AAE Control Room 10 LTS

Failover Cluster Configuration Guide

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Table of Contents

1 INTRODUCTION

This document provides introduction to Microsoft failover cluster technology, configuration overview and configuration guide to:

- Automation Anywhere Web Socket Server Service
- Subversion Server
- Microsoft SQL Server

2 ACRONYMS AND TERMINOLOGY

MSFC	Microsoft Failover Cluster
LB	Load Balancer
SCSI	Small Computer System Interface
iSCSI	Internet Small Computer System Interface
DO	Domain Object
AD	Active Directory
DC	Domain Controller
CSV	Cluster Shared Volume
HA	High Availability
DAS	Direct Attached Storage
SAN	Storage Area Network
Failover	A procedure by which a system automatically transfers control to a duplicate system when it detects a fault or failure.
Failback	A process of restoring operations to a primary machine or facility after they have been shifted to a secondary machine or facility during failover. During a site-wide failover, I/O (input/output) and its processes are shifted from a primary location to a temporary disaster recovery (DR) location.
Node	Physical Host who is participating in Failover process.
Primary (Active) Node	Host (Node) which has access to all service and storage and actively serving.

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Secondary (Passive/Slave) Node	A Duplicate or replicate node of primary which is ideal to serve after failover.
Clustered Service	Generic Windows Service who is participating in failover/failback procedure.
Cluster Group (Role)	Group of clustered services which failovers together and dependent on each other.

3 OVERVIEW

Automation Anywhere's product is designed from scratch to be single-tenant, isolated, and self-contained within our customer's environment and therefore mitigates the risk of "cross-contamination" from an unlikely event of a security breach in another customer's network. In another words, we are an on premise product.

Due to the nature of the on premise approach, Automation Anywhere leverages our customers' existing Disaster Recovery (DR) and High Availability (HA) infrastructure. Therefore, we do not have our own customized solution for DR or HA. This approach allows us to configure the environment so that it easily integrates with existing DR or HA infrastructure, avoiding the need for our customers to change their existing process / solution. However, we do have recommendations:

1. What is High Availability (HA)?
   High Availability is a designed system that ensures continued content/database availability and maintains business service continuity. The purpose of HA is to protect business processes from any single points of failure.
   Threats to service availability include hardware and network failure, storage corruption, and unacceptable Mean Time To Recovery (MTTR) responses. Any interruption to routine processes potentially disrupts business operations.
   Protection options include many choices – cluster failovers, virtualization, mirroring, caching, etc. Businesses must have HA integrated into their systems.
   The HA policies must include a specified SLA (Service Level Agreement).
   Depending on the importance of the business processes, SLA can range from 90% to 99.999%.

2. What is Disaster Recovery (DR)?
   A disaster is defined as a catastrophic interruption of business processes. A disaster might be a local event – for example, power failure to the company's data servers. Of greater consequence would be regional disasters – for example, weather (flooding, tornados, etc.) that take down communication services over a large area.
   The Disaster Recovery process requires a much more robust system response process. The company's DR policies must include recovery situations from the common foreseeable events to the uncommon but possible catastrophes.

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4   LOAD BALANCING

4.1   OVERVIEW

Since "productivity" is essential part of our product, optimal system performance is extremely important to us. Hence, our system is designed to be flexible to handle large number of requests. Our web-tier is designed such that it can scale horizontally. In another words, there can be multiple web servers handling requests (load) simultaneously. Our approach is to balance the load among several webservers so that the load could be balanced across multiple physical boxes.

4.2   LOAD BALANCING ARCHITECTURE

The Server Control Room (CR) is a web-based application responsible for Management and Control of all Bot Development and Operations.   The Control Room executes on MS Internet Information Services (IIS) 8 or later in Windows Server 2012 R2. The IIS hosts the application layer including licenses, Version Control System (VCS), and other function calls.

Network load balancing is achieved by running multiple instances of the CR, each in its own IIS web server and a load balancer in front of it handling web requests. The Load Balancer can either be an external appliance (such as an F5 load balancer) or you can use the built-in Microsoft Network Load Balancer (NLB) available on Server 2012. With NLB, the IIS Servers in the cluster also acts as the Load Balancer.

The IIS instances access a separate physical box containing shared services (that may be customer-specific), Web Socket Services, a shared MSSQL database, and the CR license manager.

4.3   MICROSOFT WINDOWS CLUSTERING

By using a failover cluster, you can ensure that users have nearly constant access to important server-based resources. A failover cluster is a set of independent computers that work together to increase the availability of services and applications. The clustered servers (called nodes) are connected by physical cables and by software. If one of the nodes fails, another node begins to provide service through a process known as failover.

Failover cluster provides single point of access to end users so that when cluster resources fail over to secondary node, end user doesn't require to change any configuration from his end. This single point of contact is a Virtual IP that represents Name of the cluster. This IP is not associate with any physical machine but just represents an entry in the Domain name list which is used by Domain Controller and Failover Clustering services together to divert traffic to Physical Failover cluster ACTIVE node. Following is the High Level component diagram of the same.
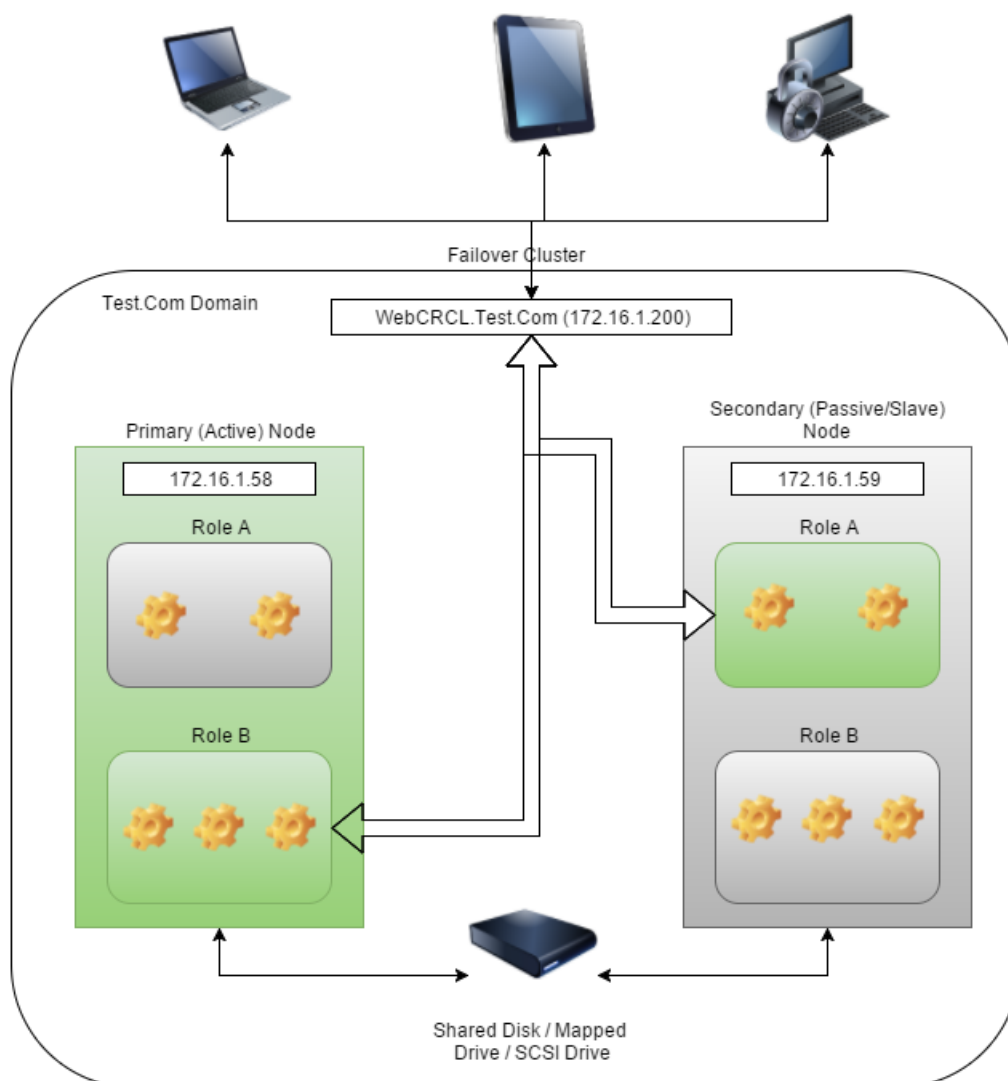
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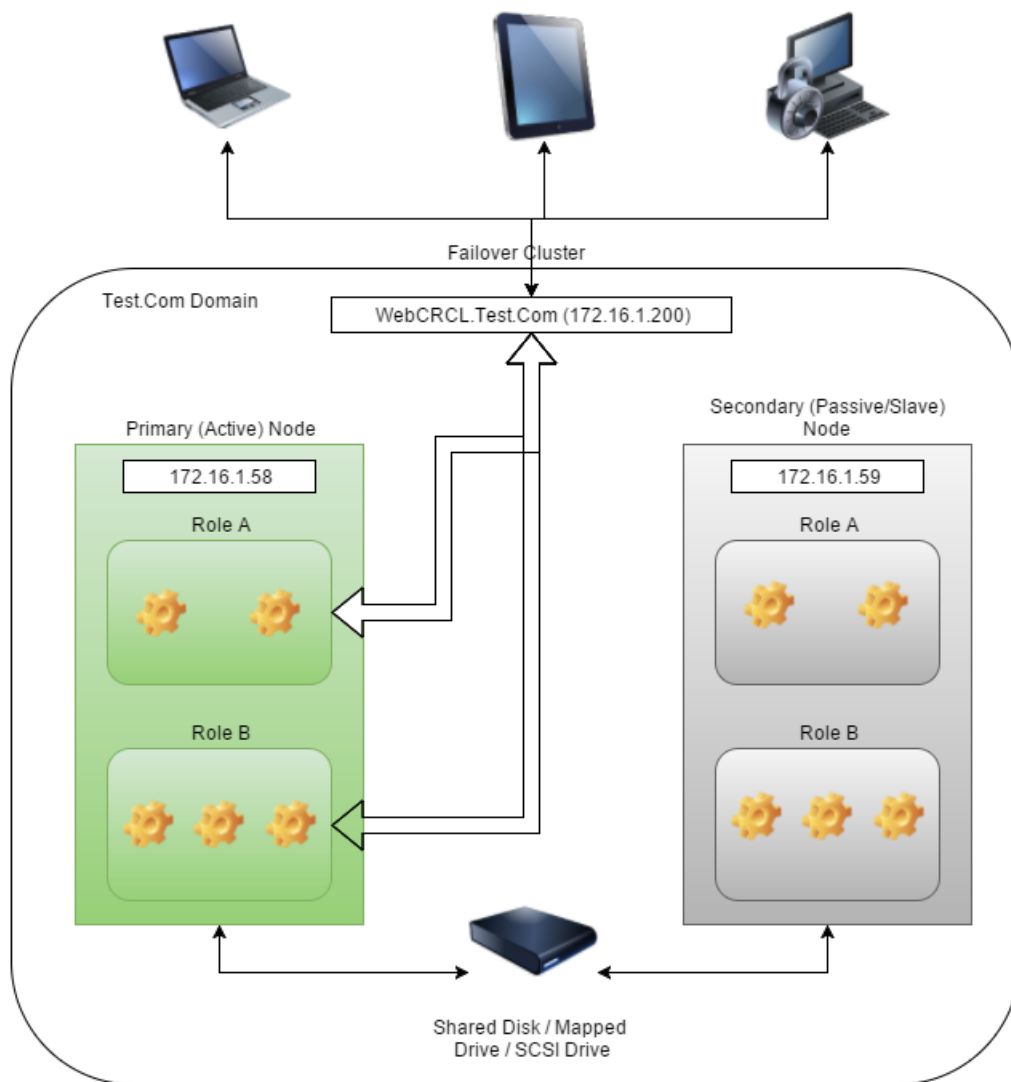
Figure 4.1

Figure 3-1 represents the two node failover cluster. Complete environment is setup in Test.Com domain.

- **WebCRCL** is the name of the cluster which is associated with Virtual IP (I.e. 172.16.1.200).

- Two roles (Groups) have been created which contains set of services. Role to Service(s) relationship can be One to One or One to Many i.e. one Role can have one service or many services.

- Figure 3-1 represents normal scenario where all the services in both the roles are working fine. Traffic is being diverted to Node 1 in normal way.

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Figure 4.2

- Figure 3-2 represents failover scenario. One of the service in Role A (let's say Service 1) faces some issue serving the request and crashes. It stops the service (Windows Service state changes from Running to Stopped). As soon as goes to Stopped state, failover happens and all the service in Role A goes offline and comes online in Secondary Node. The requests to that particular service(s) will now be diverted to Node 2.

  - In both the scenario end user don't need to take any action and after **an X* minute downtime** the service will be available to serve again from Node 2.

    * X minutes downtime depends on the configuration administrator selects. These are the number of restart attempts he configures before failing over while configuring Role, number of failover allowed in particular hours and failback configuration.

  Refer the section on Configuring Distributed Components… for details of configuration administrator can perform on Cluster Role to configure restart attempts and failback.

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5 WEB CONTROL DISTRIBUTED ARCHITECTURE

5.1 TWO TIER ARCHITECTURE WITH LOAD BALANCER

Figure 5.1

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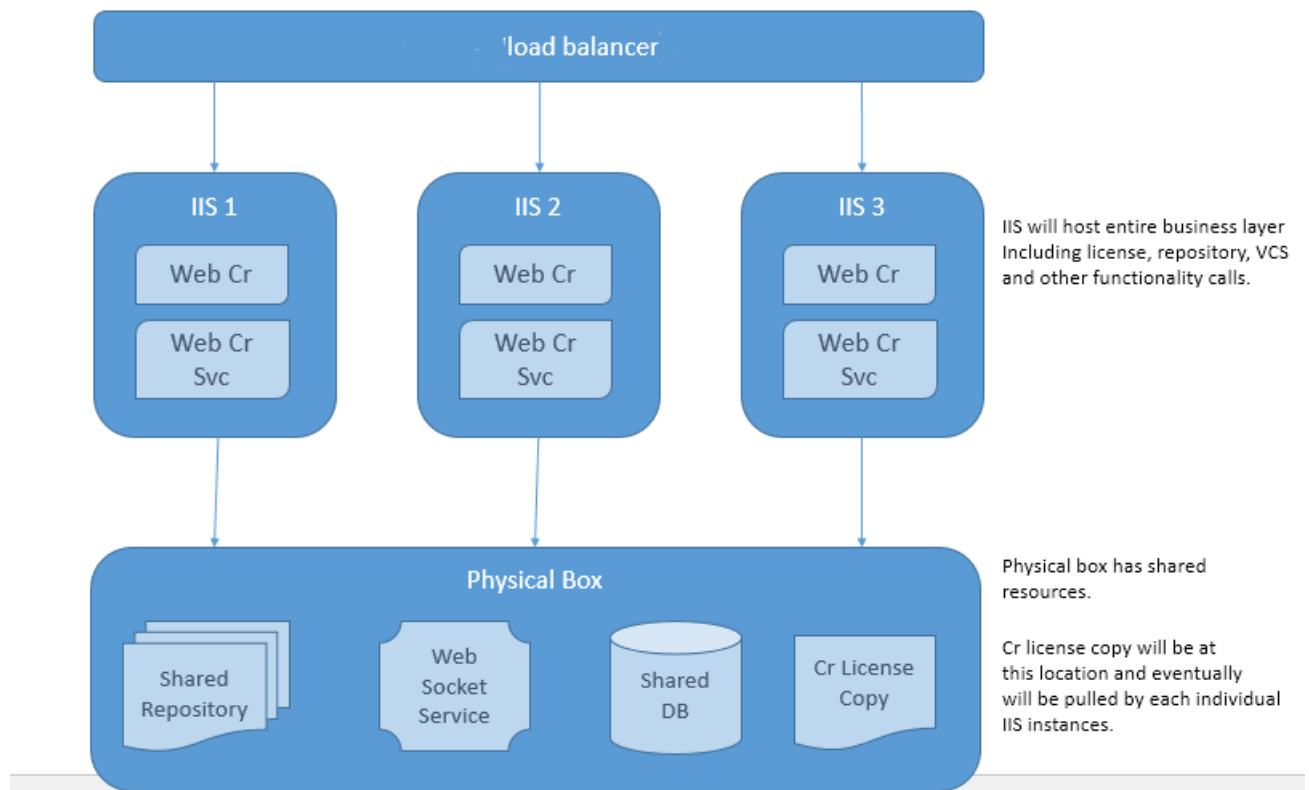
5.2 TWO TIER ARCHITECTURE WITH LOAD BALANCER AND HIGH AVAILABILITY WITH FAILOVER CLUSTER
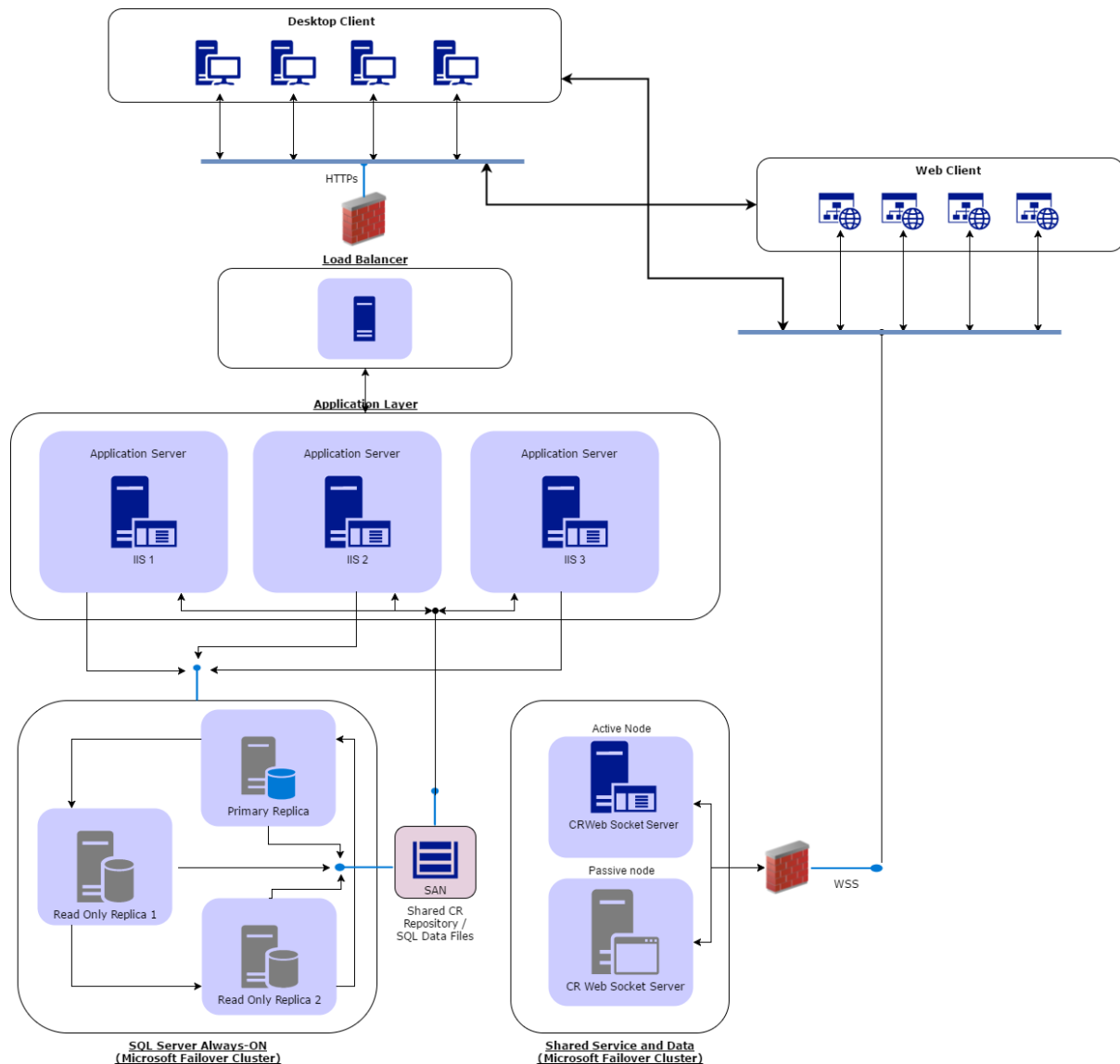
Figure 5.2

6   UNDERSTANDING REQUIREMENT OF SAN

It is highly recommended to utilize the SAN for storing the shared data. SAN provides good scalability, performance and data isolation over NAS. Web Control Room has following components required a shared location,

- Repository
- Microsoft SQL Server 2012 and higher
- Subversion Repository

Apart from above benefits, SAN also provides, high uptime, workload isolation, long distance connectivity, centralized management, and disaster recovery.

7   EVALUATING THE BENEFITS OF CLUSTERING

A cluster is two or more computers working together to provide higher availability, reliability, and scalability than can be obtained by using a single system. When failure occurs in a cluster, resources are redirected and the workload is redistributed. Microsoft cluster technologies guard against three specific types of failure:

- Application and service failures, which affect application software and essential services.
- System and hardware failures, which affect hardware components such as CPUs, drives, memory, network adapters, and power supplies.
- Site failures in multisite organizations, which can be caused by natural disasters, power outages, or connectivity outages.

If one server in a cluster stops working, a process called failover automatically shifts the workload of the failed server to another server in the cluster. Failover ensures continuous availability of applications and data.

This ability to handle failure allows clusters to meet two requirements that are typical in most data centre environments:

1. **High availability**. The ability to provide end users with access to a service for a high percentage of time while reducing unscheduled outages.
2. **High reliability.** The ability to reduce the frequency of system failure.

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8 HOW TO CONFIGURE FAILOVER CLUSTER

Pre-requisite: Make sure both the nodes have latest windows update installed and no restart pending.

Note: User is required to have rights to create DO (Domain Object) in the AD (Active Directory). Please make sure to use suitable user permission or consult your Domain Administrator to provide particular access rights to create Failover Cluster object.

1. Open Server Manager Console and navigate to "Add Roles and Features" in Manage from Local Server.
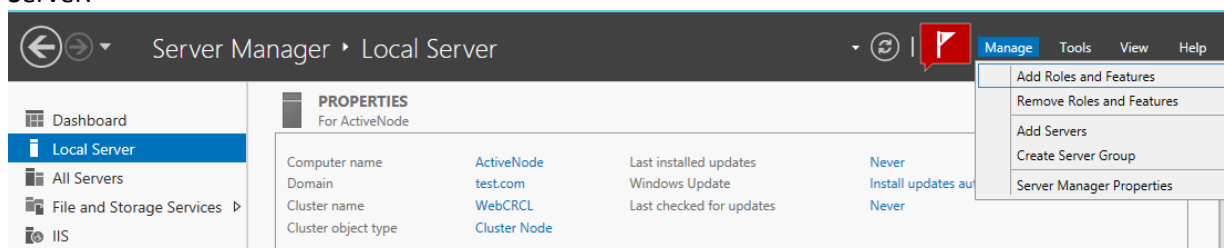
2. Select Default option selected to install on current machine.
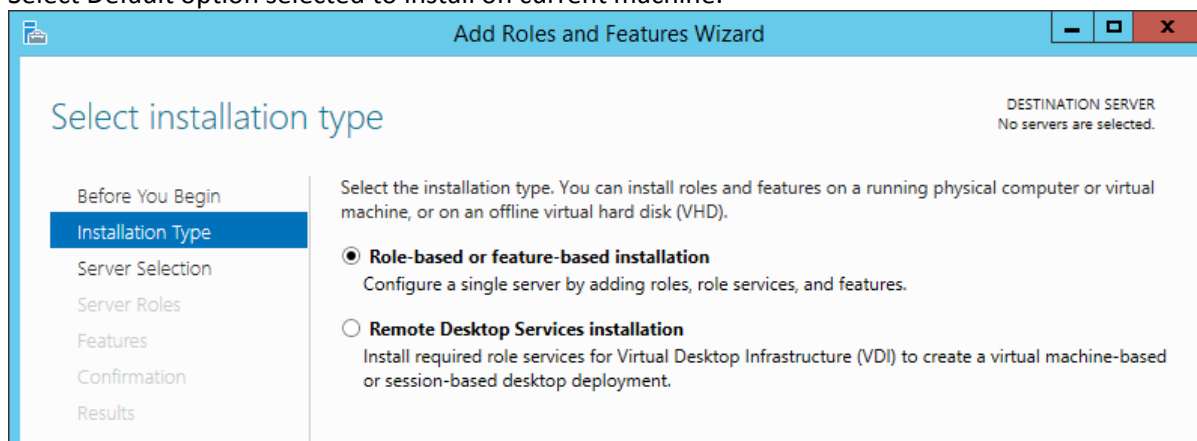
3. Keep "Select a server from the server pool" selected. If you have multiple server in cluster group selected already, you will see multiple options in the below window.

   Note: The Server pool name is an example. It will be different and based on Machine name configured for particular node. (The image shown below mentions the Conteso-N1. Conteso.local which is taken as an example. The actual name will be different based on the name of the

computer given by administrator).

4. Click "Next" and select "Failover Clustering" option.

5. Click on "Add Features".

6. Click on "Install" and let installation finish. If it asks to restart, please do so.

7. Once installation completed, user will be able to see option in the Tools (or search from start menu) i.e. Failover Cluster Manager. Clicking the same will open below console.
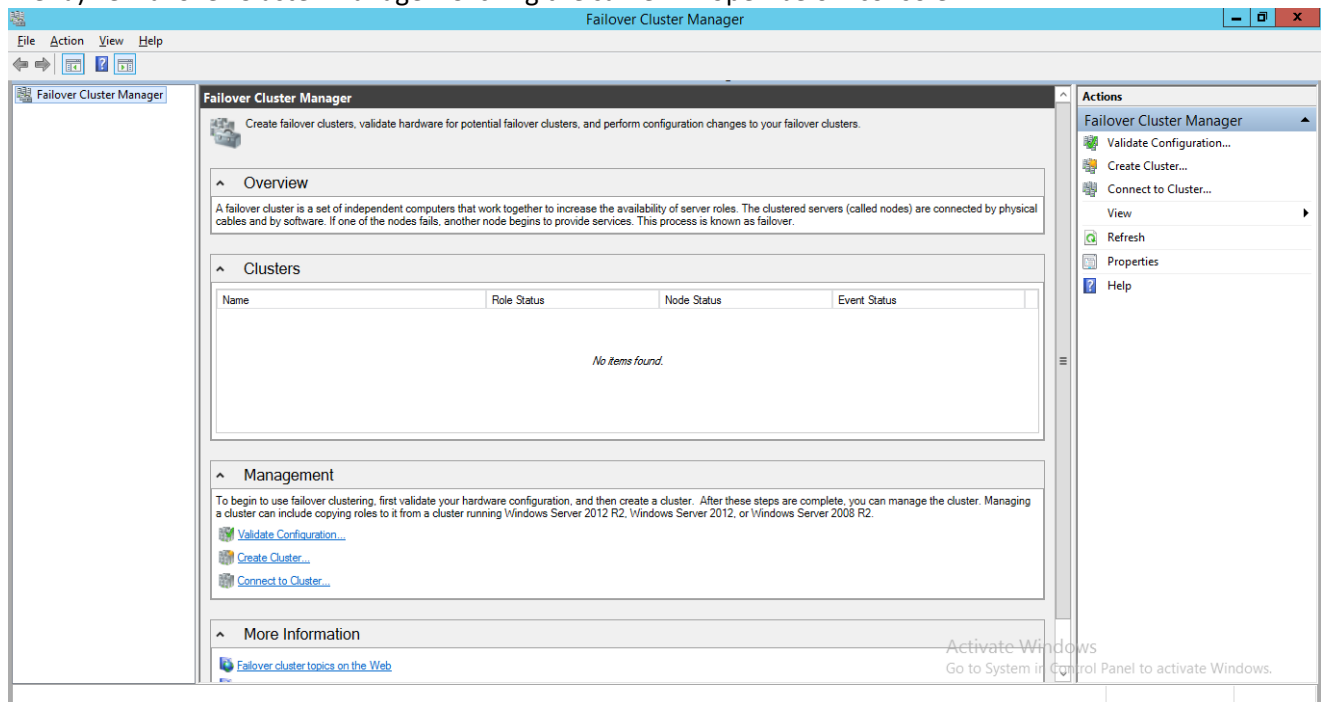
8. Perform the same steps for Node 2.

9   CREATING CLUSTER

Note: Please make sure to login as domain admin account to perform below steps.

1. Open Failover Cluster Manager Console and click on "Create Cluster" link. Type the name/IP of
    the hosts whom you want to participate in clustering. Click on Add button to add them.

2. Click "Next" and provide a valid cluster name. Please make sure there don't exist any physical
    machine or domain object with the same name in the domain. Select the IP address from the
    available range.

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3. Click "Next" and validate the configuration. If cluster hosts are missing any configuration or update, the validation report will show as an error.
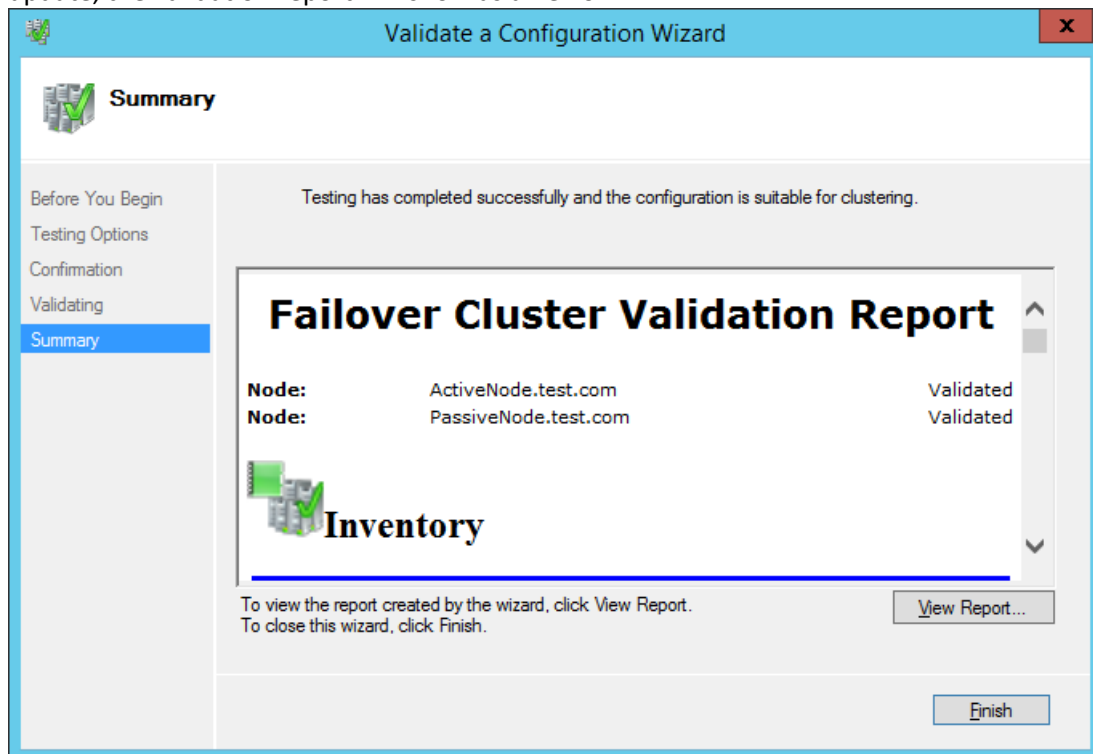
4. Click "Finish" and it will navigate to "Create Cluster" Dialog. Click "Next" and it will create cluster with provided configuration.

5. Once created, cluster configuration and other details will be available in the Failover Cluster Manager console as shown in the image below.

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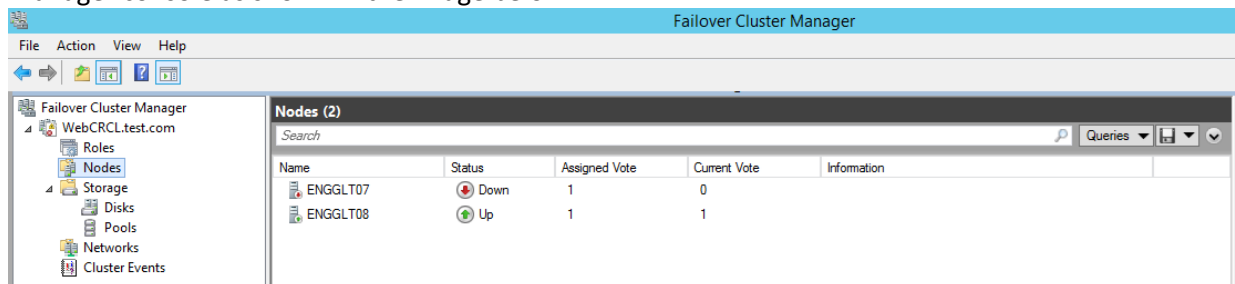
10 CREATING A SQL SERVER 2012 ALWAYSON AVAILABILITY GROUP
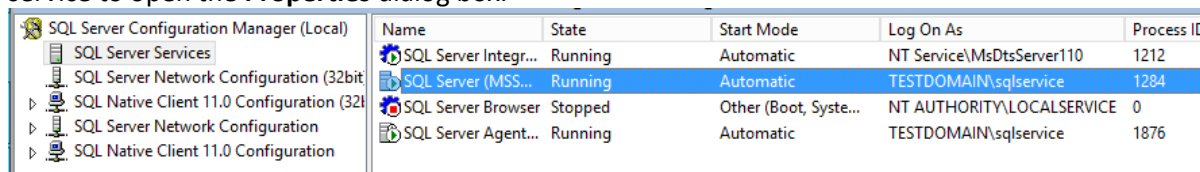
10.1 PREREQUISITES

- **Windows Server Failover Cluster (WSFC)**. AlwaysOn Availability Groups rely on the Windows Server Failover Cluster for failure detection and management of the Availability Group replicas.

- **Download SQL Server 2012 Enterprise Edition**. AlwaysOn Availability Group is an Enterprise Edition feature.

- **Same SQL Server collation for all replicas**. It is recommended not running databases with different collation requirements in the same SQL Server instance due to potential issues caused by applications using temporary tables.
  This is one of the reasons for keeping the database collation the same for a single instance (SharePoint 2013 also requires a specific collation for the content databases.) If you want to configure AlwaysOn Availability Groups for your databases, they should all be running the same collation on all of the SQL Server instances acting as replicas.

- **Two SQL Server Instances acting as replicas.** SQL Server instances that will be used as a standby for high availability and/or disaster recovery are called **replicas**. Two nodes to act as Active-Node and Passive-node with SQL Instance installed.

10.2 ENABLE SQL SERVER 2012 ALWAYSON AVAILABILITY GROUPS FEATURE

Once the Windows Server Failover Cluster has been created, we can now proceed with enabling the AlwaysOn Availability Groups feature in SQL Server 2012. This needs to be done on all of the SQL Server instances that you will configure as replicas in your Availability Group. To enable the SQL Server 2012 AlwaysOn Availability Groups feature:

1. Open **SQL Server Configuration Manager.** Double-clic**k** the **SQLServer (MSSQLSERVER)** service to open the **Properties** dialog box.

2. In the **Properties** dialog box, select the **AlwaysOn High Availability** tab. Check the **Enable AlwaysOn Availability Groups** check box. This will prompt you to restart the SQL Server service. Click **OK**.

3. Restart the SQL Server service.

10.3 CREATE AND CONFIGURE SQL SERVER 2012 ALWAYSON AVAILABILITY GROUPS

First, Add Login Role "SQL service user" or "NT AUTHROTIY\SYSTEM" to each SQL Node / Instance. For example, you can write a query as shown:

USE [master]

GO

CREATE LOGIN [nt authority\system] FROM WINDOWS WITH DEFAULT_DATABASE=[master]

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GO

Grant the "SQL service user" or "NT AUTHORITY\SYSTEM" account the following server-level permissions:
1. Alter Any Availability Group
2. Connect SQL
3. View server state

For example, you can write a query as shown:

"GRANT ALTER ANY AVAILABILITY GROUP TO [NT AUTHORITY\SYSTEM]

GO

GRANT CONNECT SQL TO [NT AUTHORITY\SYSTEM]

GO

GRANT VIEW SERVER STATE TO [NT AUTHORITY\SYSTEM]

GO"

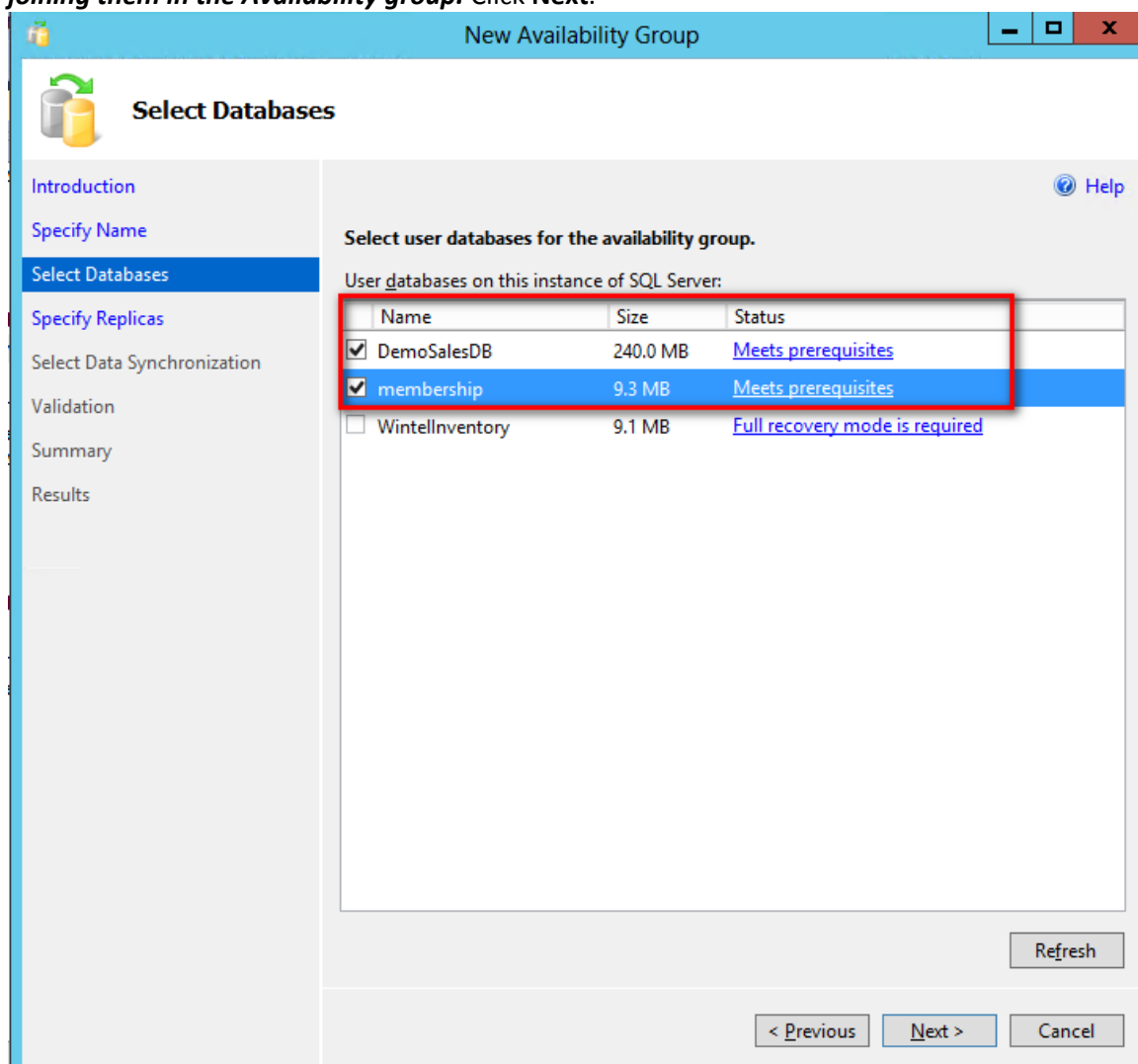To create and configure a SQL Server 2012 AlwaysOn Availability Group,

1. Open **SQL Server Management Studio.** Connect to the SQL Server instance.

2. Back up Database before creating New availability group.

3. In **Object Explorer**, expand the **AlwaysOn High Availability** folder. Right-click on the **Availability Groups** folder and select the **New Availability Group Wizard…** option. This will launch the **New Availability Group Wizard.**
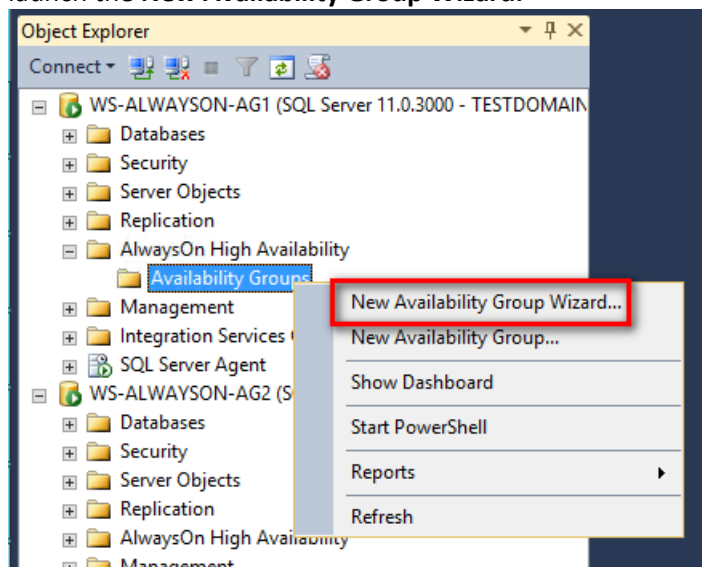
4. In the **Introduction** page, click **Next**.

5. In the **Specify Availability Group Name** page, enter the name of the Availability Group in the **Availability group name:** field. Click **Next**.

6. In the **Select Databases** page, select the checkbox beside the database that you want to include in your Availability Group. ***The databases have to be in Full recovery model prior to***

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joining them in the Availability group. Click **Next**.

7.   In the **Specify Replicas** page, under the Replicas tab, click the **Add Replicas** button and connect to the other SQL Server instances that you joined as nodes in your Windows Server Failover Cluster. Configure the following options:

- Automatic Failover (Up to 2) :   **Checked**

- Synchronous Commit (Up to 3) :   **Checked**

- Readable Secondary: **No**

3.   In the **Endpoints** tab, verify that the port number value is **5022**.

4.   In the **Listener** tab, select the **Create an availability group listener** option. Enter the following details.

- Listener DNS name: **Name that you will use in your application connection string**

- Port: **1433**

Note: This Client Access point to be used while connecting to DB during Application Layer Installation

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5. Click the **Add…** button to provide an IP address. In the **Add IP Address** dialog box, enter your preferred virtual IP address in the **IPv4 Address** field. Click **OK**. Click **Next**.

6. In the **Select Initial Data Synchronization** page, select the **Full** option. Provide a shared folder that is accessible the replicas and that the SQL Server service account used by both replicas has **Write** permissions to. This is just a temporary file share to store the database backups that will be used to initialize the databases in an Availability group. If you are dealing with large databases, it is recommended that you manually initialize the databases prior to configuring them as your network bandwidth may not be able to accommodate the size of the database backups. Click **Next**.

7. In the **Validation** page, verify that all validation checks return successful results. Click **Next**.

8. In the **Summary** page, verify all configuration settings and click **Finish**. This will create and configure the AlwaysOn Availability Group and join the databases.

9. In the **Results** page, verify that all tasks have been completed successfully.

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11 INSTALLING WEB CONTROL ROOM DISTRIBUTED COMPONENTS

Following are the main distributable components of Web Control Room which is required to be clustered in order to achieve High Availability.

- Automation Anywhere Web Socket Server Service
- Subversion Service
- Microsoft SQL Server 2012 and higher

A service to be highly available, it need to share the data that it offers to clients. During installation, administrator needs to identify the required components that is required to be deployed on shared directory (mapped drive). Following are the list of files and directory that is needed to be installed/deployed at mapped drive for distributed component of Web Control Room.

- Web Socket Service: None (in memory data)
- Subversion Service: Repository Directory
- Microsoft SQL Server 2012 and higher: Data Dictionary

All installer of above distributed components provide provision to select directory location during installation. Please make sure to select mapped drive while selecting Data Directory or Repository Directory.

12 CONFIGURING DISTRIBUTED COMPONENTS AS CLUSTERED SERVICES

To configure the distribute components as clustered component, identify the dependency of component and service first. Group all those components while configuration. E.g. CollabNet provide two services upon installation of Subversion Server, CollabNet Subversion Apache and CollabNet Subversion svnserve services respectively. For repository to work over HTTP protocol, Apache service in dependent on Svnserve service. Hence it is required to group them under same role.

1. Open Failover cluster manager console.
2. Navigate to cluster node and click "Roles"
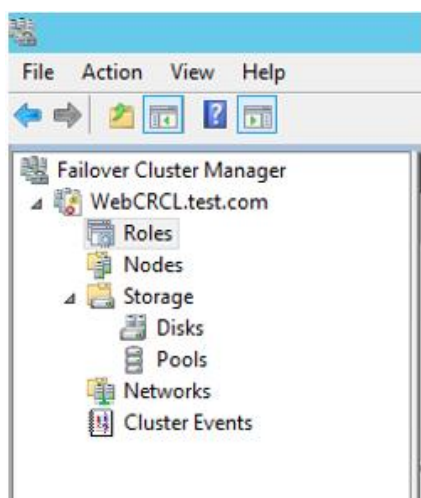
3. Go to Right panel and select "Configure Role".
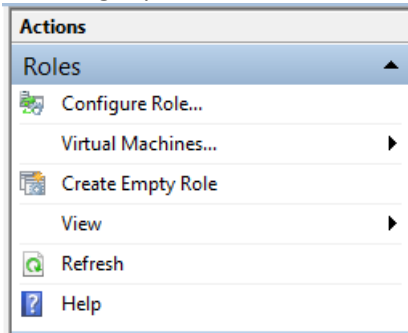
4. Select "Generic Service" and click on Next.
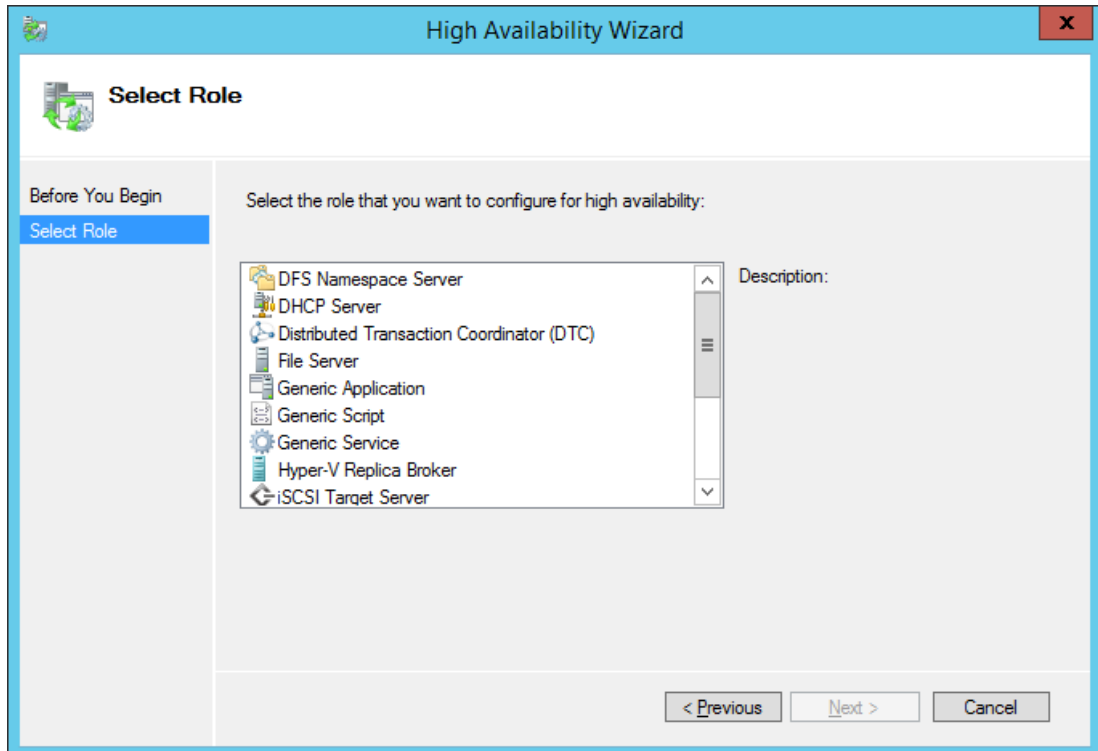
5. Select required generic service from the list.
    Select respective service from Generic Service wizard for which Cluster Role is being
    created. I.e.

      • For Web Socket Server, select Automation Anywhere web socket server service,

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- For SVN Server, select respective Subversion Service
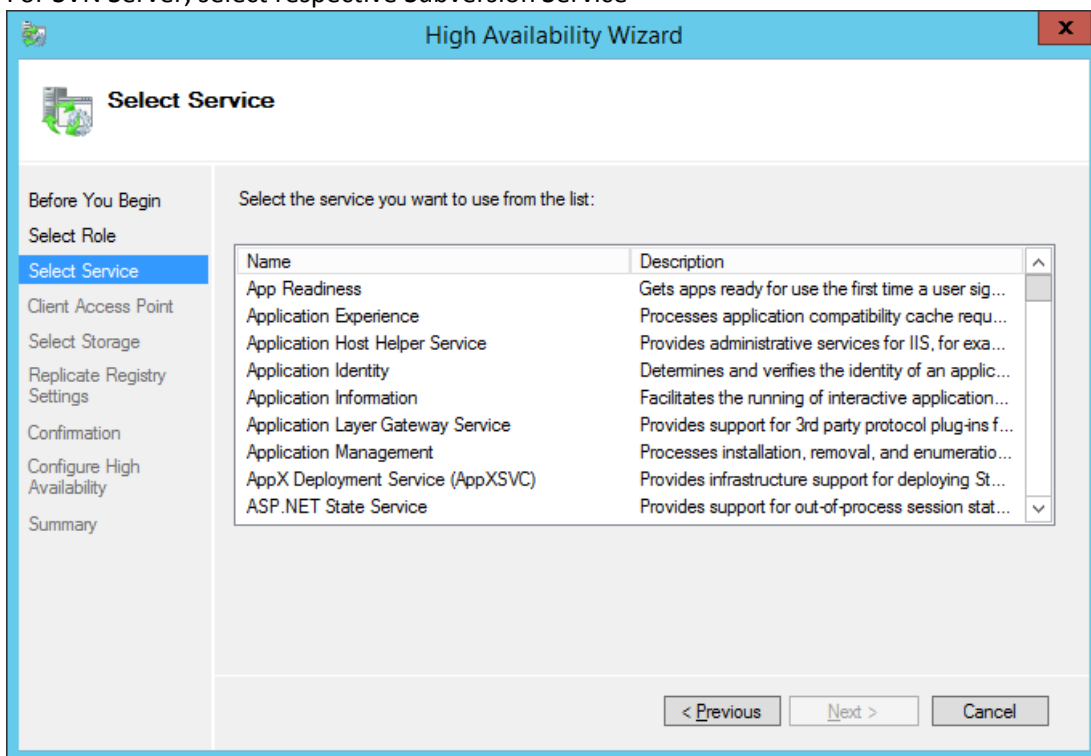
6. Select Client Access Point. This is an IP address/DNS Name access by client application and will be point of contact.

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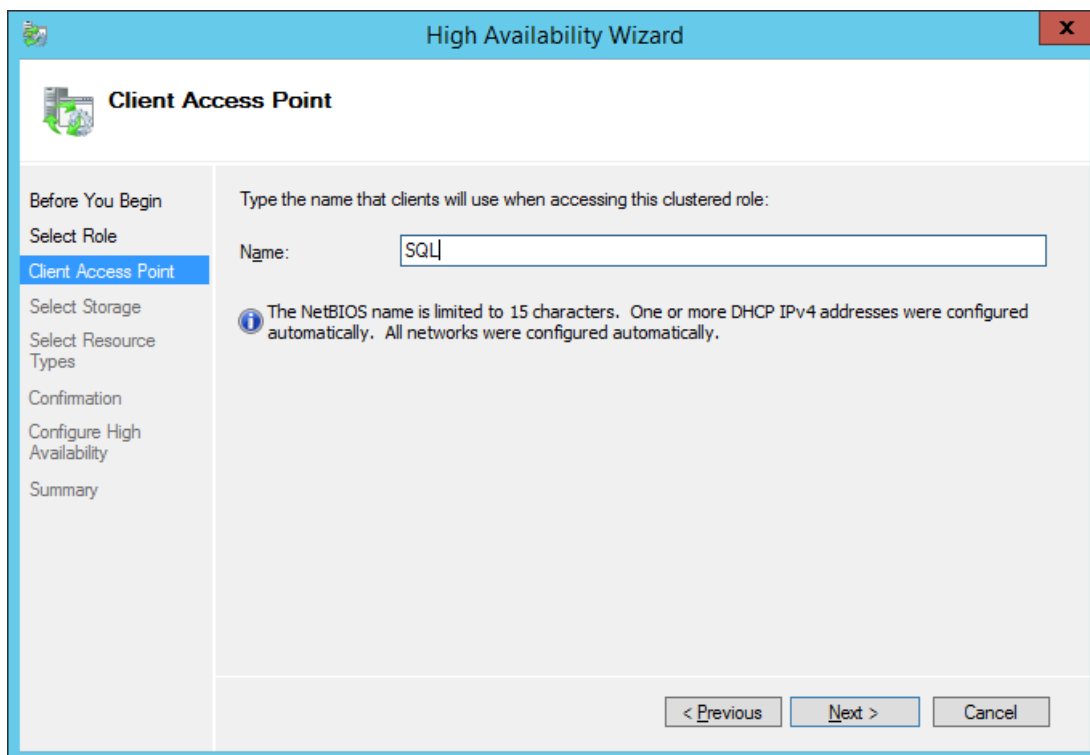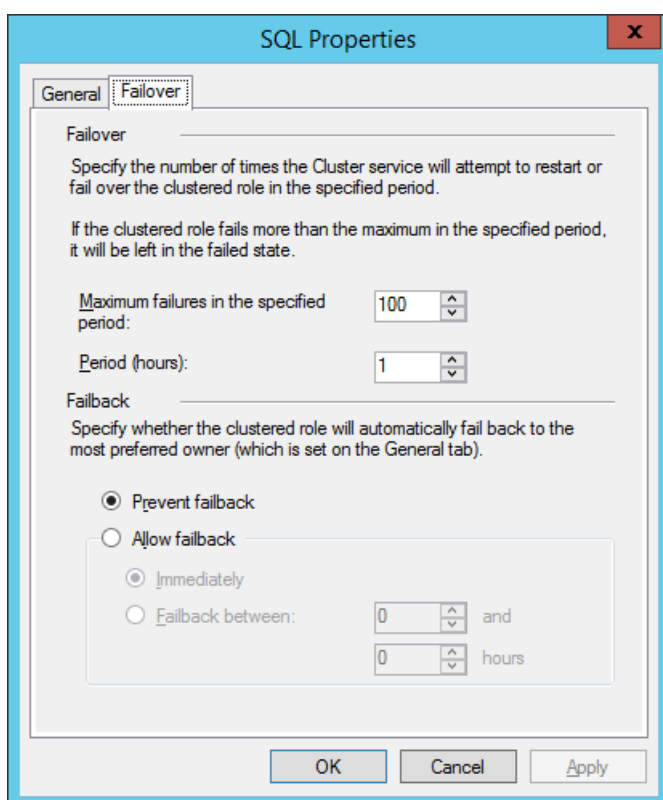
7. Click on next and finish the wizard. It will create a Role with required resource and dependency added.
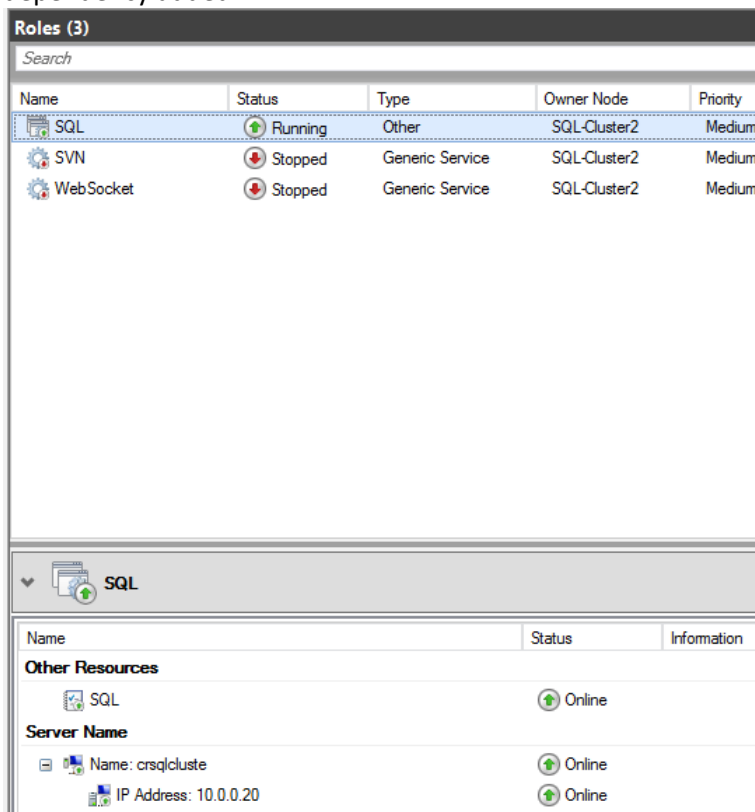
8. Right click on Role and go to properties. Select owner and go to Failover tab in same window and provide appropriate values for failover and failback conditions.
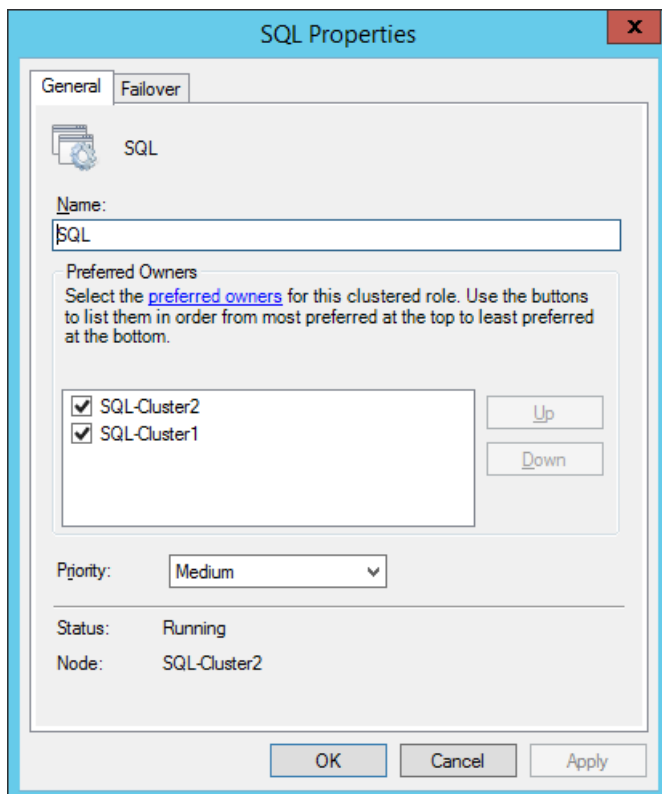
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- Maximum failure in the specified period: This represents the number of time a Role can failover in particular time period.

- Period (hr): The time period mention in above property

- Failback: Whether to allow or prevent failback of role when server/services is available online back.

Note: Please make a note that default value is 1 failover within 6 hours. It is recommended to increase this value.

9. Once the above configurations have been set, roles are technically available to serve. However, it is required to set dependency if any. To set the same select the Role and go to "Resources" tab in below panel.

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10. Right click on particular resource and select Properties. Go to "Dependencies" tab. Here you can provide series of combination of dependencies. Select the resource from dropdown.
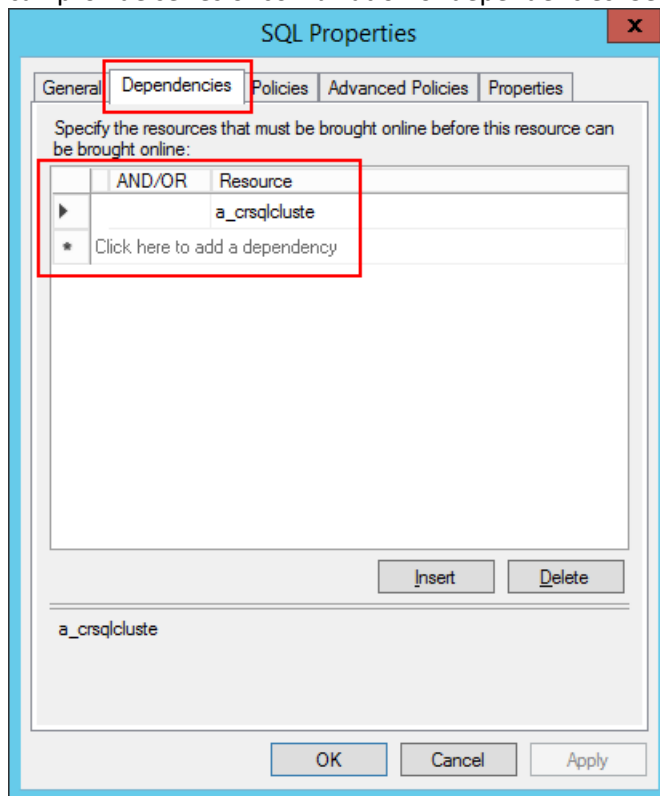
11. The Configuring Dependency is dependent of the Service being configured. E.g. Automation Anywhere Web Socket Server Service has no dependency over any other resource.

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12. Go to Policies tab and select the Failover policies.

13. Click "OK" and complete the procedure for all Roles and Resources you have created.

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13 MANUAL FAILOVER TEST

Microsoft Failover Cluster Management console provides provision to test failover manually by right clicking on the role and moving it to other node. This will replicate the failover e.g. service executable crash, network failure and machine failure.

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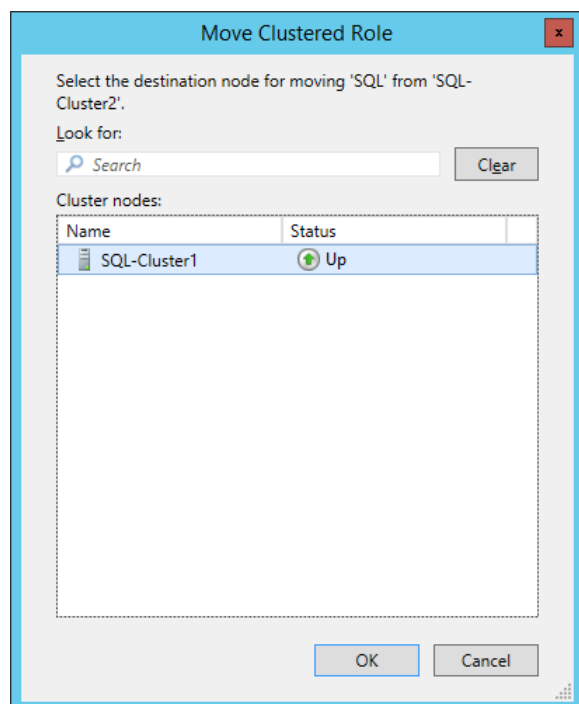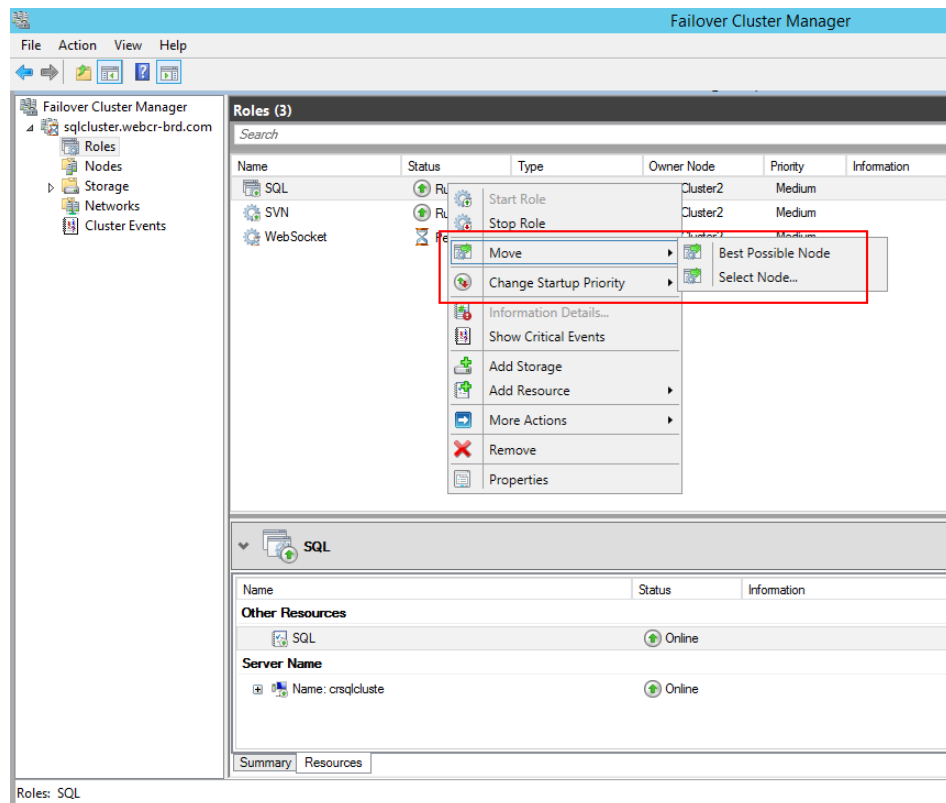
14 DISASTER RECOVERY

Automation Anywhere defaults to the Windows platform for Disaster Recovery, we recommend that Automation Anywhere Tasks and reference files be deployed according to the existing organization's DR policies for file, and data transfers. Usually it's prior or in parallel to production deployment of automated tasks.

14.1 HARDWARE FAILURES

It is recommended that multiple webservers be setup in an active-active method to not only balancing load but also provides protection against local hardware failures. It is recommended that database server be setup in a Windows Clustering environment so that there are multiple database servers connected to a single storage array. Depending on the criticality of data, the storage array should be using RAID 5 at minimum. Usage of SAN for shared services and DB is recommended.

14.2 DATA CORRUPTION

Regular on-site full and daily backup of database server is highly recommended. More frequent differential backup strategy can also be used to reduce the data loss.

Besides the database, the AAE Control Room repository also requires backup of configuration and task files.
If network storage is used on the primary site, the same storage configuration should be used at the DR site. The in-built replication mechanism updates the DR repository from the main site.
If a solution for replication s needed, one option would be the optional Windows feature,

Distributed File System (DFS). DFS configuration is described in Appendix A.

14.3 ENVIRONMENTAL DISASTERS

To protect against a geographical or environmental disaster, we also recommend that a regular off-site backup be performed regularly where the backups are stored geographically apart.

Note: *For any processes that had stopped during an event of production failure in between execution, the task level log file and other intermediate files would help to provide the last execution status of the process.*

This step-by-step has been created to help you get started in creating a SQL Server 2012 AlwaysOn Availability Group

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15 APPENDIX A – REPOSITORY REPLICATION

15.1 INSTALL DFS MANAGEMENT FEATURES

Follow these steps to setup and run DFS.
NOTE: This procedure is done on the Primary server and the Hot-standby server.
1. Start the Server Manager and select the Local Server tab.
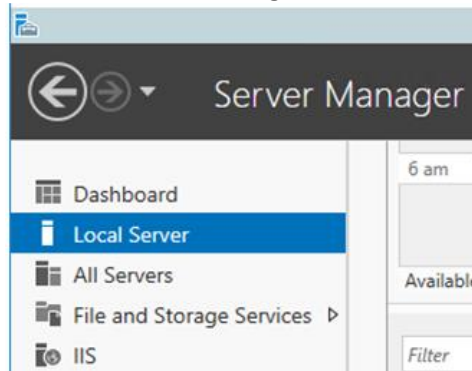
2. On Manage, select Add Roles and Features. This starts the Add Roles and Features Wizard dialog.
3. On the Before You Begin page, click Next.

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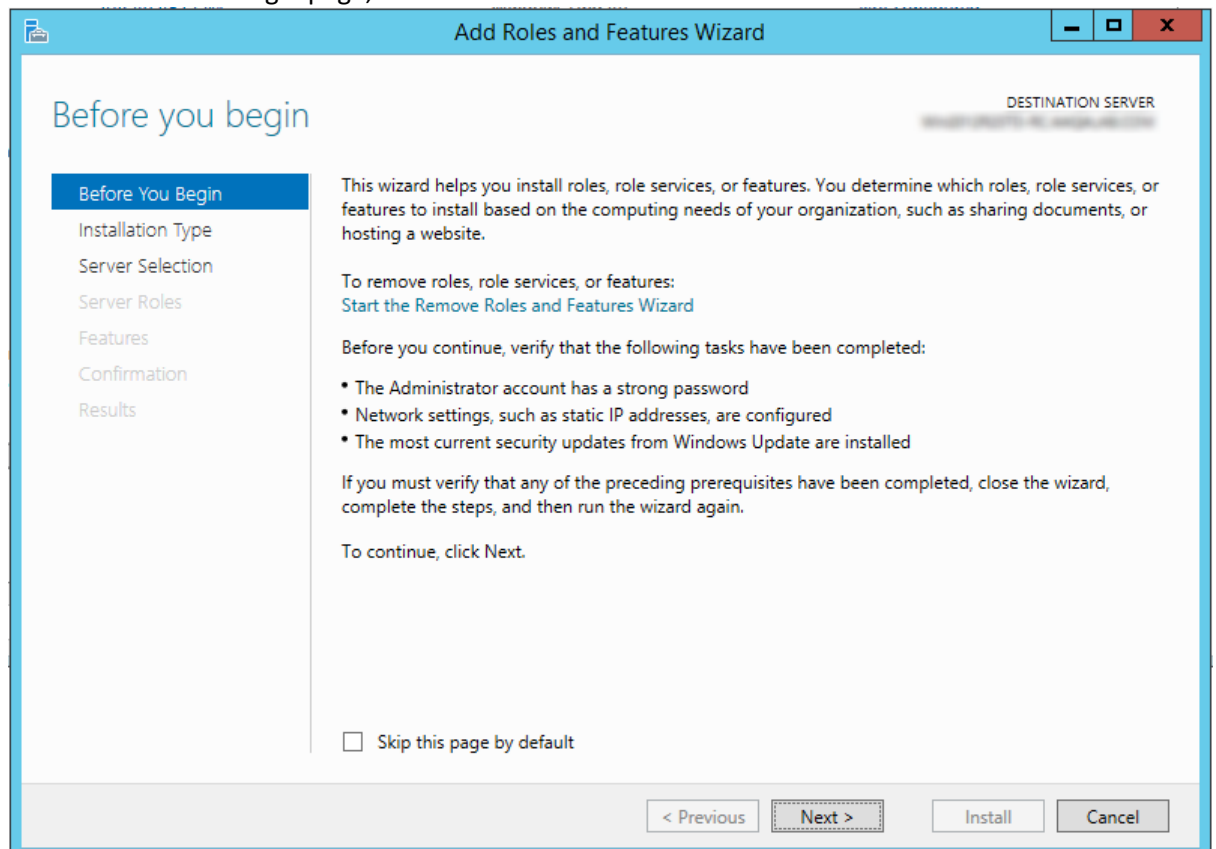
4. On the Select installation type page, select Role-based or feature-based installation radio button. Click Next.

5. On the Select destination server page, select the Select a server from the server pool radio button. Click Next.

6. On the Select server roles page, Roles section, expand the File and Storage Services > File and iSCSI Services tree.
   a. Select DFS Namespace and DFS Replication checkboxes. Click Next.
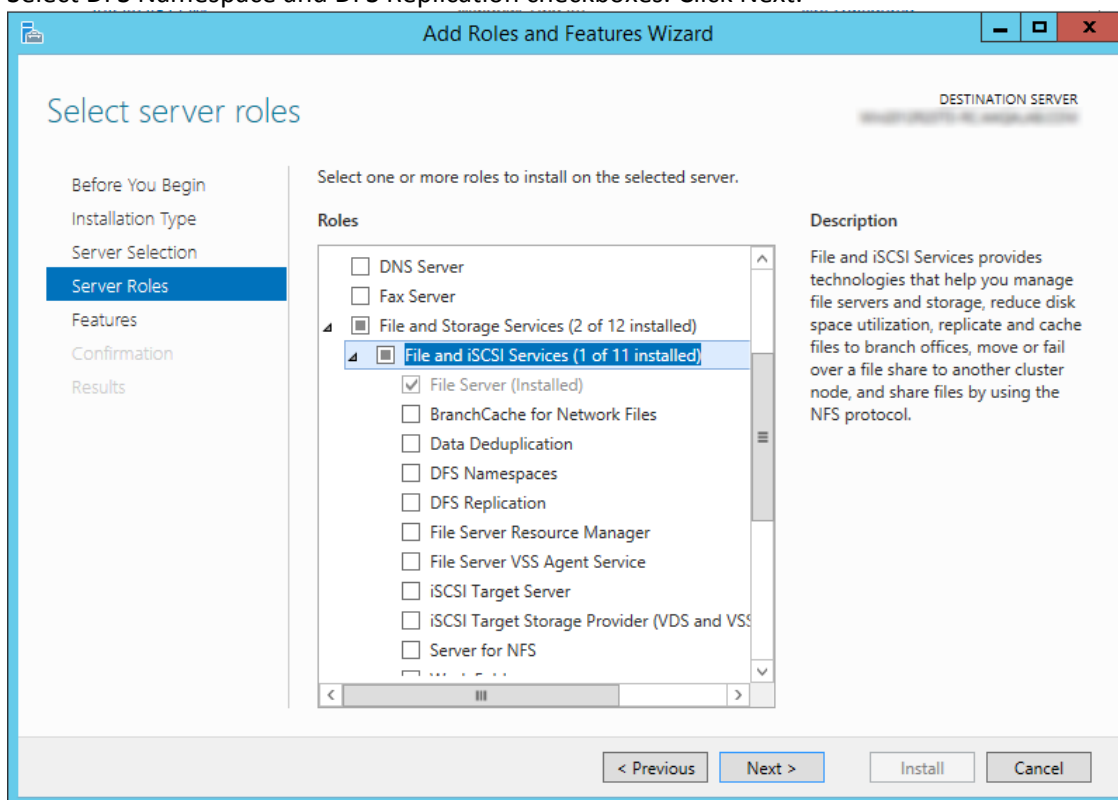
7. On the Confirm Installation Selections page, click Install button. This initiates the installation of the selections.

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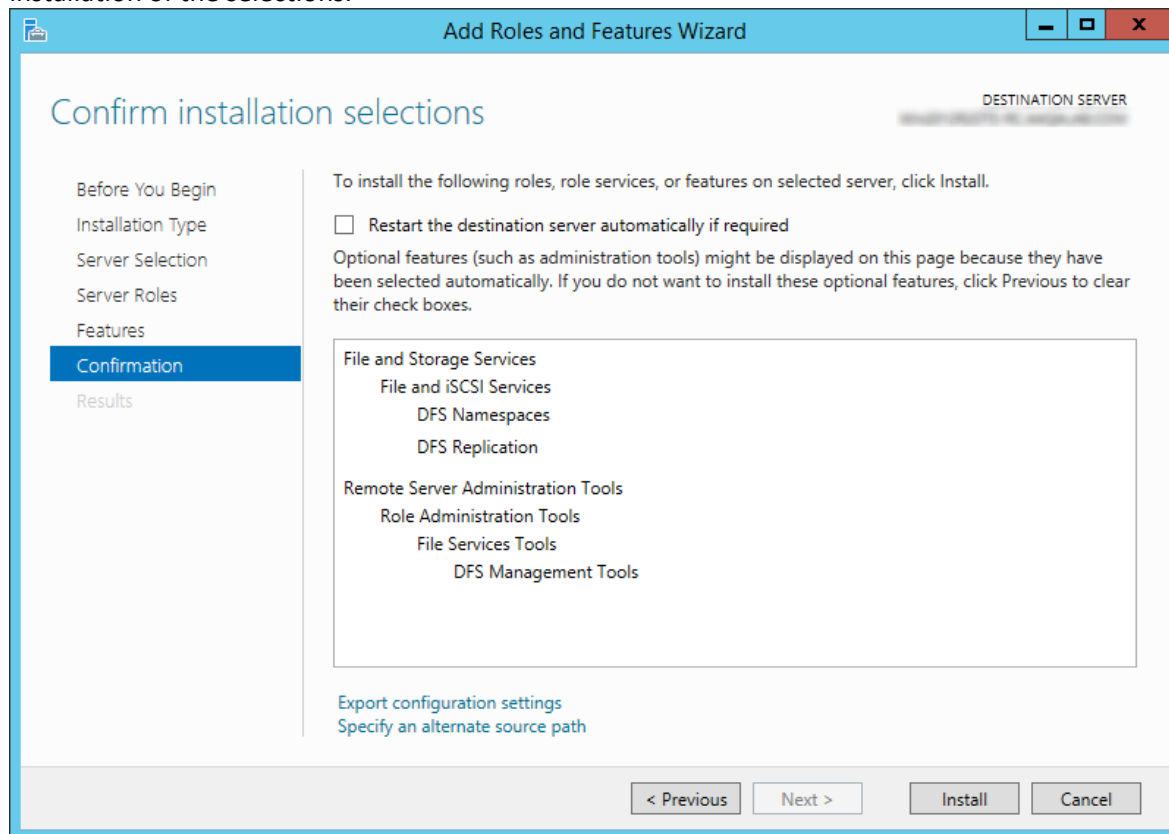
8. On the Installation Progress page, wait for the installation to complete. When done, click Close.
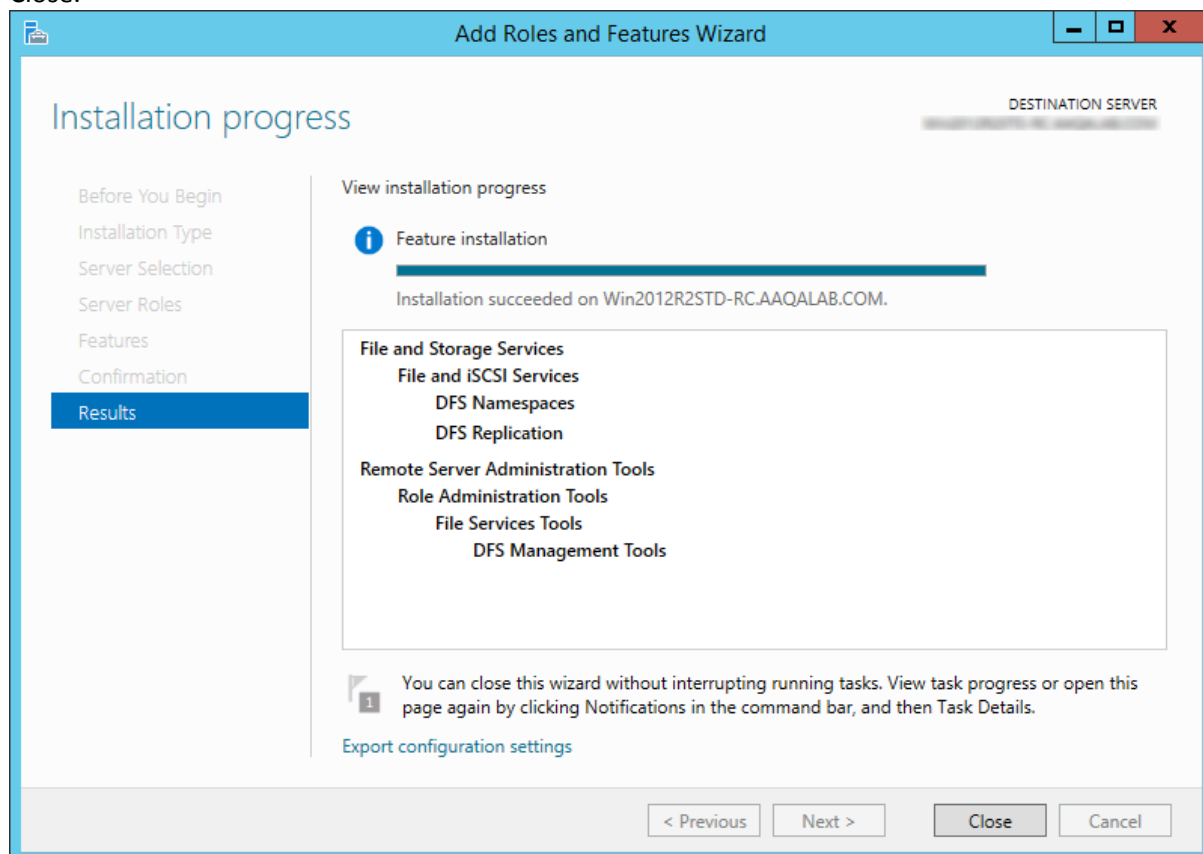
Note: *This procedure is done on the Primary server and the Hot-standby server. This completes the installation of DFS Management.*

15.2 DFS MANAGEMENT

1. On the Tools drop-down menu (right side), select DFS Management. This displays the New Replication Group Wizard.
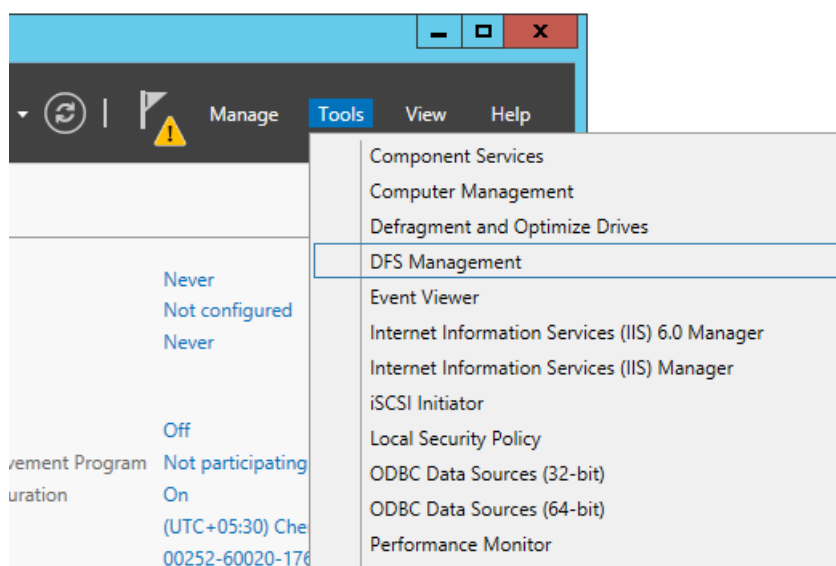
2. Right-click on Replication and select New Replication Group. This displays the New Replication Group Wizard.
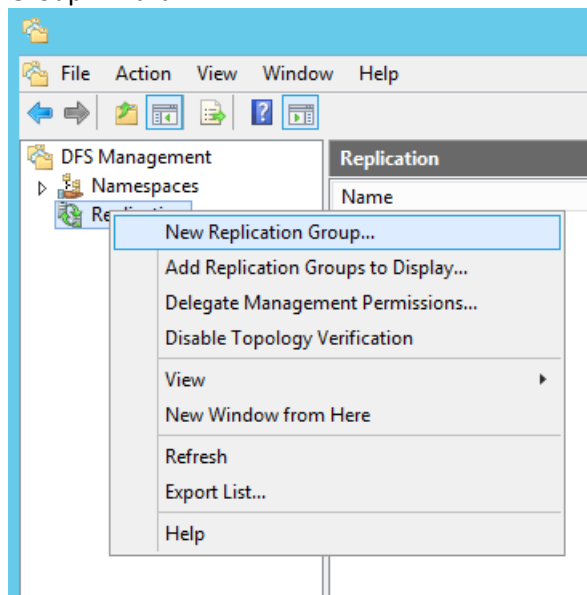
3. On the Replication Group Type page, select Multipurpose replication group radio button. Click Next.

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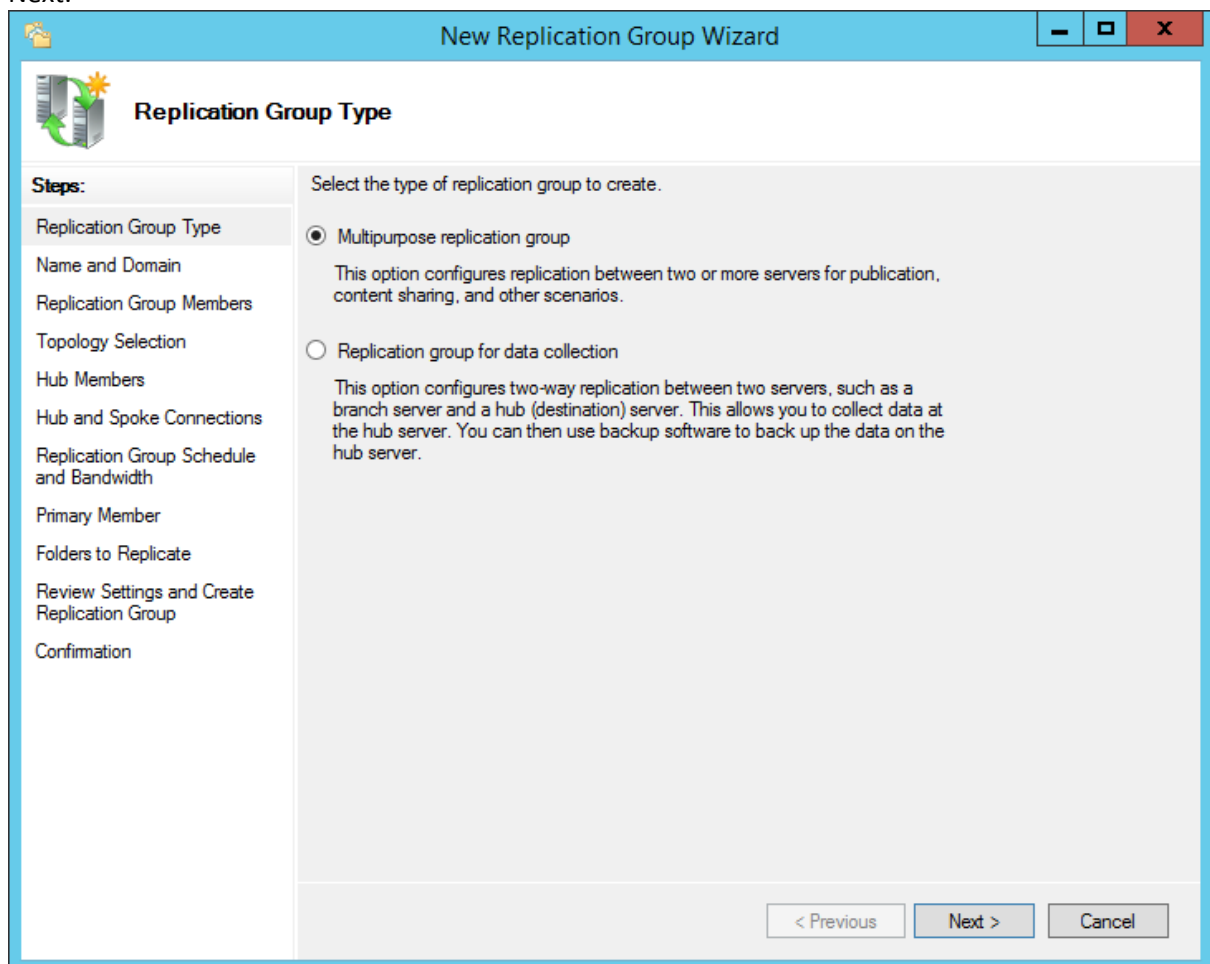
4. On Name and Domain page:
    a. Enter Name of replication group.
    b. Enter Domain (or click Browse to locate).
    c. Click Next.

5. On Replication Group Members page, use Add to include replication member nodes. When done, click Next.

6. On Topology Selection page, select the appropriate topology. Click Next.

7. On Replication Group Schedule and Bandwidth page:
    a. Select Replicate continuously using the specified bandwidth radio button.
    b. On Bandwidth drop-down, select Full.
    c. Click Next.

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8. On Primary Member page, on Primary member drop-down, select item. Click Next.

9. On the Add Folder to Replicate dialog:
    a. Enter Local path of folder to replicate (or click Browse and locate folder).
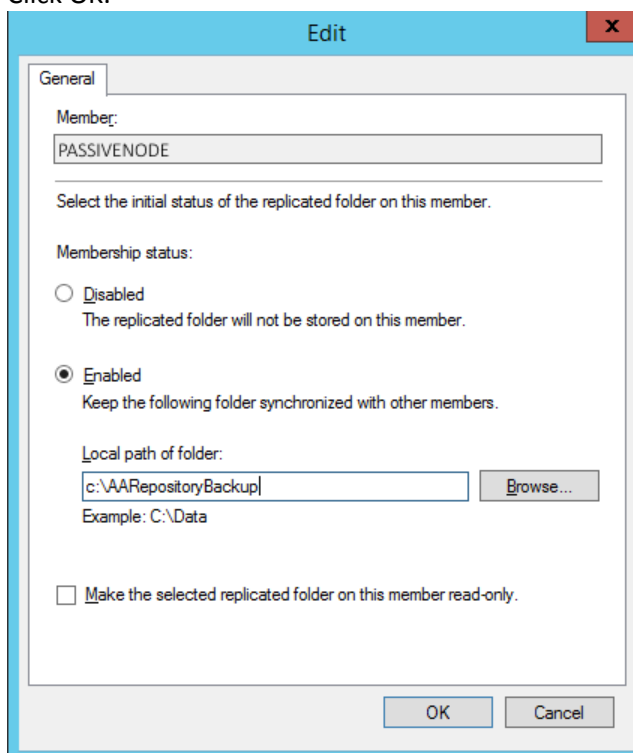   b. Accept Use name based on path default.
    c. Click OK.

10. On the Folders to Replicate page, review the list. Click Next.
    Note: *(optional) Click Add to include additional folders.*
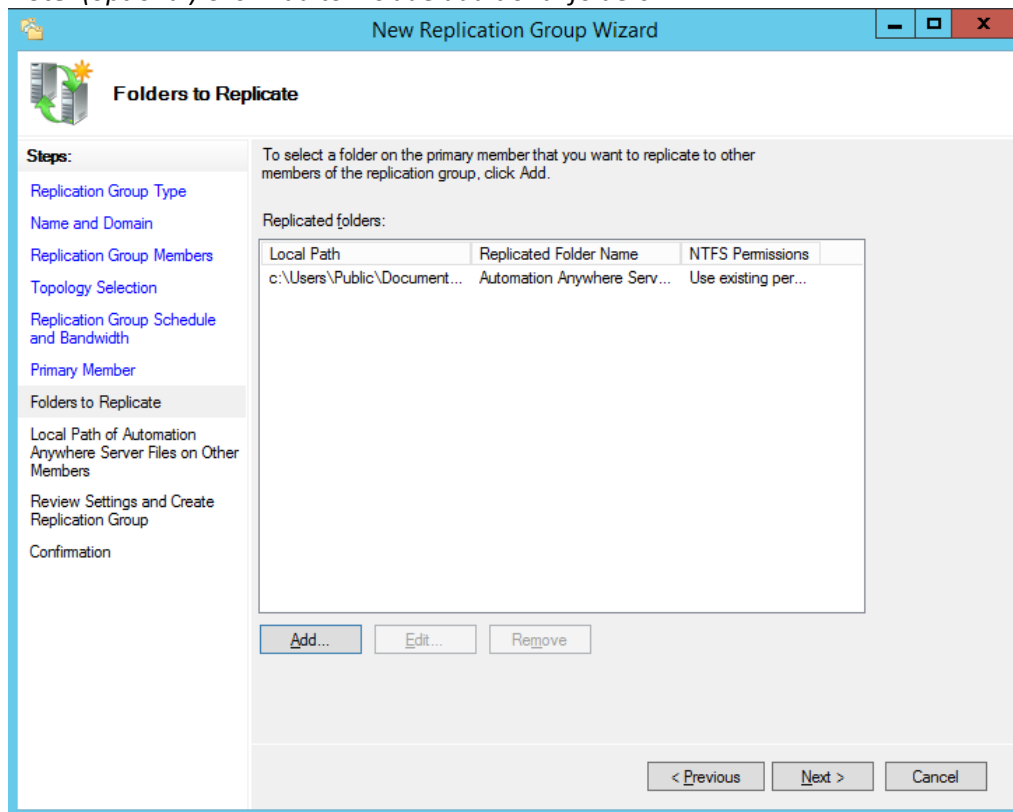
11. On the Edit dialog:
    a. Accept Enabled default.
    b. Enter Local path of folder (or click Browse and locate folder).
    c. Click OK.

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12. On Local Path of Automation Anywhere Server Files on Other Machines page, review path. Click Next.

13. On Review Settings and Create Replication Group page, confirm the configuration details are accurate. Click Create.

14. On the Confirmation page, the wizard displays successful actions. Click Close.
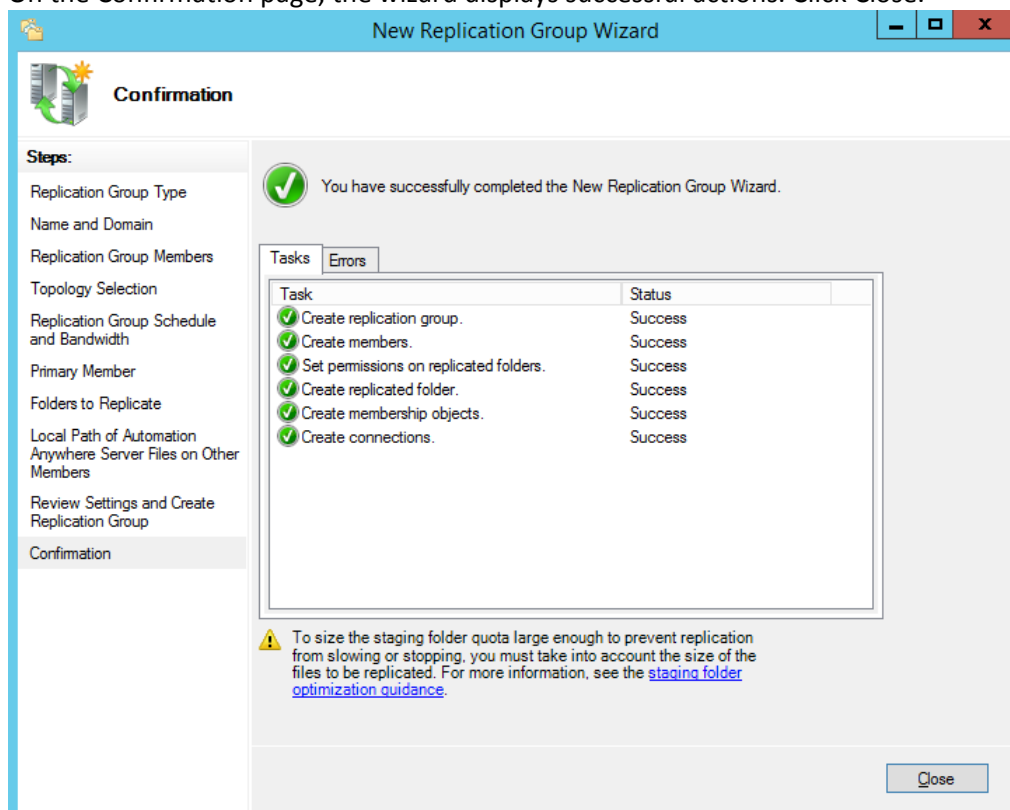
15. On the DFS Management window, Memberships tab, the created group is available.

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