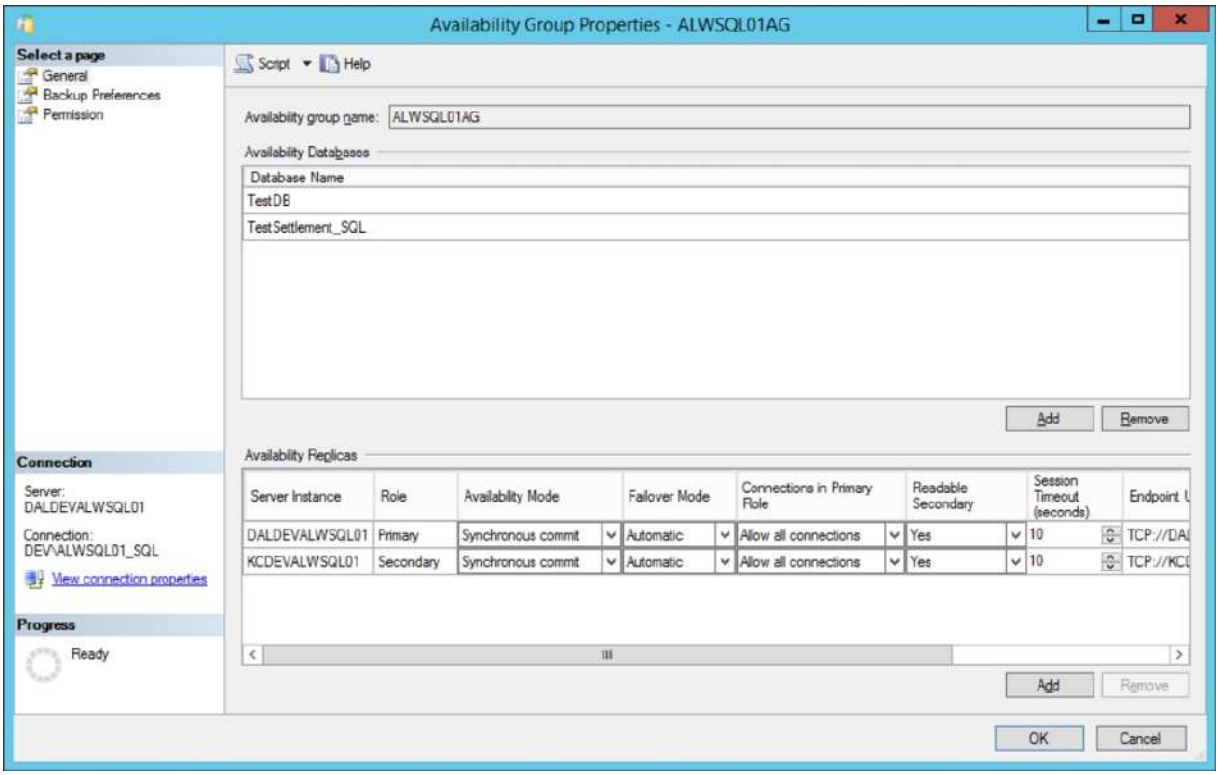
8. Select SQL server service – in properties – enable AlwaysOn High Availability groups and restart the server



9. You can repeat the above installation and configuration steps for the rest of AlwaysOn Instances.
10. Start SQL Server Management Studio and log in.
11. Right-click on Databases → restore the database.
12. Make sure that the database recovery mode is full and the compatibility level is SQL Server 2012 (110) / SQL Server 2014 (120).
13. Take full backup on network shared folder location \\DALDEVAPPSQL01\AWLSQL01_Witness
14. Now will start to configure the Always on Availability group wizard.

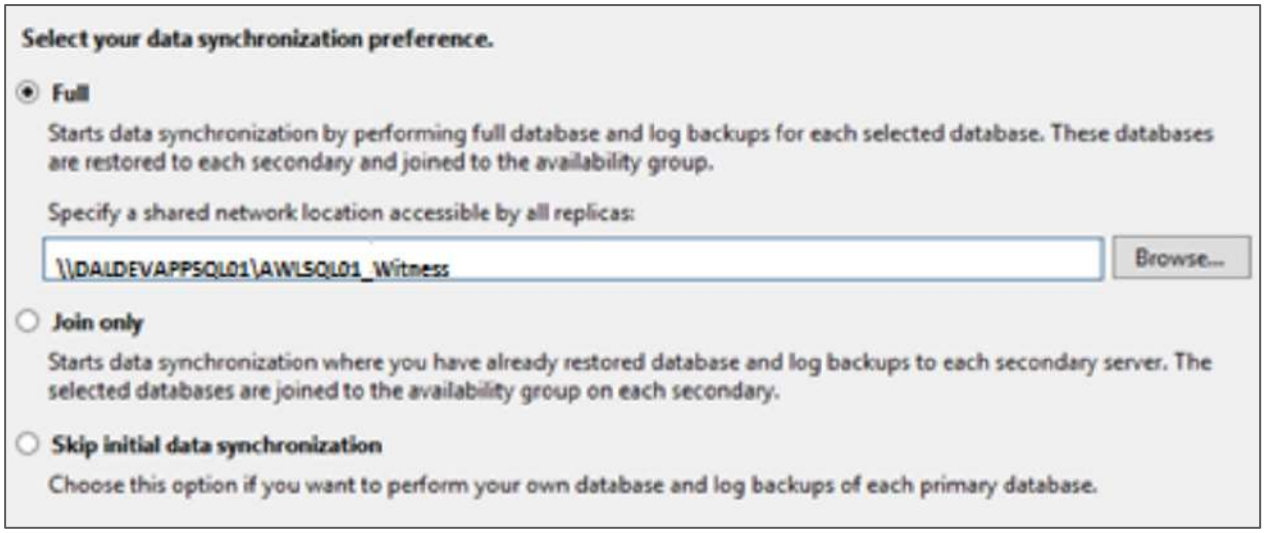


15. Click on the new availability group wizard, and specify the below details within the wizard
    - Availability group Name: ALWSQL01AG
    - Specify Replica: DALDEVALWSQL01, KCDEVALWSQL01
16. In the Select Databases page, select the checkbox beside the database that you want to include in the Availability Group. The databases have to be in a Full recovery model before joining them in the Availability group. Click Next.
17. In Specify Replica, you can add a replicas button and connect to the SQL instances that you joined as nodes in your WSFC
    - Specify Replica: DALDEVALWSQL01, KCDEVALWSQL01
18. Set to automatic failover and synchronous commit instance, and readable secondary – Yes.

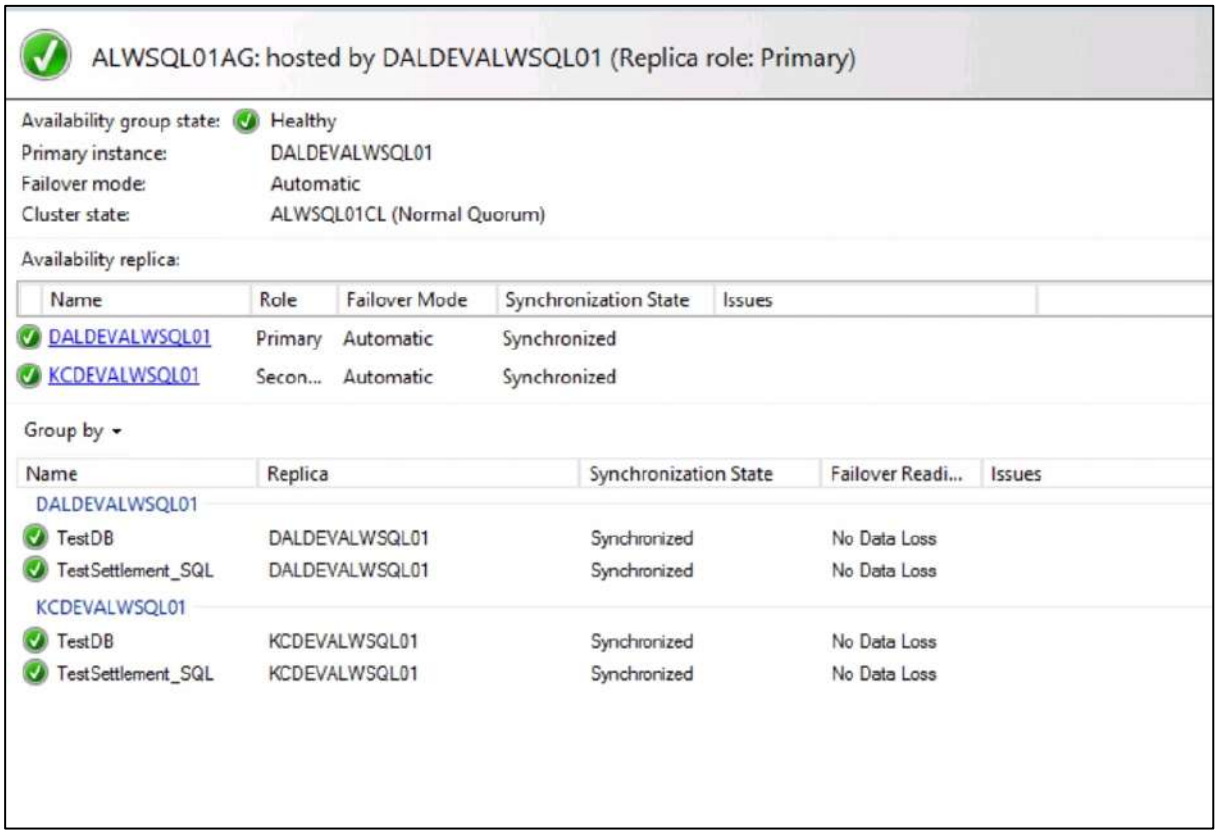


19. Make sure that you do not choose to specify a listener as shown below, we need to create a listener separately

20. And set network location for data synchronization. Here is the specified folder name which is planned for Backup and log file purposes - \\DALDEVAPPSQL01\AWLSQL01_Witness

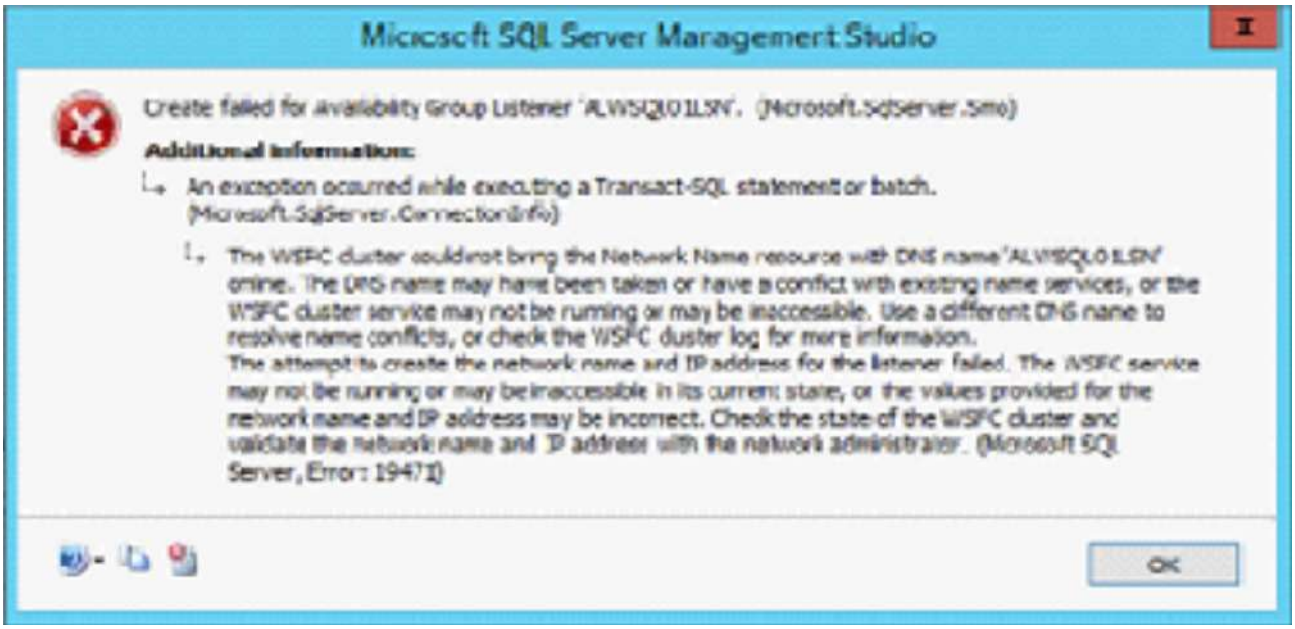


21. This process will take a few minutes to complete, it depends on database size. Once it's completed successfully, you will see the AlwaysOn dashboard of the primary instance as shown below

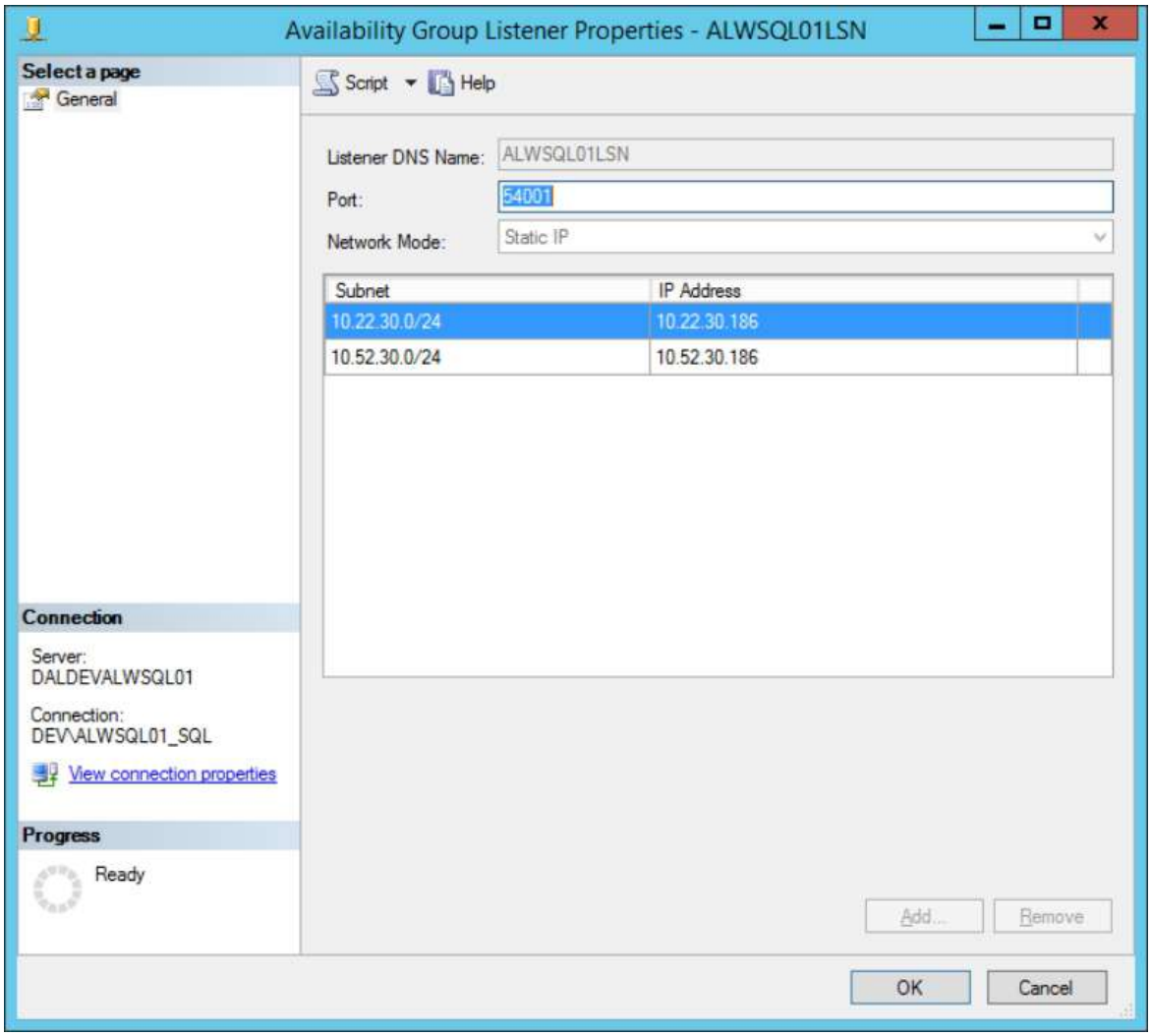


22. Before starting to create a listener, make sure you contact to CDS Administrator to set security access from this URL https://blogs.msdn.microsoft.com/alwaysonpro/2014/03/25/create-listener-fails-with-message-the-wsfc-cluster-could-not-bring-the-network-name-resource-online/

For the CDS environment – **Domain Administrator/Jeremy Hoch need to perform all these steps.** This listener creation step creates internal AD objects in the Active Directory.
If you skip this step there is the possibility that you will get the below error.



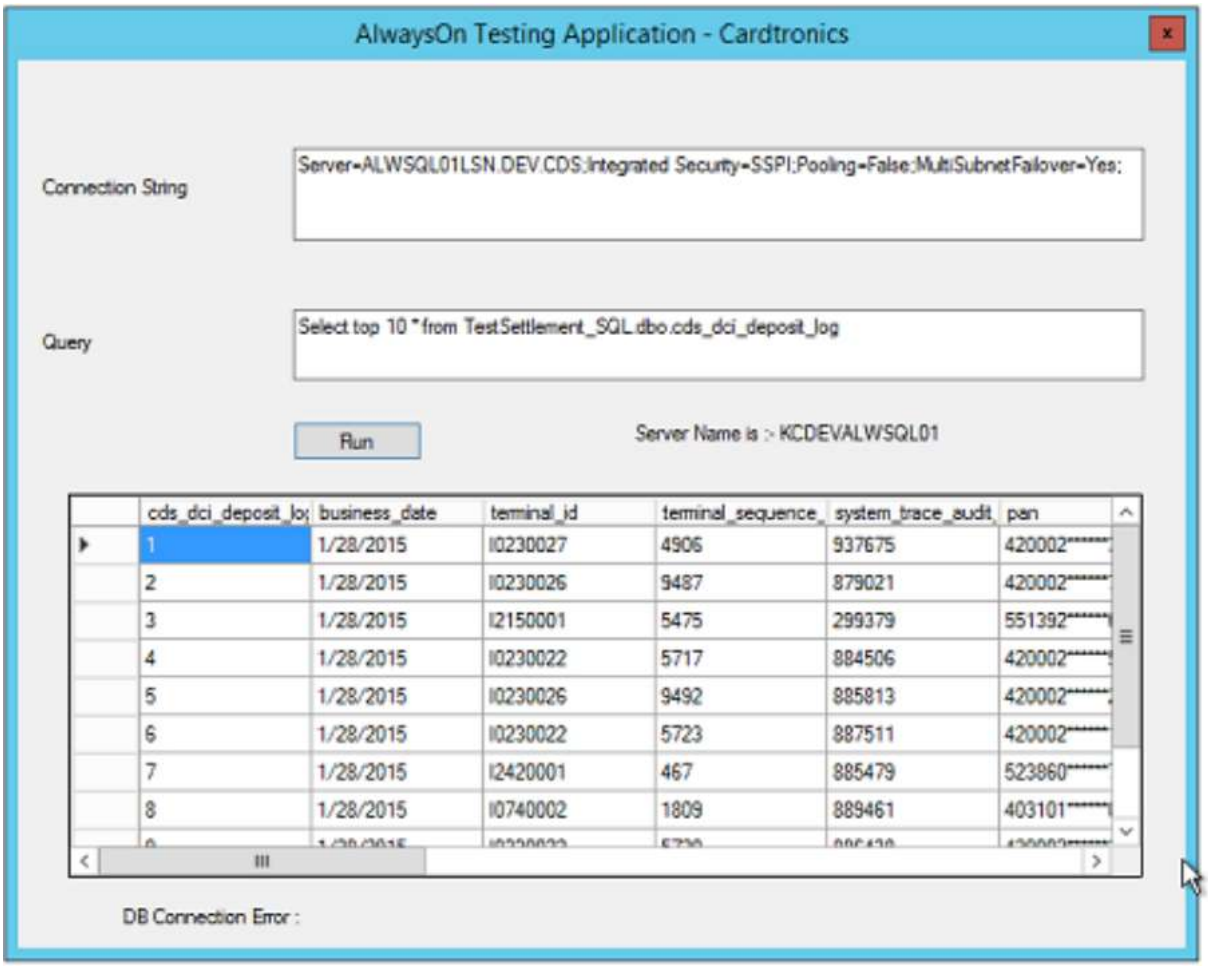
23. In SQL server SSMS → AlwaysOn High Availability → Availability Group → ALWSQL01AG (AG group) → Availability group Listeners → Add Listener
    - Listener Name: ALWSQL01LSN
    - Listener Port: 54001
    - Listener IP: 10.22.30.186, 10.52.30.186 to their appropriate subnet as shown below



Testing of AlwaysOn Feature

The test application is developed in .net keep in mind that to simplify developers' lives to understand connection strings and the rest of all scenarios

1. Run the Test application and change the connection string accordingly.



2. Perform failover manually and again test this application, refer to Planned manual failover steps in Appendix

3. The sample connection string for the Read/write operation will be

   Primary Instance Connectivity Connection Strings
   Server=ALWSQL01LSN.DEV.CDS;Database=TestDB;Integrated Security=SSPI; Pooling=False; MultiSubnetFailover=Yes;
   If multiple database access is required then in that case do not specify the database name in the connection string
   Server=ALWSQL01LSN.DEV.CDS;Integrated Security=SSPI;Pooling=False;MultiSubnetFailover=Yes;
   And such scenarios make sure to use full (FQDN format) in queries
   select top 10 * from [TestDB].[dbo].[cds_alert_message]

   Read only Reporting Connection
   Server=ALWSQL01LSN.DEV.CDS;Integrated Security=SSPI;Pooling=False; MultiSubnetFailover=Yes;ApplicationIntent=ReadOnly

APPENDIX

Acronyms

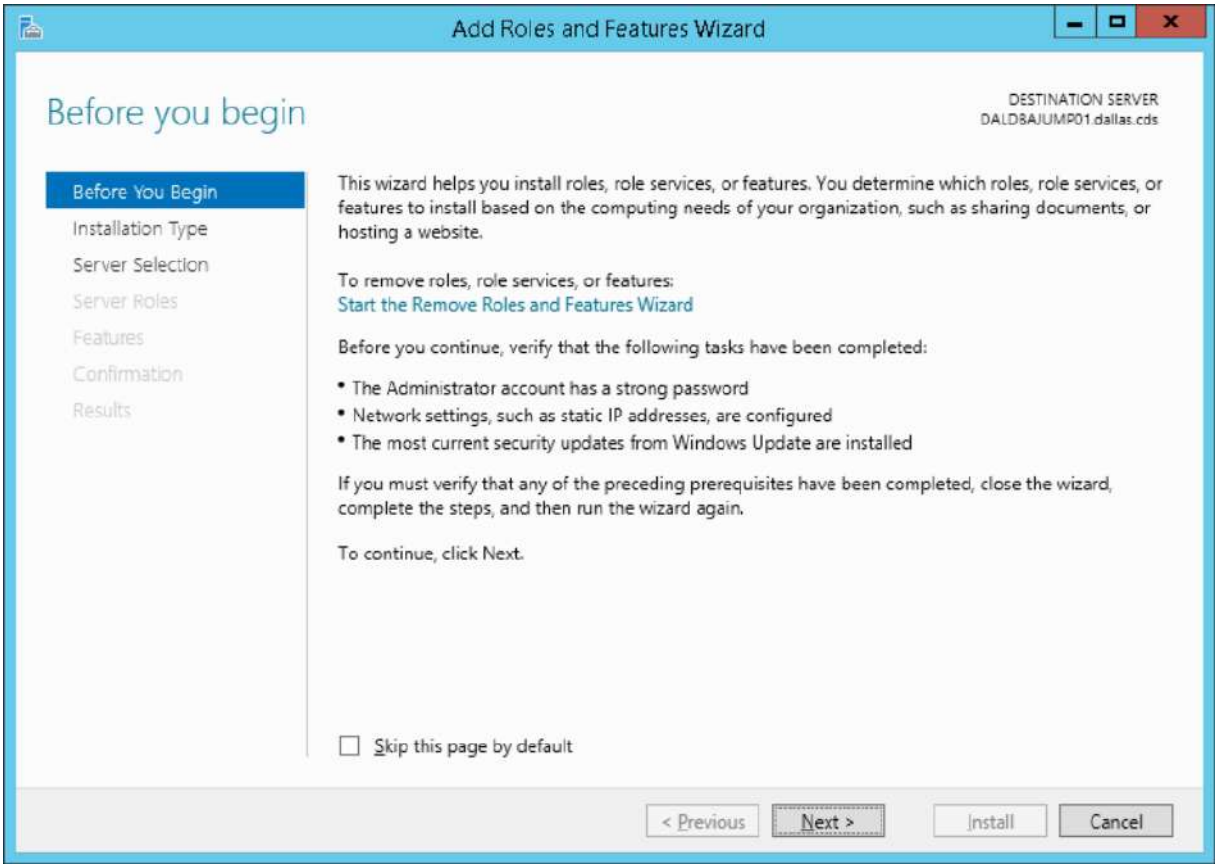
Acronyms	Description
AG	Availability Group
FCM	Failover Cluster Manager
HADR	High availability and Disaster Recovery
SSMS	SQL Server Management Studio
WSFC	Windows Server Failover Cluster

WINDOWS FEATURES INSTALLATION

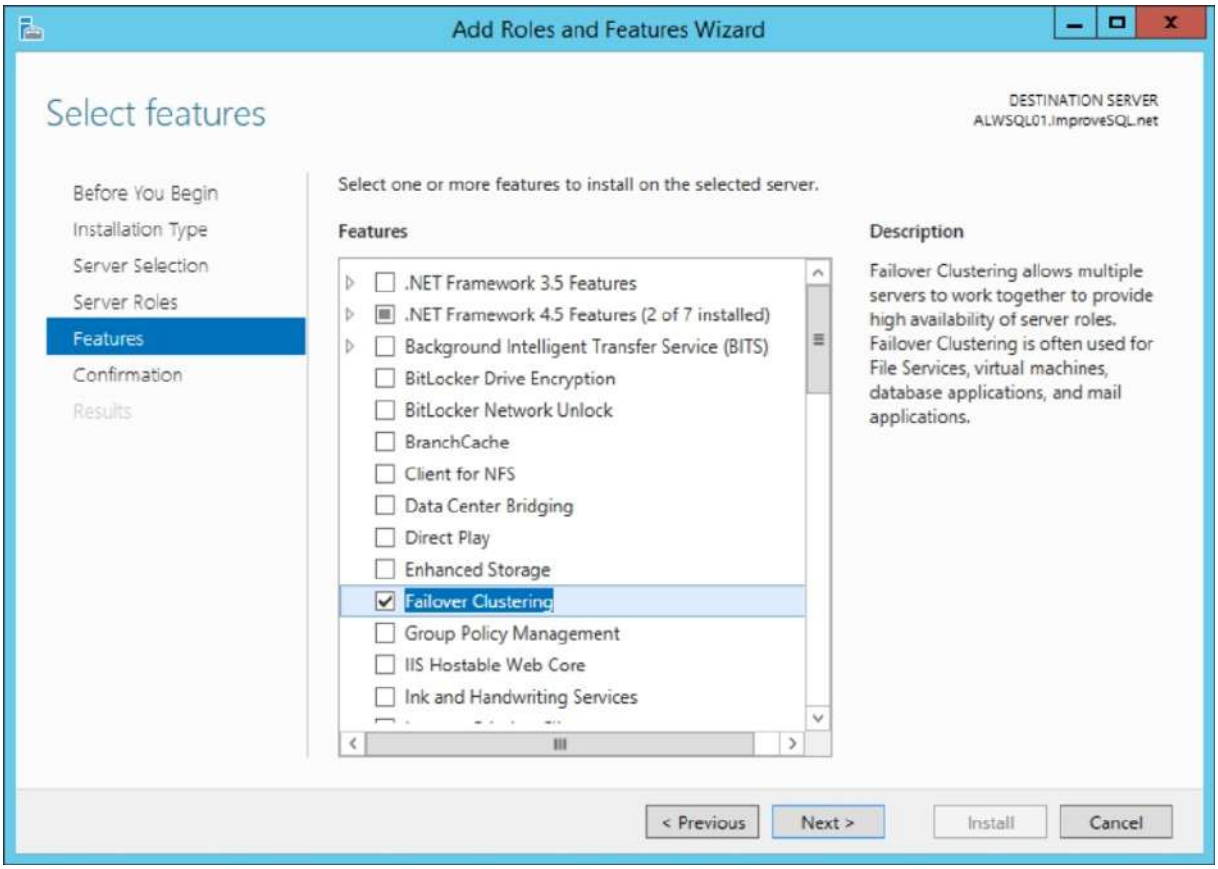
Windows Failover Cluster Manager Installation

1. To start the failover clustering manager installation– connect through a remote desktop using the service account (ImproveSQL.net\srvAcctAlwaysOn) / DBA regular login which has local Administration rights.

2. GUI Steps: Server Manager → Dashboard → Add Roles and Features



Next → choose Role-based or feature-based installation, Next → select server, Next → It will display the Server Roles window (do not select anything here), Next → Features List, select Failover Clustering and Next → Finish.



3. Or you can use Powershell Steps: Run Powershell command prompt as Administrator and execute the below script to install the active directory

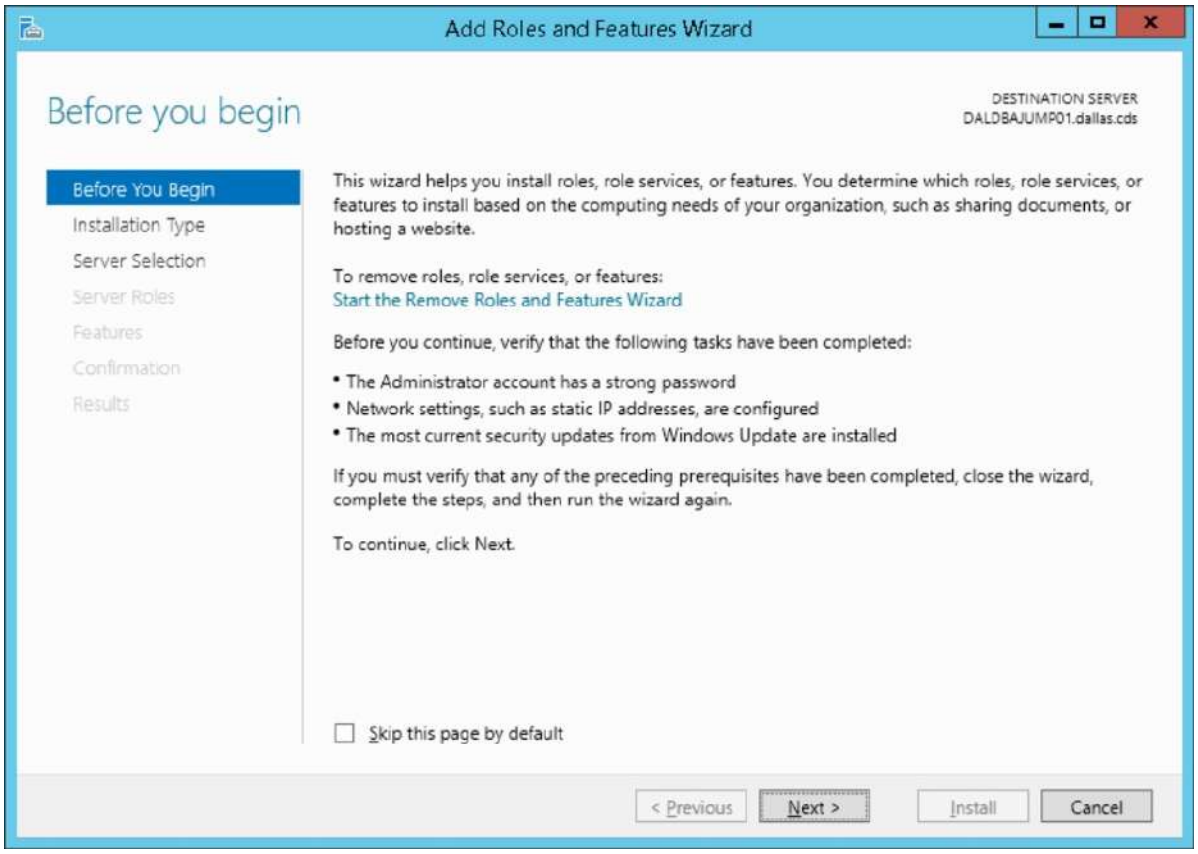
```
PS C:\> Set-ExecutionPolicy Unrestricted
PS C:\> Import-Module ServerManager
PS C:\> Get-WindowsFeature  Failover-Clustering | Install-WindowsFeature
```

Note: You need to repeat the same installation steps 1 to 3 on other VM machines.

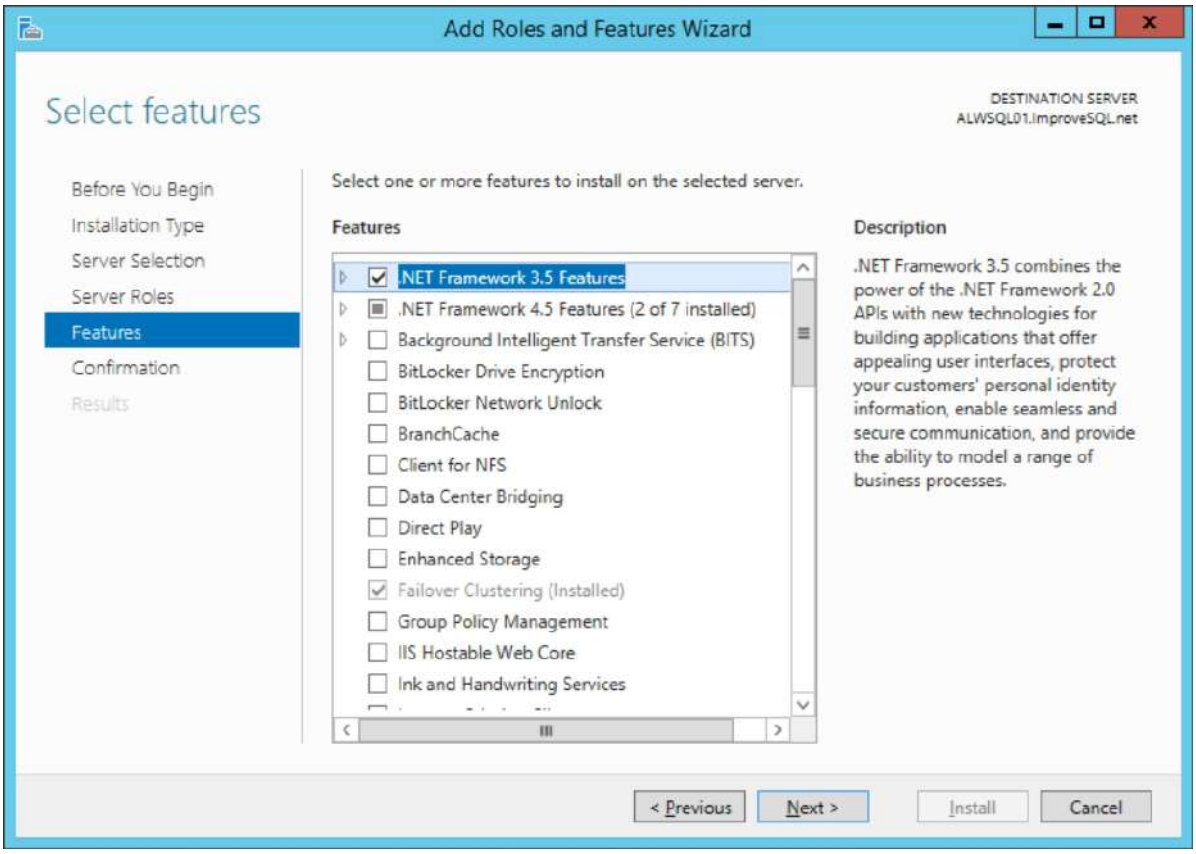
.Net Framework 3.5 Feature Installation

1. To start .Net Framework 3.5 features installation– connect through remote desktop using service account / DBA regular login which has local Administration rights.

2. GUI Steps : Server Manager → Dashboard → Add Roles and Features



3. Next → choose Role-based or feature based installation, Next → select server, Next → It will display Server Roles window (do not select anything here), Next → Features List, select .Ne Framework 3.5 Features and Next → Do not forget to specify alternate path of OS Installation (i.e. C:\IT_LIBRARY\Win2012R2DC\sources) → Finish.



4. Or you can use Powershell Steps : Run Powershell command prompt as Administrator and execute below script to install active directory

```
PS C:\> Set-ExecutionPolicy Unrestricted
PS C:\> Import-Module ServerManager
PS C:\> Get-WindowsFeature NET-Framework-Features | Install-WindowsFeature
```

Note: You need to repeat same installation steps 1 to 3 on all other VM machines.

Planned Manual Failover Steps

❖ Using SSMS

1. Connect to SSMS object explorer – Expand the **AlwaysOn High Availability** node and the **Availability Group** node

2. Right-click on availability group **ALWSQL01AG** to be failed over, and select **Failover**

3. The Failover Availability Group wizard starts before you choose the secondary replica that will become the new primary replica whose Failover Readiness value is "No data loss"

4. On the Connect to Replica page, Next → to see the summary and affected databases & click Finish.

❖ Using Transact-SQL

1. Connect to the server instance that hosts the target secondary replica
2. Use below script

```
ALTER AVAILABILITY GROUP alwsql01ag FAILOVER
```