# DELL™ POWEREDGE™ M420 BLADE SERVER
## WITH DELL EQUALLOGIC™ STORAGE AND DELL FORCE10™ SWITCH
# REFERENCE ARCHITECTURE

*for Microsoft® SQL Server® 2012 AlwaysOn Failover Cluster Instances*

**Principled Technologies®**

**DELL**

**A Principled Technologies Reference Architecture commissioned by Dell Inc.**

# WHAT YOU WILL LEARN

- The features and advantages of the Dell PowerEdge M420

- How to install and configure your Dell PowerEdge M420 hardware

- How to install Microsoft SQL Server 2012 on the Dell PowerEdge M420

- How to configure Microsoft SQL Server Failover Clustering

# TABLE OF CONTENTS

# EXECUTIVE SUMMARY

Data center space almost always comes at a premium. For that reason, it's important to consider not only performance and manageability, but also the amount of physical space your servers use when you are selecting a blade server to run your database applications. The ultra-dense, quarter-height Dell PowerEdge M420 blade server lets you fit twice as many servers in a single chassis than if you were using conventional half-height blades, without sacrificing performance or other features. Combined with high-performance storage and network options, such as the Dell EqualLogic PS6110XS storage array and Dell Force10MXL 10/40GbE switches, the M420 is able to provide excellent performance in a compact form-factor.

Dell designed the Dell PowerEdge M420 blade server specifically to meet the needs of organizations that want to maximize their data center space. In this reference architecture, we look at some of the many benefits that the Dell PowerEdge M420 server can bring to data centers in combination with the EqualLogic PS6110XS and Force10MXL switches, and describe in detail the setup of a common clustering configuration: Microsoft SQL Server 2012 AlwaysOn Failover Cluster Instances running on Microsoft Windows Server 2008 R2 on the Dell PowerEdge M420.

# ABOUT THE TEST ENVIRONMENT

To create this guide, we set up and tested a SQL Server 2012 Failover Cluster with Dell PowerEdge M420 servers. Figure 1 presents a concise configuration summary for the solution we tested.

| Solution | Dell PowerEdge M420 solution |
|----------|------------------------------|
| Servers | 2 x Dell PowerEdge M420 |
| Operating system | Microsoft Windows Server 2008 R2 SP1 |
| Database | Microsoft SQL Server 2012 |
| Switches | 2 x Dell Force10 MXL 10/40GbE |
| Storage | 1 x Dell EqualLogic PS6110XS |

Figure 1: General configuration summary for the solution we tested.

For more detail about the configuration of the servers we used, please see Appendix A.

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## Features of the Dell PowerEdge M420 blade server

The new Intel® Xeon® processor E5-2470-powered Dell PowerEdge M420 blade server (see Figure 2) sets a new standard for computing density in a blade environment, all using your existing Dell PowerEdge M1000e blade enclosure. Features include:



**Figure 2: The Dell PowerEdge M420 blade server.**

- **Double the computing power per rack unit.** Quarter-height blades capable of handling Intel Xeon processor E5-2400-series parts in a two-socket configuration, with up to eight cores per processor allow you to use your rack space to its maximum potential.
- **Cost-efficient upgrade.** Utilizing the same M1000e chassis as previous Dell blades, deploy the PowerEdge M420 using the power, cooling, and network infrastructure already in your data center.
- **Management.** The Dell OpenManage™ suite of tools, combined with the Integrated Dell Remote Access Controller (iDRAC7), give you maximum flexibility in administering your computing infrastructure.
- **Connectivity.** Snap-in FlexIO technology provides the backbone for a flexible, high-speed interconnect system. With options including 1 and 10 Gigabit Ethernet, Fibre Channel, InfiniBand®, and the new Dell Force10 MXL 10/40GbE blade switches, the M420 is able to interface with your network at maximum speed.
- **Power efficiency.** Dell PowerEdge M420 servers implement leading industry power-efficiency standards, and are designed to optimize performance while maintaining low power consumption.
- **Virtualization-ready.** Supporting Hyper-V™, Citrix® XenServer™, and VMware® vSphere®, the M420 contains two SD card slots for hypervisor, redundant hypervisor, and/or vFlash media support.

For details on the Dell PowerEdge M420 blade server configuration we used, see Appendix A.

## Features of the Dell Force10 MXL 10/40GbE blade switch

The Dell Force10 MXL 10/40GbE blade switch brings new connectivity and performance options to blade computing environments with modular configuration options and standards-based 10/40GbE support. The Force10 MXL features:

- **Performance.** 10/40GbE connectivity minimizes latency and maximizes network throughput for data-intensive servers and applications, and Layer 3 routing guarantees fast traffic between isolated networks.

- **Flexibility.** Choose 1, 10, or 40GbE ports; FlexIO for plug-in QSFP+, SFP+; or 10GbE copper. Aggregate bandwidth on the FlexIO modules to support a maximum, bi-directional throughput of up to 160 Gigabits per second.
- **Extend and simplify.** The MXL is modular, and supports stacking for ease of management and higher performance. Support for converged switching allows iSCSI, NAS, Ethernet, and Fibre Channel traffic to all use the same physical hardware, potentially reducing additional management overhead and hardware costs.

## Features of the Dell EqualLogic PS6110XS 10GbE iSCSI array

The Dell EqualLogic PS6110XS 10GbE iSCSI array combines the high-I/O strengths of solid-state storage and combines it with the raw capacity of traditional hard-disk drives in a single-chassis solution. Features include:

- **Agility.** Use storage that fits the demands of your server or application. Dell management software allows administrators to dynamically allocate storage on SSDs or HDDs, depending on the performance requirements for a specific situation.
- **Upgradable.** Start out using your existing 10GbE SFP+ modules, and build out to cost-effective 10GBASE-T as your budget allows. Move volumes between storage pools without downtime, and change hardware without disruption.
- **Robust.** Vertical port sharing keeps your bandwidth at full speed, even if a network port fails. Automatic load-balancing keeps data moving reliably to and from your physical or virtual server farm.
- **Management.** EqualLogic Host Software, Host Integration Tools, and EqualLogic SAN Headquarters (SANHQ) provide the tools administrators need to keep a high-level view of the storage system, while providing the flexibility to make granular changes as needed.

## About Microsoft SQL Server 2012

According to the Microsoft Web site, SQL Server 2012 provides Mission Critical Confidence with greater uptime, blazing-fast performance and enhanced security features for mission critical workloads; Breakthrough Insight with managed self-service data exploration and stunning interactive data visualizations capabilities; Cloud On Your Own Terms by enabling the creation and extension of solutions across on-premises and public cloud.

SQL Server 2012 is available in three main editions: Enterprise, Business Intelligence, and Standard. For this reference architecture, we use the available trial of Enterprise Edition.

For more information about Microsoft SQL Server 2012, visit http://www.microsoft.com/sqlserver/en/us/editions.aspx.

# SUPPORTING HARDWARE – POWEREDGE M1000E AND FABRIC

The Dell PowerEdge M1000e blade chassis and its supported fabric interconnects are designed for dense computing situations. Features of the PowerEdge M1000e include:

- **Management.** Reduces administrative demand by providing a secure centralized management interface for the chassis and blades within, using proven Web (SSL-encrypted) and CLI (SSH/Telnet) technologies.
- **Simplified configuration.** The Chassis Management Controller allows administrators to control up to nine enclosures and 144 server blades, including BIOS/firmware change management and updates, thermal monitoring, and power threshold configuration.
- **Flexible I/O.** Six interconnect sockets with the capability to support three fully-redundant fabrics, a passive midplane with more than 8Tbps in I/O bandwidth capacity, and FlexIO support provide a number of connectivity options for your servers.
- **Reliability and efficiency.** Six power supplies and nine fans, all hot-swappable, allowing for no-downtime maintenance of key chassis components. All components are tuned for maximum power efficiency to reduce data center power consumption.

All situations vary and you should consider your specific scenario when designing your topology. In our case, we used two Force10 MXL 10/40GbE switches along with four Dell PowerConnect™ M8024-K switches for fabrics A, B, and C in our PowerEdge M1000e chassis.

For redundancy, we combined the Force10 MXL switches in a single stack to support our iSCSI traffic, and also, we teamed the NICs on Fabric A in each of our two PowerEdge M420 nodes. For Fabrics B and C, we stacked the PowerConnect M8024-K switches and teamed the third and fourth NICs in each node for our client application and cluster heartbeat traffic. This configuration allowed for full redundancy and the highest level of throughput. Each networking situation will vary, so consult your network administrator and the network hardware manuals for best practices on balancing

performance and redundancy. See Appendix B for specific details on Broadcom NIC teaming on the PowerEdge M420 using Microsoft Windows. Figure 3 shows our setup for this reference architecture.
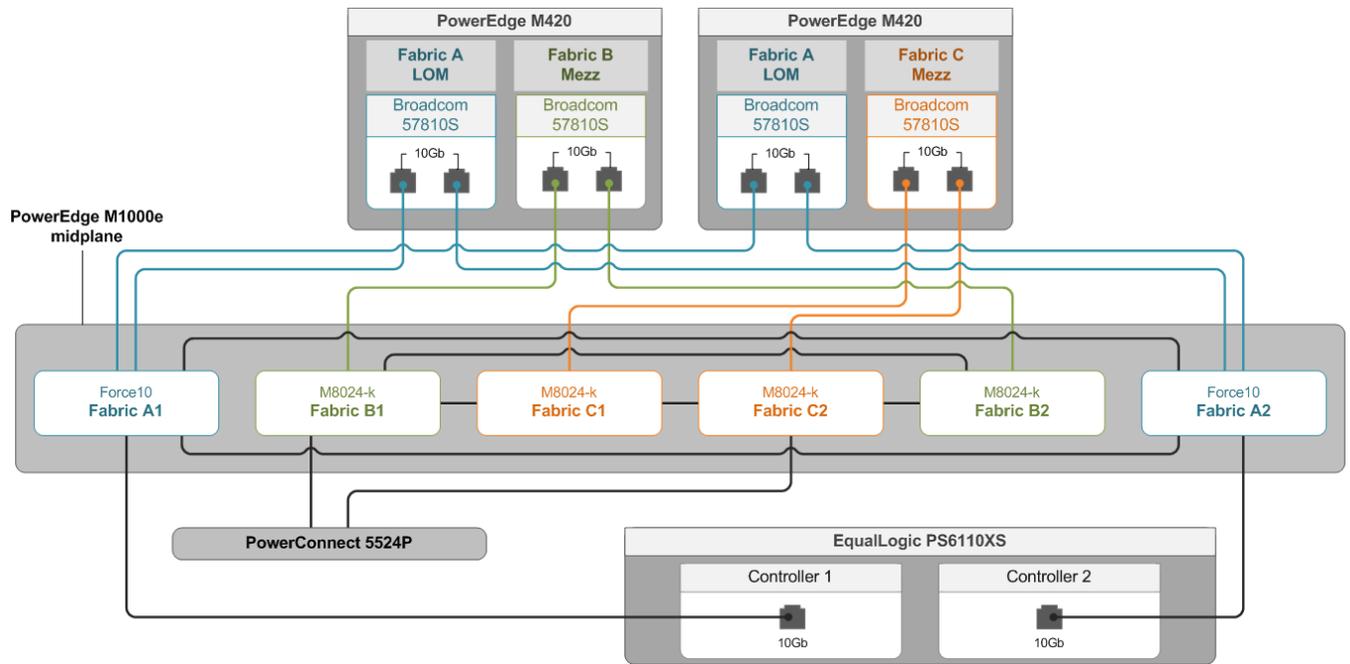


**Figure 3: The topology we used for this reference architecture.**

## Storage configuration

### Storage considerations and best practices

The storage subsystem plays a vital role in any database system design. In our test environment, we used a Dell EqualLogic PS6110XS as the main storage hardware for our SQL Server clustered instances. You should consider the following points when designing your storage for your SQL Server database environment:

- Always ensure that you have applied the latest firmware and updates to your storage subsystem and storage network hardware.

- If using iSCSI, consult the manufacturer's best practices for switch configuration, such as settings related to Jumbo Frames, Flow Control, Spanning tree, and so on.

- If using iSCSI, use VLANs to separate storage traffic when physically separate networks are unavailable.

- Redundancy is critical – always plan for and provide multiple paths for your hosts to communicate with your storage. Use multipath drivers from the storage hardware vendor to ensure optimal performance.

- Use some type of tiering if possible – if your environment does not contain an EqualLogic PS6110XS or other storage with auto-tiering functionality, consider tiering your data manually, placing critical and volatile database files on faster storage, and placing data accessed less frequently on slower storage.

- Consider the workload – application workloads can vary greatly in data access patterns, and can therefore affect your system's performance. OLTP workloads and SQL Server tempdb system databases should generally be placed on RAID 10 volumes, while read-intensive OLAP workloads can be placed on RAID 5 volumes.

- SQL Server transaction logs should go on RAID 10 volumes for fastest write completion. When possible, SQL Server transaction log files should reside on separate physical media.

- Create separate volumes for SQL Server database data files, database log files, and tempdb files. This allows for flexibility in file placement on the underlying storage.

Each situation and application design is different. Consider all layers of your hardware and software stack and their interoperability prior to establishing a storage design.

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## Configuring the Dell EqualLogic PS6110XS

Thanks to the unified management interface of Dell EqualLogic storage (see Figure 4), configuring the Dell EqualLogic PS6110XS is like configuring any other Dell EqualLogic array. To configure your storage, you should:

- Configure your group, if not already configured. You can perform this action via a serial connection to the first member array, using the setup command.

- Configure RAID levels on your arrays. In the Web interface, right-click the member, and choose Modify Raid Configuration.

- Create the volumes and configure authentication to those volumes. In the Web interface, click Volumes, and select Create volume. You can configure volume access from the Access tab.

- After configuration, use SAN HeadQuarters (SANHQ) to monitor your SAN for any issues.

- Monitor the Dell EqualLogic support site for any firmware or Host Integration ToolKit upgrades.
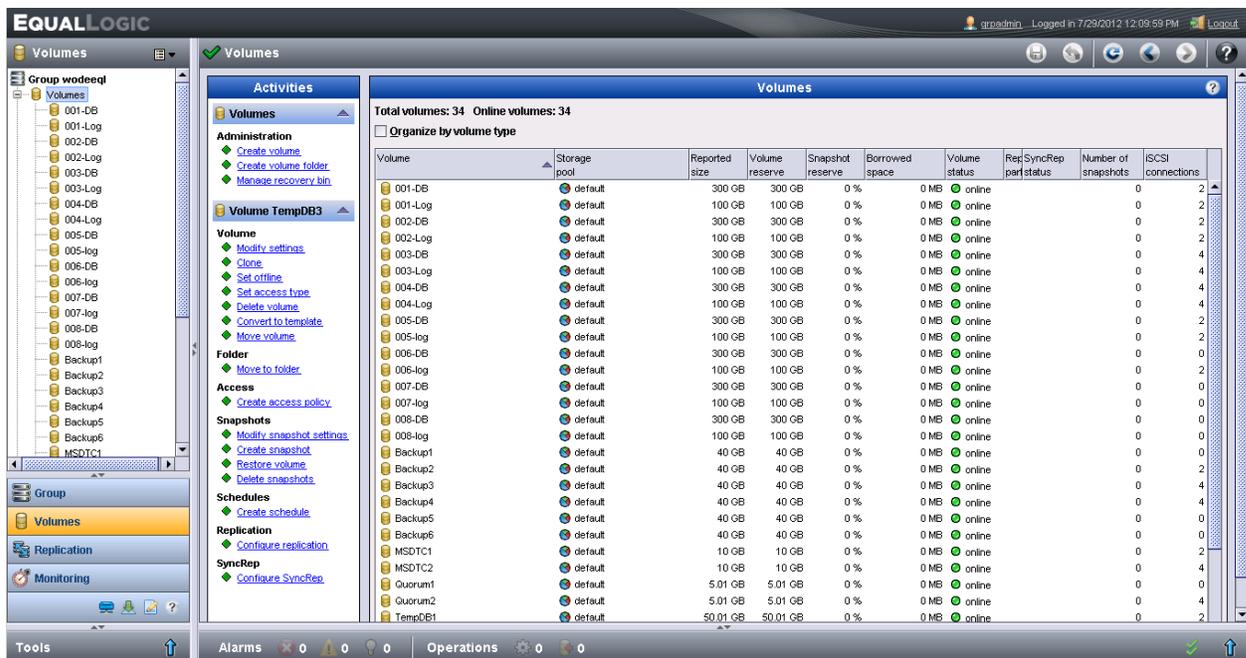


**Figure 4: The Dell EqualLogic management Web interface.**

### Server configuration

#### Dell PowerEdge M420 considerations and best practices

The Dell PowerEdge M420 blade server ships with the Intel Xeon processor E5-2400-series in a two-socket configuration and with up to 192GB RAM. When configuring your PowerEdge M420 hardware, consider the following:

- Most database workloads are RAM intensive. Configure your server with enough RAM to handle your database workloads.

- Core count options for the PowerEdge M420 are 4, 6, and 8. Processor cache options range from 10MB to 20MB cache. We recommended buying the processors with as many cores and as much cache as your budget allows for maximum performance. This is especially true for CPU-intensive database application workloads that may thrive with many cores, faster frequencies, or more CPU cache.

- Ensure your PowerEdge M420 BIOS and firmware are at the latest levels released by Dell.

- Test your workload patterns and performance profiles using the Dell-supplied BIOS power options to be as power-efficient as possible.

# INSTALLING AND CONFIGURING THE OPERATING SYSTEM

## Installing Microsoft Windows 2008 R2 and clustering prerequisites

### OS installation

To begin building your SQL Server 2012 Failover Cluster, start by installing Microsoft Windows Server 2008 R2 SP1 and all current Microsoft updates. The installation can be performed manually via physical media, using the iDRAC management functionality, or by mass deployment methods, such as those provided by Microsoft System Center Configuration Manager (SCCM) with the Dell Server Deployment Plugin. Basic OS installation is outside the scope of this paper.

After installing the operating system and updates, the next preparation steps are simple:

- Assign a static IP address to the servers that will be members of the SQL Server cluster.

- Join each server node to the Active Directory® domain, which SQL Server AlwaysOn Failover Cluster Instances require.

### SQL Server Failover Clustering prerequisites and considerations

Though Microsoft has streamlined the cluster installation process greatly in SQL Server 2012, there are various prerequisites and points to consider prior to beginning your cluster installation and configuration. We list several of those considerations below.

- Join the Active Directory domain prior to beginning setup. Do not install SQL Server on a domain controller.
- Verify your hardware with Microsoft's recommendations. For full details on Microsoft recommendations, see: http://msdn.microsoft.com/en-us/library/ms189910#Hardware.
- The installation process requires the .NET4 framework and will install it if necessary. To save cluster installation time, you may consider installing .NET4 prior to beginning the cluster installation.
- Configure the Windows Server Failover Cluster feature in Server Manager, and create a cluster at the operating system level. For details, see Appendix C.
- Create the shared disk resources on your SAN prior to beginning installation, and add those disks in Windows Server Failover Cluster Manager.

Before installing your SQL Server AlwaysOn Failover Cluster, there are many considerations. For full details on all prerequisites and considerations, see the Microsoft Web site at: http://msdn.microsoft.com/en-us/library/ms189910.

## SQL SERVER FAILOVER CLUSTER INSTALLATION AND CONFIGURATION

### Installing SQL Server 2012

In this section, we review the process of installing a SQL Server AlwaysOn Failover Cluster Instance on the PowerEdge M420 platform – first on one node, then on subsequent nodes. For more details on installing SQL Server 2012, consult the full Microsoft Books Online documentation at http://msdn.microsoft.com/en-us/library/bb500469.

### Installing SQL Server 2012 on the first cluster node

In SQL Server 2012, Microsoft provides a cluster-specific installation option, streamlining the process for systems and database administrators. Whereas in past versions, systems and database administrators had a long list of manual prerequisites, in SQL Server 2012, the installer completes much of the work. The cluster installation option includes a prerequisite checker and other features that automate aspects of

cluster configuration. The full installation may take 30 to 60 minutes depending on the specific services and security your database environment needs.

To begin the installation, attach the SQL Server 2012 installation media to the server, either via virtual media or physical media, and begin setup. The first screen that appears is the SQL Server Installation Center on the Planning page. To view all installation options and begin the setup of SQL Server 2012, click Installation. Below, we walk you through the specific steps for installing the first node of the SQL Server failover cluster instance.

1. On the SQL Server 2012 installation page, click New SQL Server failover cluster installation.



2. Prior to any user interaction, the SQL Server 2012 installer performs a quick system check to ensure that the server is prepared for the installation. If any warnings or alerts occur, verify that your server meets all requirements and best practices found at http://msdn.microsoft.com/en-us/library/ms189910. After any warnings or failures are resolved, click Re-run. After all checks are passed, click OK to continue the installation.
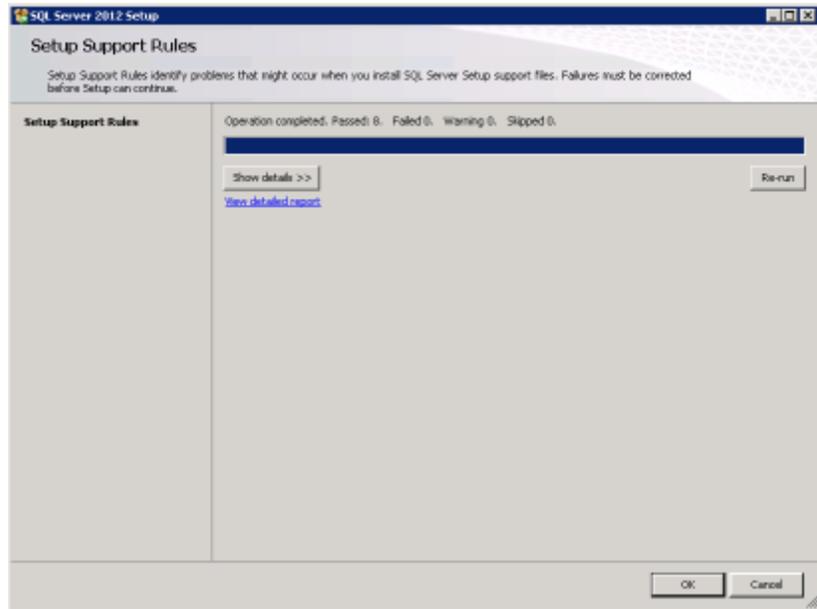
3. On the next page, enter your specific product key for SQL Server 2012 or select the free evaluation edition. Click Next to continue the installation.
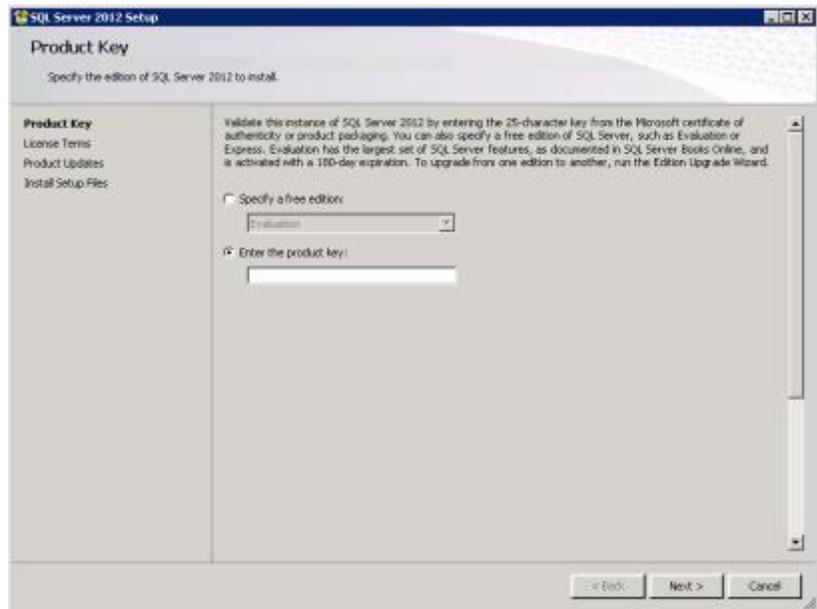


4. Review the Microsoft License Terms carefully, select I accept the license terms, and click Next.

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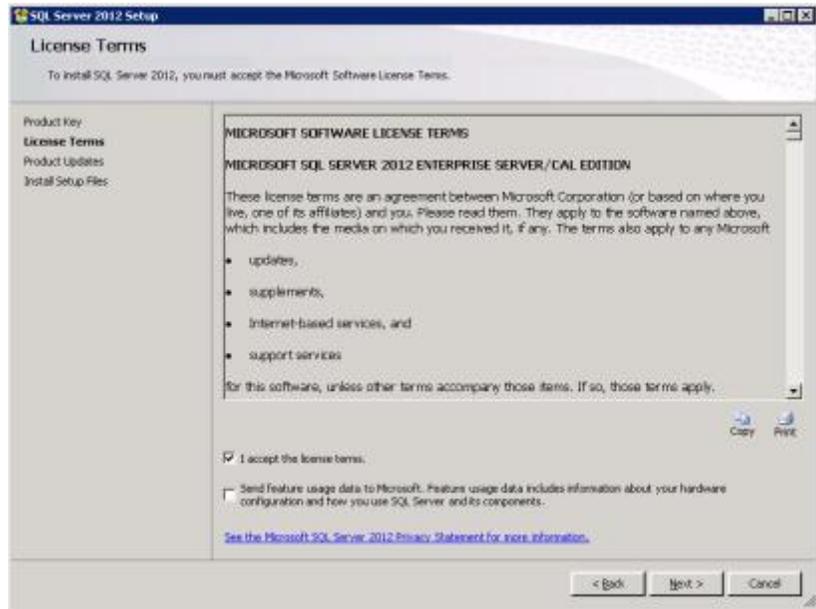
5.  During this step, the SQL Server 2012 installer checks for updates and installs the necessary files to begin the installation setup process. Click Install to continue to the next section of the installation.
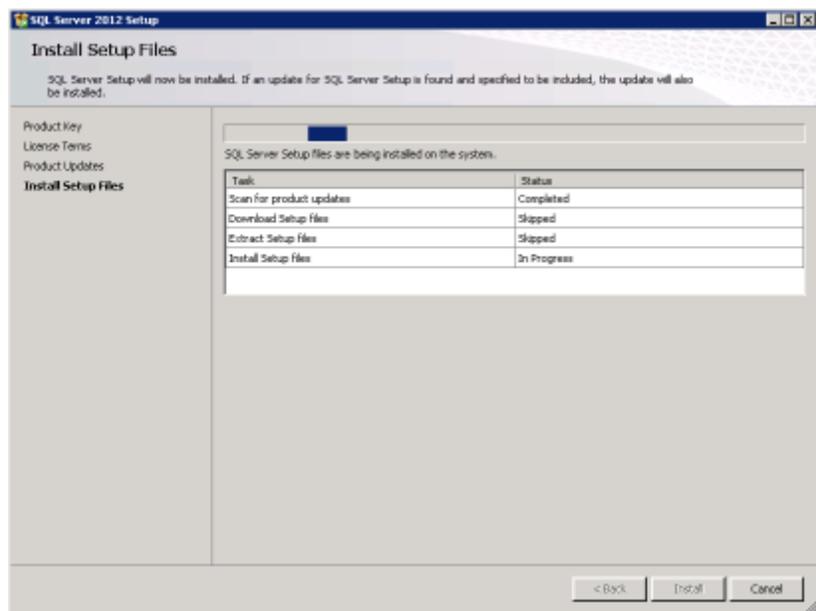


6.  Before continuing with the SQL Server 2012 configuration steps, the installer performs another system check to ensure that all prerequisites are met. This is the main prerequisite check in the installation process. Due to

NIC teaming and VLANs that we set up with our network configuration, the Microsoft Cluster Service verification presented a warning stating that two of the network adapters have the same MAC address. This warning is expected and will not affect the functionality of SQL Server failover instances. Again, if any errors are reported, resolve them following Microsoft best practices and prerequisites, re-run the system check, and click Next to continue.
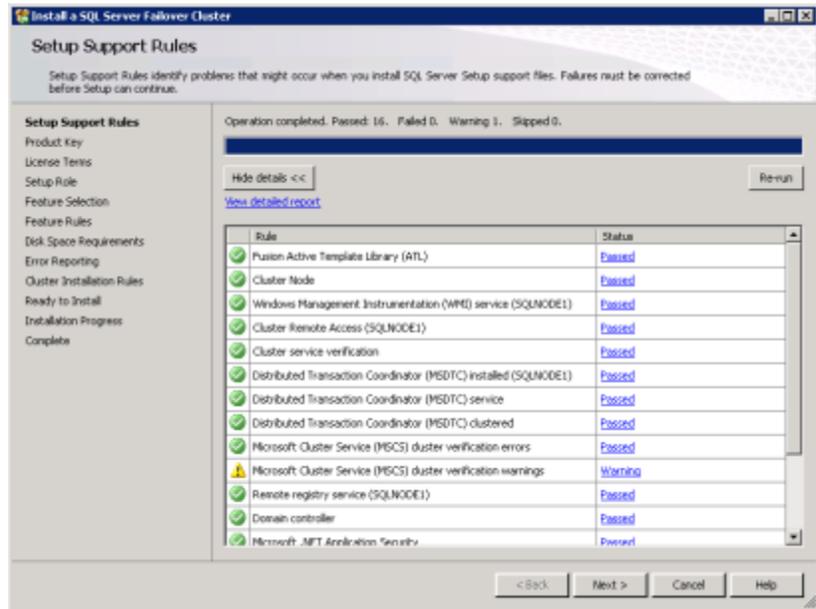


7. The next page again asks for the product key. Select the desired option, and click Next.

8. The installer once again presents the Microsoft Software License Terms. To continue, select I accept license terms, and click Next.

9. On the next screen, select the desired setup role. Select the SQL Server Feature Installation. SQL Server PowerPivot for SharePoint is beyond the scope of this paper. Click Next to continue the installation.
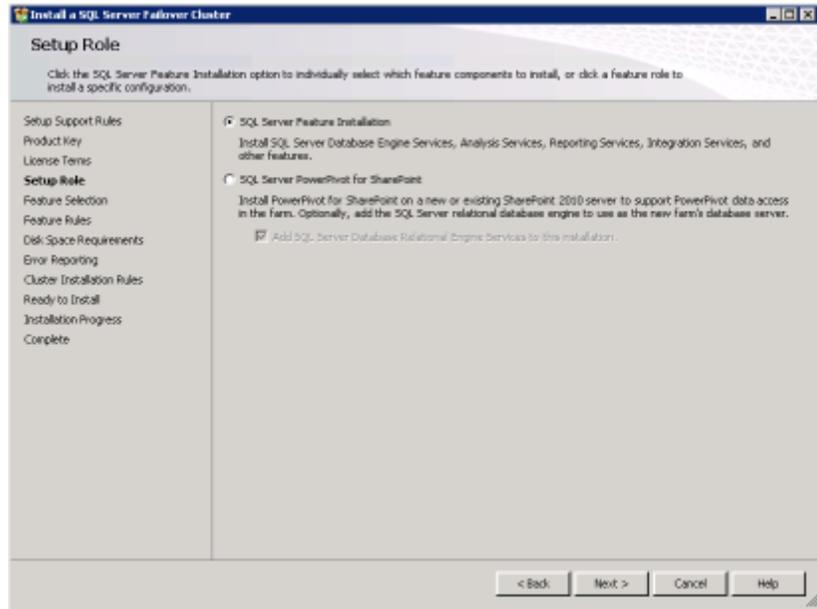
10. On the Feature Selection page, select the SQL Server features required for your database environment. This page includes brief descriptions of each feature as well as required prerequisites for each feature selected. Click Next.
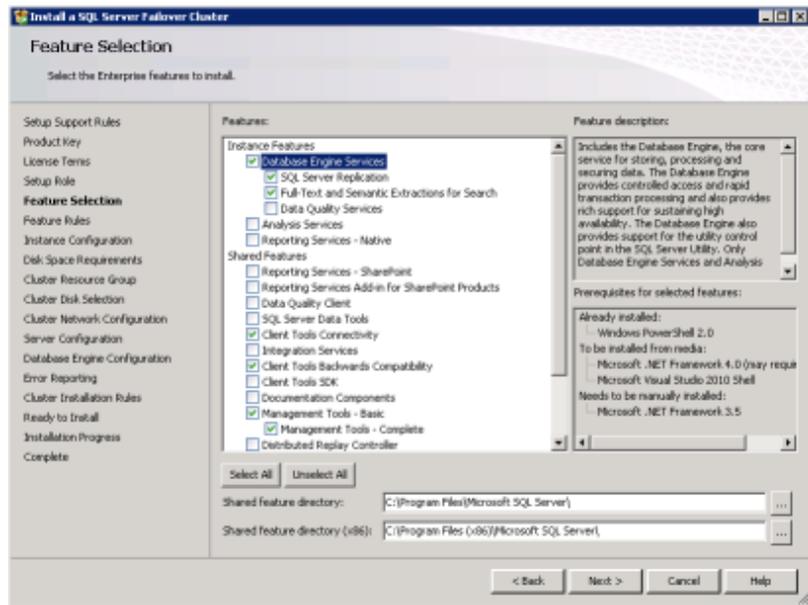
11. After selecting the desired features, the SQL Server installer runs a system check to ensure that the prerequisites for the selected features are present on the server.
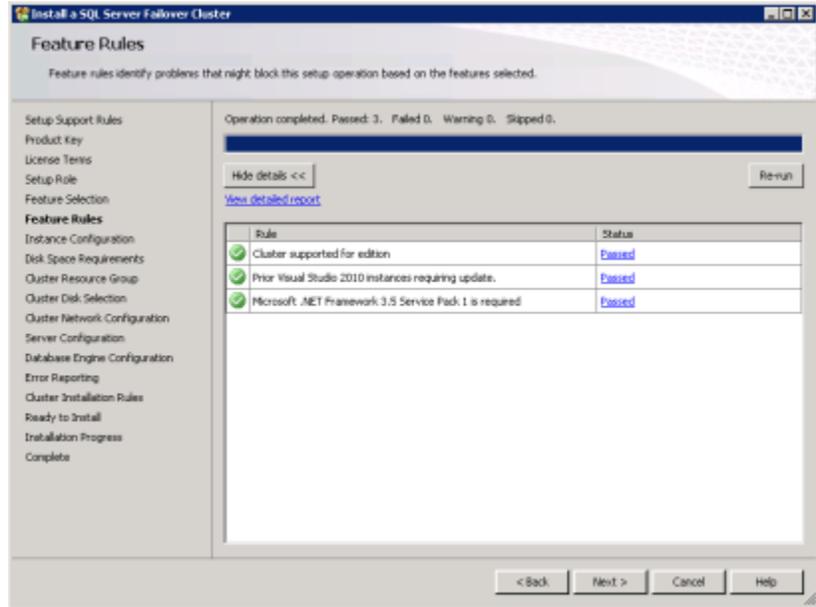


12. Generally speaking, when installing failover cluster instances, you should choose to install a named instance. Enter a name for your SQL Server cluster network and failover instance. Click Next.
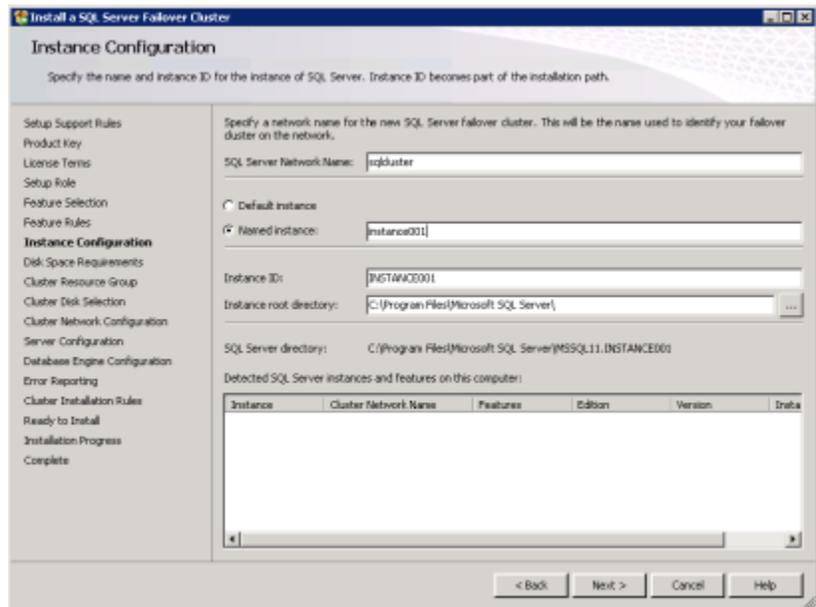
13. Select a name for the cluster resource group. The cluster resource group is a
logical container in Window Failover Cluster manager that pairs the SQL
Server Failover Cluster Instance with its shared resources and dependencies.
Using the cluster resource group, you can easily move failover instances
from one server to another valid cluster node in your Windows Failover
Cluster. A red square beside an existing resource group means it is in use by
other services and applications and therefore unavailable. Click Next.
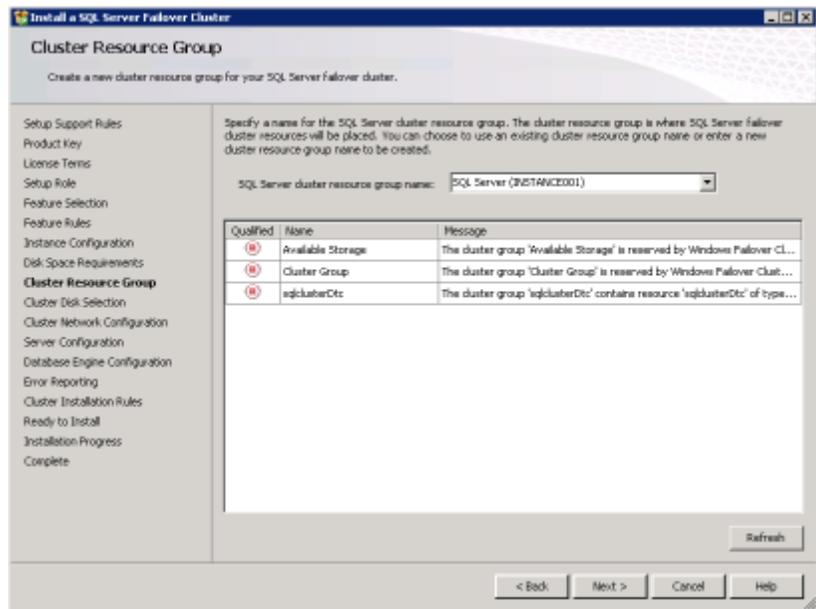
14. Ensure that you have available cluster disks in the Windows Failover Cluster before proceeding. In our setup, we allotted three disks specifically for use by SQL Server: database, log, and the tempdb database. These shared disks allow for the instance to failover to another host. Click Next.
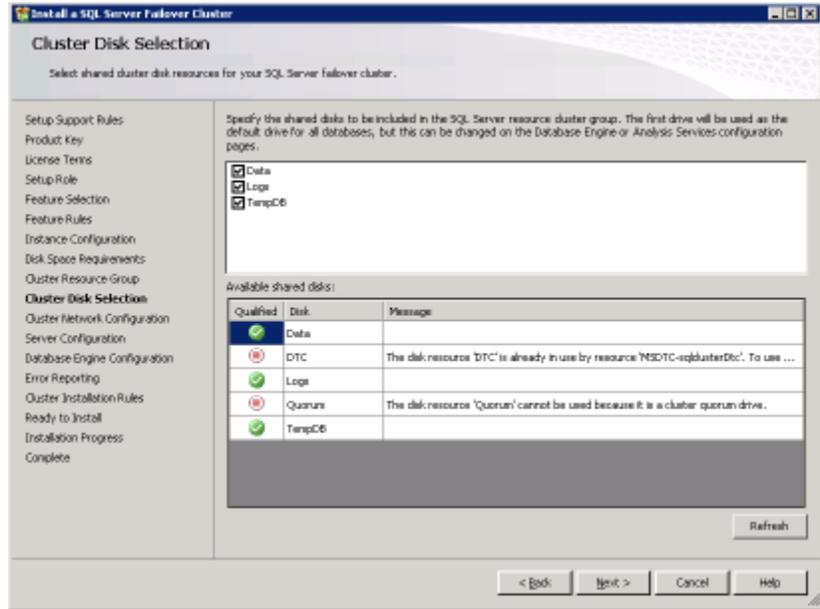


15. Select the appropriate cluster network, and enter the desired IP address for the new SQL Server failover instance. Click Next.
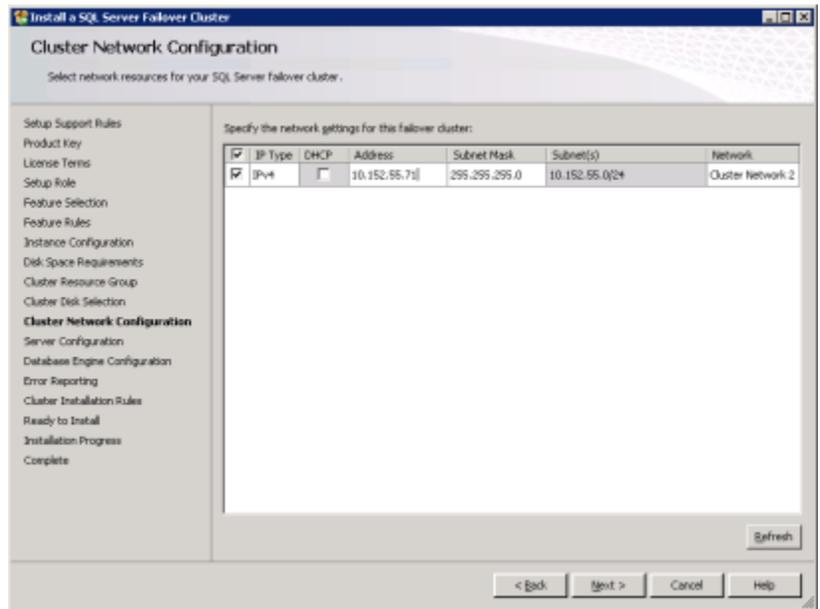
16. SQL Server requires security user accounts for different services. For added security, Microsoft recommends that you assign individual low-permission Active Directory user accounts to each service and do not use administrator accounts. The default collation settings are typically sufficient, but you can find additional settings on the Collation tab. For more information regarding collation, see http://technet.microsoft.com/en-us/library/cc281995. Once all credentials are configured, click Next.
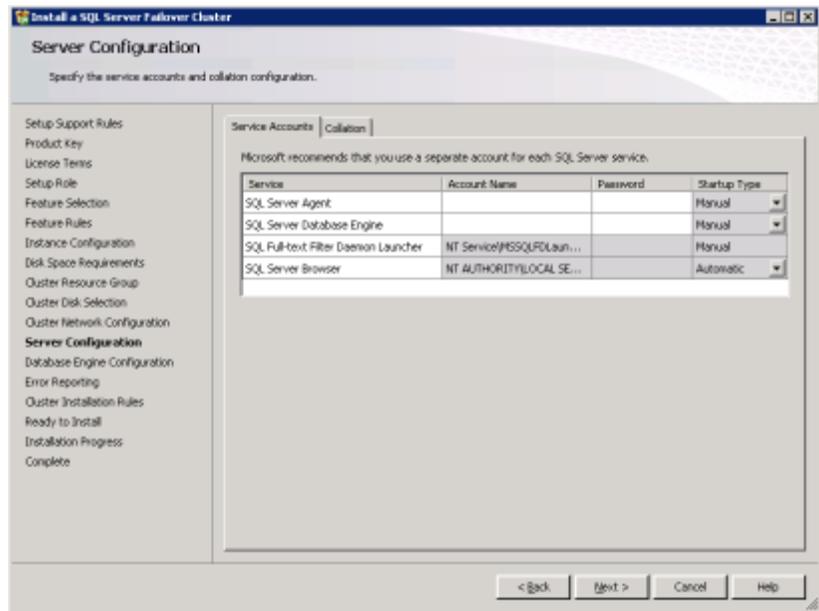


17. At the Database Engine Configuration screen, select the desired authentication mode. By selecting Mixed Mode, authentication to SQL Server can use both Windows logins and built-in SQL Server security. If you choose to enable Mixed Mode, enter a strong password for the SQL Server administrator account (sa). Next, add all Domain or Local Windows accounts that you wish to be included as a SQL Server administrator. To add the user that you are currently using to log into Windows, click the Add Current User button. Continue by clicking the Data Directories tab.
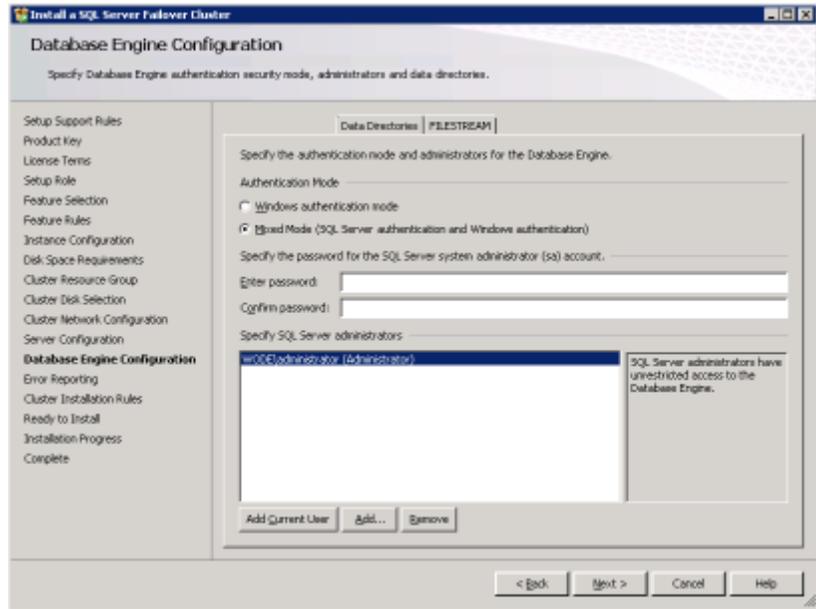
18. This screen lists the various data and log directories used by the instance database engine. Default locations are presented first, but the locations can be adjusted based on your desired setup. For our setup, we had a separate cluster disk for each basic directory listed: data, log, and tempdb database.
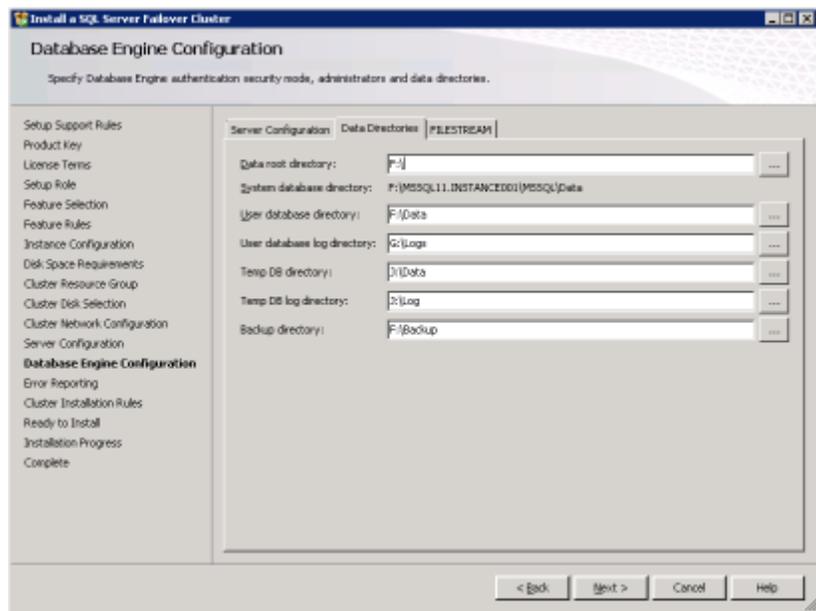


19. Choose your Error Reporting feature preference, and click Next.

20. Before continuing to the install page, the SQL Server 2012 installer runs a quick system check for clustering rules. Resolve any warnings and failures before continuing with the installation.
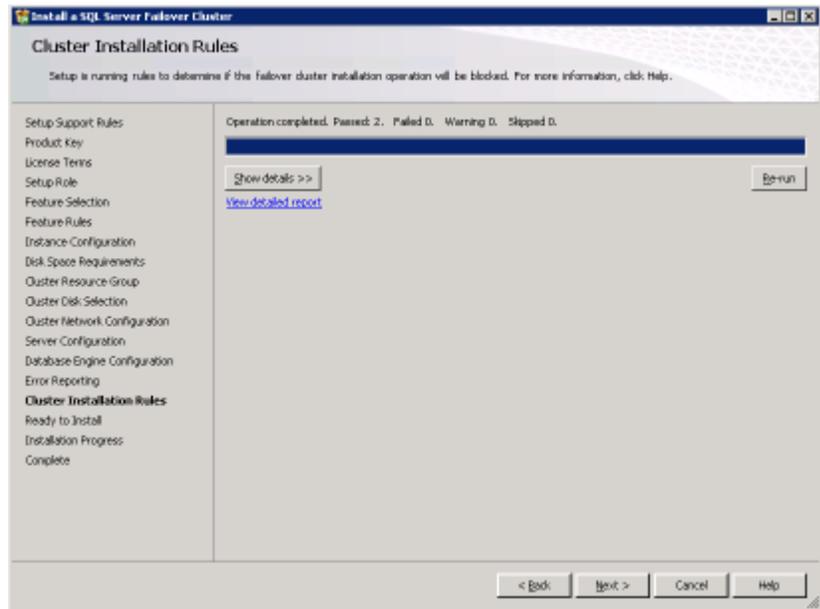


21. On the Ready to Install page, review the installation summary, and ensure that all settings are configured appropriately. If there are any items that need to be changed, click Back until you are on the correct setup page. To begin the installation of the single-node SQL Server 2012 failover cluster instance, click Install.
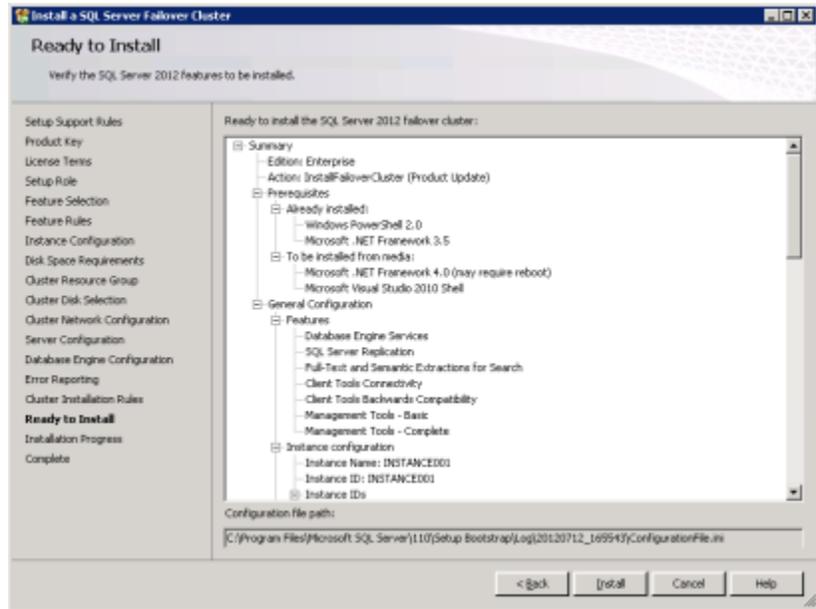
22. The installer then begins to install and configure the new instance. This process will take 20 minutes or more to complete depending on the SQL Server features selected.
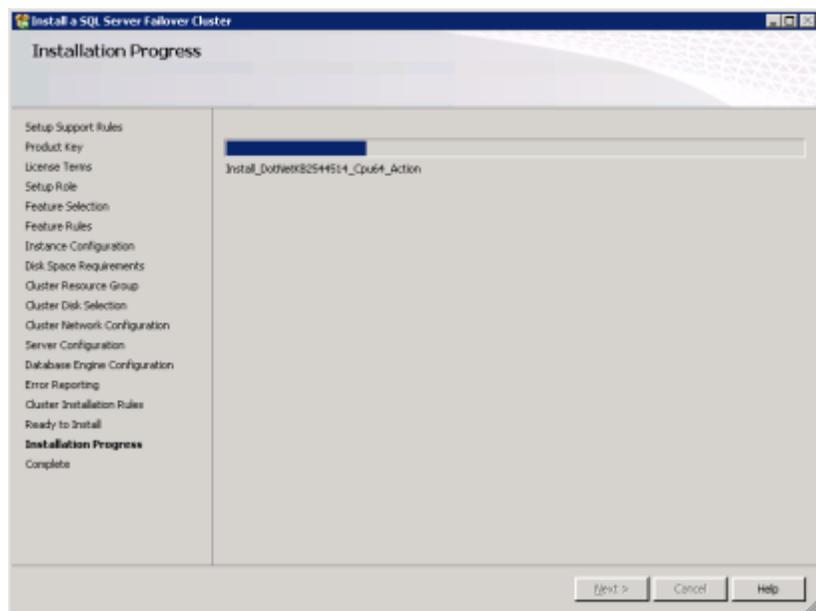


23. After the installation completes, check the Complete window and make sure that all items have successfully installed. If any errors occur, review the test environment and prerequisites for any issues you may have overlooked. For

unresolved errors, refer to the SQL Server troubleshooting and support page at http://msdn.microsoft.com/en-us/sqlserver/bb895923.aspx.
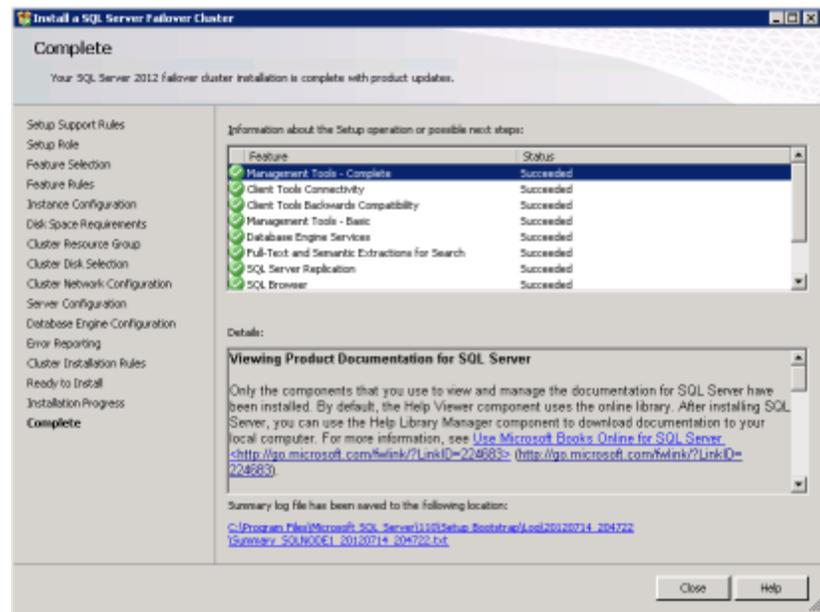


With the installation complete, the new SQL Server 2012 Failover Cluster Instance appears in the Windows Failover Cluster Manager under Services and applications.

## Configuring multiple nodes

For the new failover instance to be highly available, you must add a node to your SQL Server 2012 clustered instance. In the installer, Microsoft includes an additional installation option: Add node to a SQL Server Failover cluster. This option starts an install wizard that walks the user through a typical SQL Server installation with a few added options. You must add the new node to the Windows Failover Cluster prior to beginning the SQL Server 2012 Add Node installation. To begin the installation of a new SQL Server Failover cluster node, insert the installation media into the second Windows failover cluster server node. When the SQL Server Installation Center window appears, select Installation, and click the Add node option.

1. As in the initial setup of the first node, setup runs a quick system check to catch any problems that could interfere with the installation of the SQL Server failover cluster node. Once all errors are resolved, click OK to continue the installation.
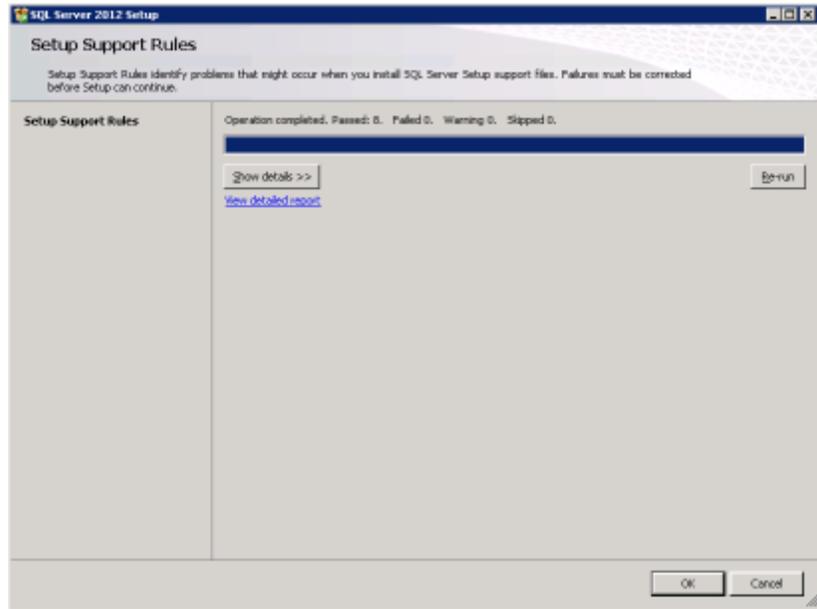
2. A product key or use of the evaluation edition is required to continue through the installation. Select the desired option, and click Next to continue.
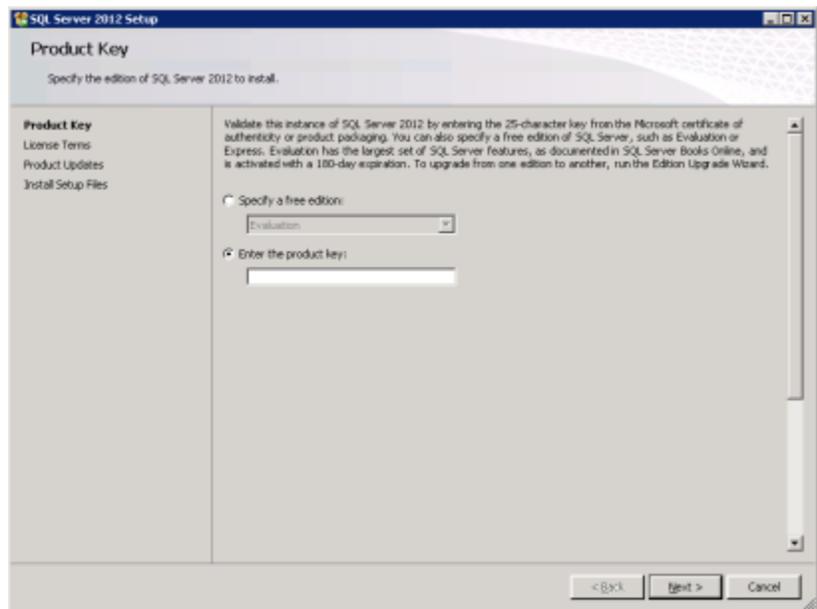
3. Carefully read through the Microsoft Software License Terms, and click Next to continue.
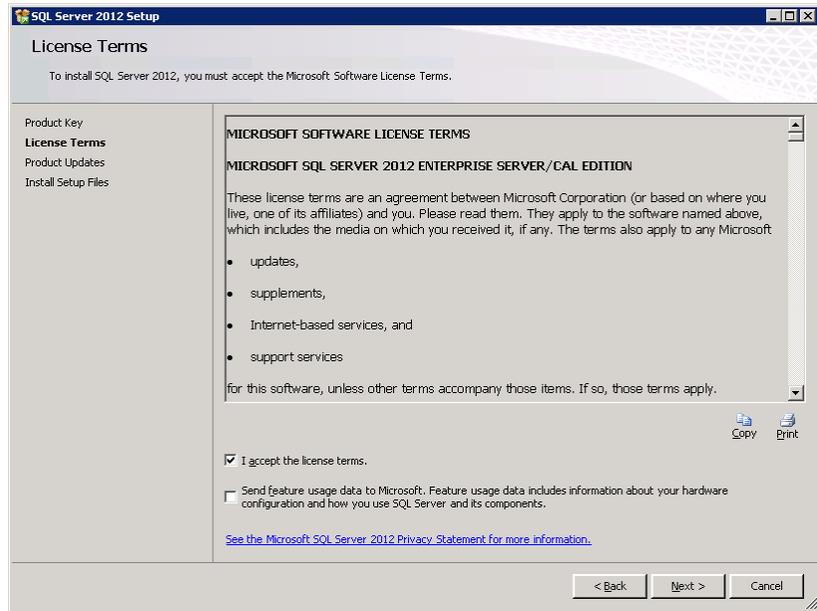


4. Click Install to continue. The installation wizard will begin a quick check for updates and install the necessary setup files to continue with the Add node operation.
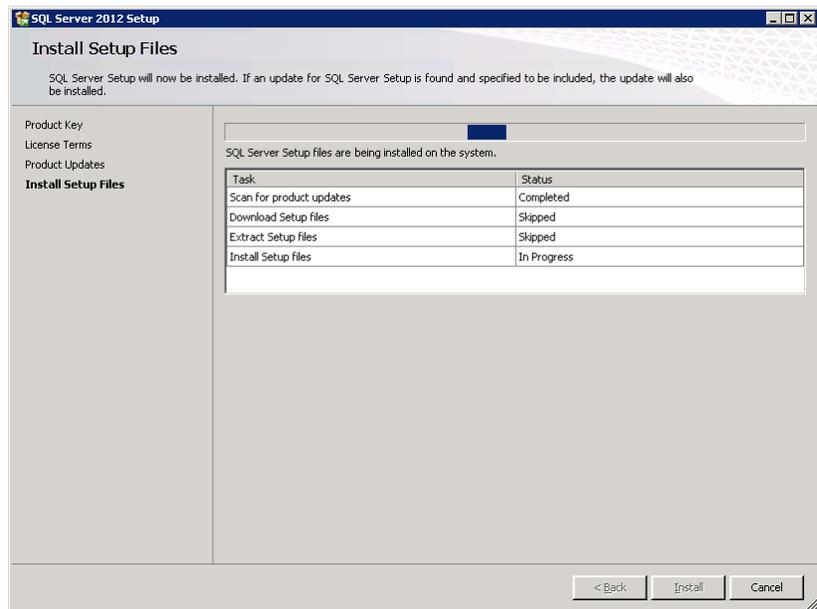
5. After the setup files have been installed, the wizard runs a system check to ensure that the server meets all prerequisites for adding it to an existing SQL Server Failover cluster. Resolve any errors and review any warnings, and click Next.
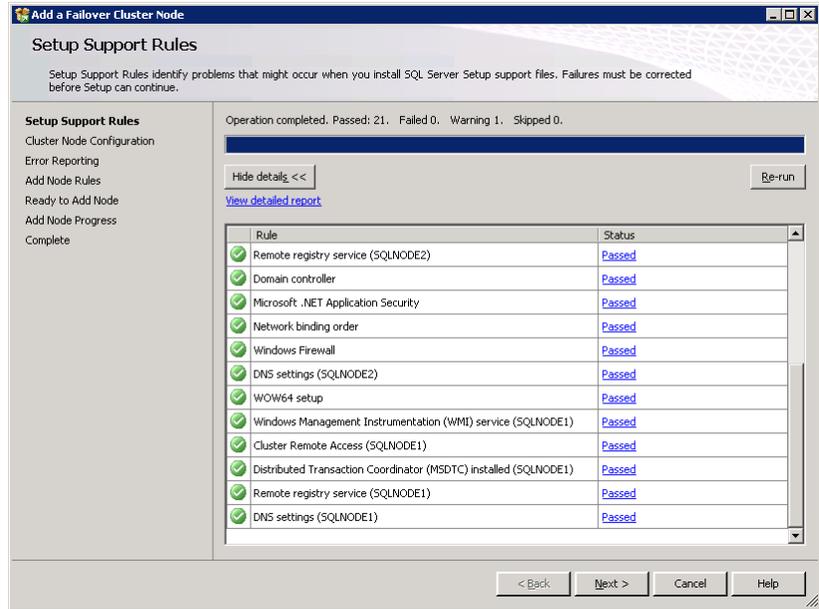


6. Select the desired SQL Server Failover cluster for the new node. Click Next to continue.
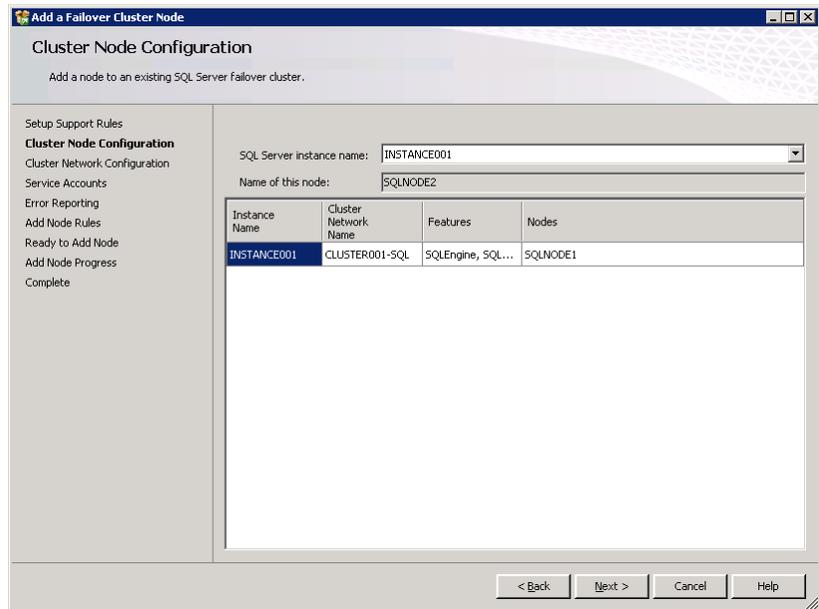
7.  Ensure that the proper cluster network is selected. Because the node has already been added to the Windows Failover Cluster, the correct cluster network already exists and is selected. Click Next to continue.
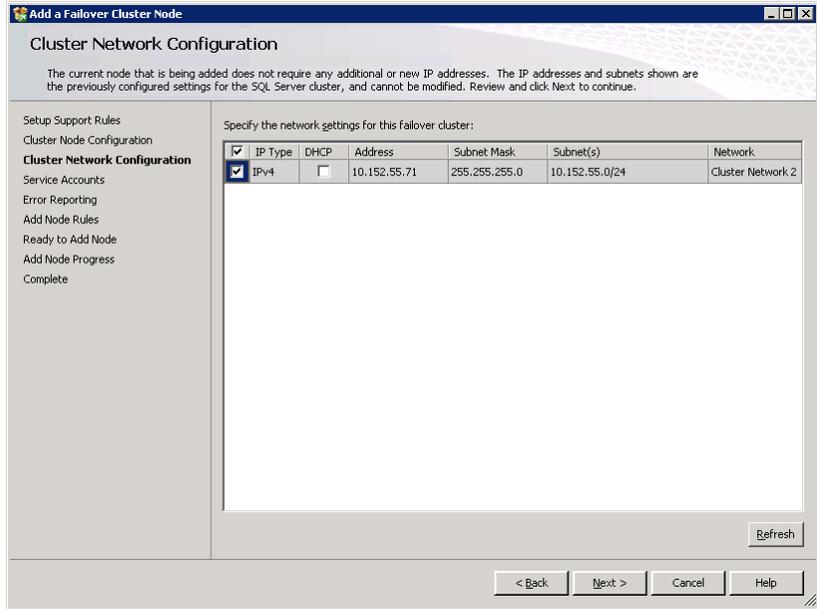


8.  Enter the passwords for each Active Directory user account assigned to the existing SQL services in the SQL Server failover cluster. Click Next.
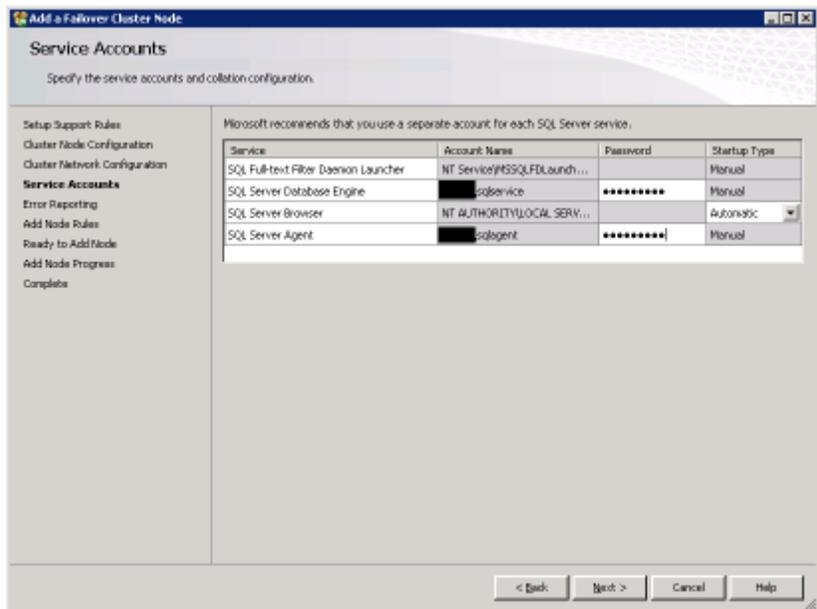
9. The installer gives you the option to enable Error Reporting. If you wish to continue without enabling Error Reporting, click Next.
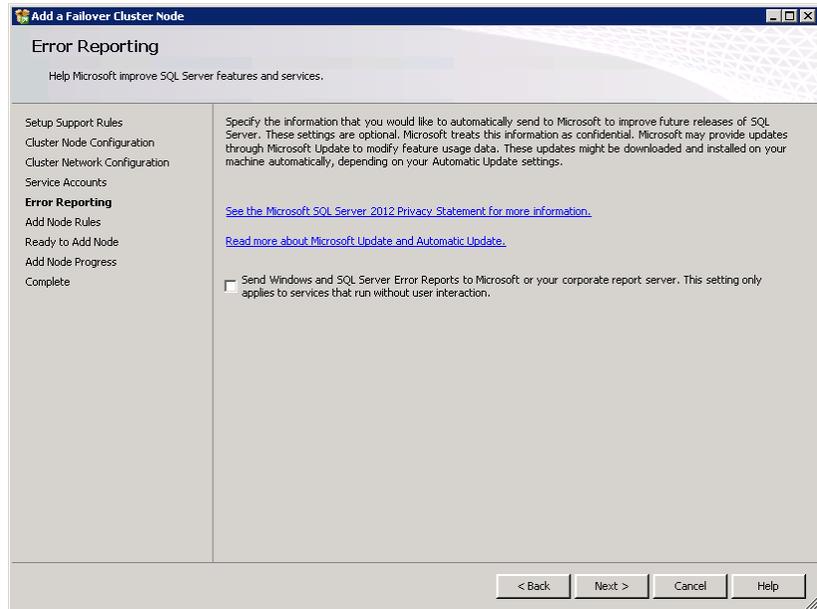


10. Before the node is added to the SQL Server failover cluster, the installer runs a system check to verify that the system meets the requirements to begin the installation. Resolve any errors, and click Next.
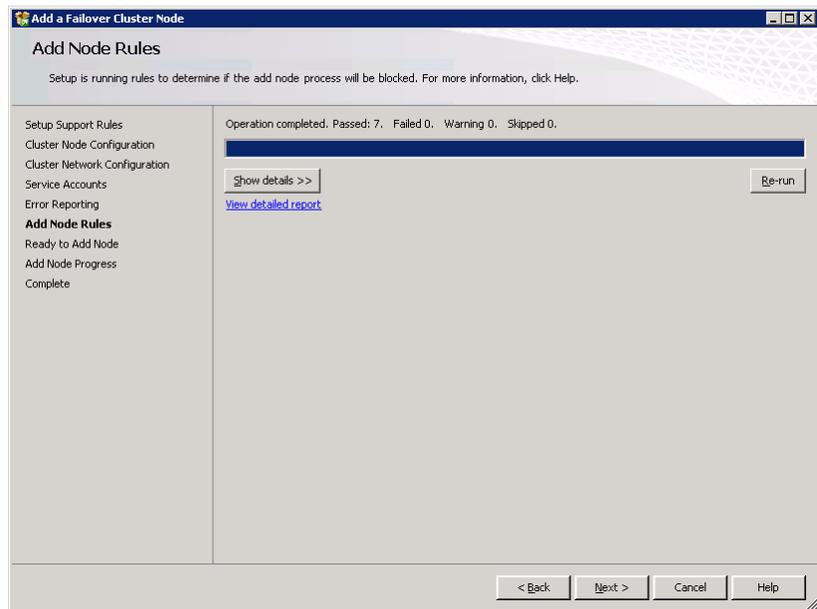
11. Review the Add node summary, and ensure that the proper SQL Server failover cluster has been selected for the new node. Click Install to begin the Add node installation. This process takes 10 minutes or more.
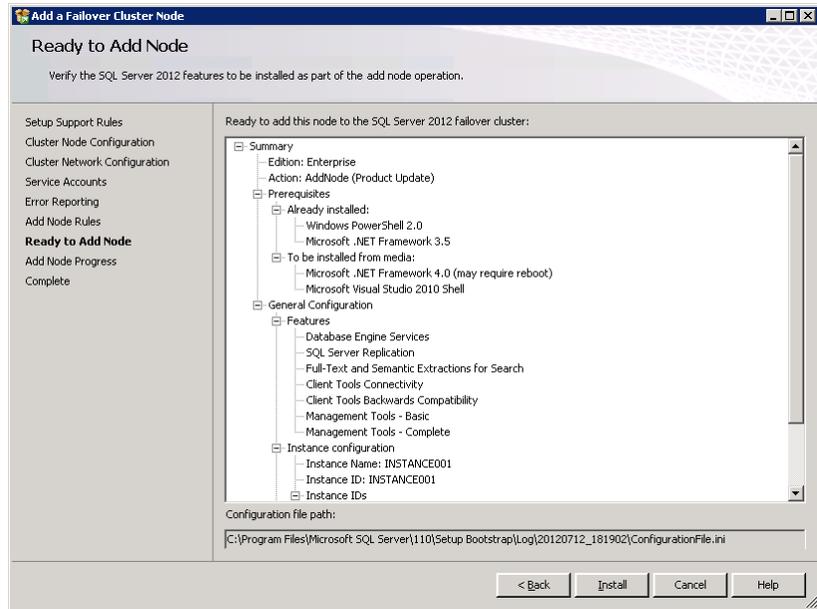


12. After the installation completes, verify that all features have successfully installed. If there are any errors, refer to the last step of the *Installing SQL Server 2012 on the first cluster node* section in this document.
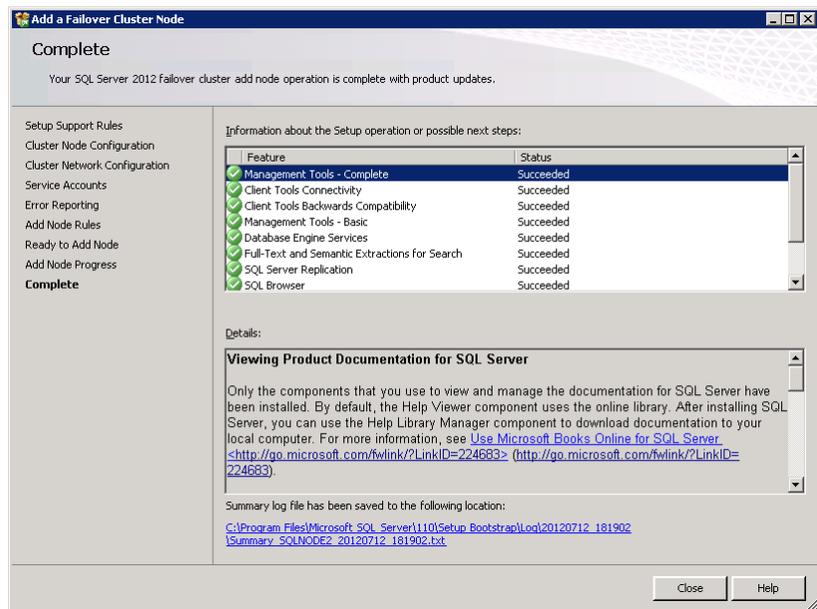
# SUMMING IT ALL UP

By utilizing the Dell PowerEdge M420 blade server with SQL Server 2012 AlwaysOn Failover Cluster Instances, you can create a self-contained, highly available database solution while using minimal rack space. The ability to cluster SQL Server instances for high availability and redundancy in such a small and dense form factor with the Dell PowerEdge M420 is a powerful combination for your enterprise database needs.

# APPENDIX A – DELL POWEREDGE M420 SYSTEM DETAILS

Figure 5 presents the server configuration we used for this guide.

| System | Dell PowerEdge M420 Blade Server |
|---|---|
| **Power supplies** | Dell PowerEdge M1000e Blade Enclosure |
| Total number | 6 |
| Vendor and model number | Dell A236P-00 |
| Wattage of each (W) | 2,360 |
| **Cooling fans** | Dell PowerEdge M1000e Blade Enclosure |
| Total number | 9 |
| Vendor and model number | Dell YK776 Rev. X50 |
| Dimensions (h x w) of each | 3.1" x 3.5" |
| Volts | 12 |
| Amps | 7 |
| **General** | |
| Number of processor packages | 2 |
| Number of cores per processor | 8 |
| Number of hardware threads per core | 2 |
| System power management policy | Balanced |
| **CPU** | |
| Vendor | Intel |
| Name | Xeon |
| Model number | E5-2470 |
| Stepping | C2 |
| Socket type | FCLGA1356 |
| Core frequency (GHz) | 2.3 |
| Bus frequency | 8.0 GT/s |
| L1 cache | 32 KB + 32 KB (per core) |
| L2 cache | 256 KB (per core) |
| L3 cache | 20 MB |
| **Platform** | |
| Vendor and model number | Dell PowerEdge M420 |
| Motherboard model number | 0MN3VC |
| BIOS name and version | Phoenix 1.2.4 |
| BIOS settings | Default |
| **Memory module(s)** | |
| Total RAM in system (GB) | 96 |
| Vendor and model number | Samsung M393B2G70BH0-YH9 |
| Type | PC3L-10600R |
| Speed (MHz) | 1,333 |
| Speed running in the system (MHz) | 1,333 |
| Timing/Latency (tCL-tRCD-tRP-tRASmin) | 9-9-9-36 |

| System | Dell PowerEdge M420 Blade Server |
|---|---|
| Size (GB) | 16 |
| Number of RAM module(s) | 6 |
| Chip organization | Double-sided |
| Rank | Dual |
| **Operating system** | |
| Name | Windows Server 2008 R2 SP1 |
| Build number | 7601 |
| File system | NTFS |
| Kernel | APCI x64-based PC |
| Language | English |
| **Graphics** | |
| Vendor and model number | Matrox® G200eR |
| Graphics memory (MB) | 16 |
| Driver | 2.4.1.0 9/8/2011 |
| **RAID controller** | |
| Vendor and model number | Dell PERC H310 Embedded |
| Firmware version | 20.10.1-0084 |
| Driver version | 5.1.112.64 6/12/2011 |
| Cache size (MB) | 0 MB |
| **Hard drive** | |
| Vendor and model number | Dell M16CSD1-50UCV-D |
| Number of disks in system | 2 |
| Size (GB) | 50 |
| Type | SSD |
| **Ethernet adapters** | |
| Vendor and model number | 4x Broadcom® BCM57810 NetXtreme® II 10 GigE |
| Type | Mezzanine |
| Driver | 7.2.8.0 3/13/2012 |
| **USB ports** | |
| Number | 2 external |
| Type | 2.0 |

Figure 5: The server configuration we used for this reference architecture.

# APPENDIX B – BROADCOM NETWORK SETUP

Below we outline the steps we used within Windows to create the necessary NIC teams we used in our SQL Server 2012 Failover Cluster environment using the Dell PowerEdge M420 Broadcom NICs with the Dell Force10 MXL and PowerConnect M8024-K 10Gb switches. To complete these steps, you must have the latest Broadcom Advanced Control Suite (BACS) installed on each server. The BACS provides more advanced networking tools, allowing for a more user-friendly interface for configuring NIC teams, hardware iSCSI, and various other networking operations. Also, make sure that the blade has connectivity to the iSCSI, domain, and cluster heartbeat networks. Your specific situation may vary based on specific mezzanine cards chosen in your PowerEdge M420 and your specific switches.

For detailed information on configuring NIC teaming with the BACS, see Dell documentation at http://support.dell.com/support/edocs/network/BroadCom/71921/NetXtremeII/en/bacs.htm.

1. Set up advanced networking (iSCSI offload):
    a. Open the Broadcom Advanced Control Suite 4 application.
    b. Select the Broadcom 10Gb NIC port 1 from the list.
    c. In the Configuration tab, enable iSCSI Offload Engine from the Resource Reservation sub-section.
    d. Select the newly created VBD interface under the same port name.
    e. In the Configuration tab, set the MTU size to 9000, assign a static IP address, and click Apply.
    f. Repeat steps b-e for Broadcom 10Gb NIC port 2 and apply the appropriate IP address.
    g. Repeat for the remaining server nodes.
2. We teamed two NICs for iSCSI and cluster heartbeat traffic, and two NICs for SQL Server application traffic. Set up advanced networking (NIC Teaming):
    a. Open the Broadcom Advanced Control Suite 4 application.
    b. From the Team Menu, select Create a Team.
    c. At the Broadcom Teaming Wizard welcome screen, click Next.
    d. Enter a name for the team (e.g., Team 1), and click Next.
    e. Select Smart Load Balacing(TM) and Failover (SLB) for the Team Type, and click Next.

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f.  Select both Broadcom 10Gb adapters from the list, click Add, and click Next.

g.  Select Do not configure a standby member, and click Next.

h.  From the Configure LiveLink list, select No, and click Next.

i.  Select Skip Manage VLAN, and click Next.

j.  Select Commit changes to system and Exit the wizard, and click Finish.

k.  Repeat for the second NIC team.

l.  Repeat for the remaining server nodes.

# APPENDIX C – WINDOWS FAILOVER CLUSTER SETUP

Prior to the installation of a SQL Server 2012 Failover Cluster, a Windows Failover Cluster must be configured on the servers where the SQL Server Failover Cluster instances will run. Below are the specific steps we took to configure a basic Windows Failover Cluster with two nodes. Before this configuration, both servers must have network connectivity to all three networks (iSCSI, domain, and cluster heartbeat), have the Failover Clustering feature installed, and all cluster disk formatted and attached to each server. The servers must be joined to the domain.

1. To begin the process of setting up the cluster with the first node, open the Failover Cluster Manager located in Administrator Tools. Use the validation wizard to check the setup prerequisites needed to create a functional cluster. To do this, click Validate a Configuration.
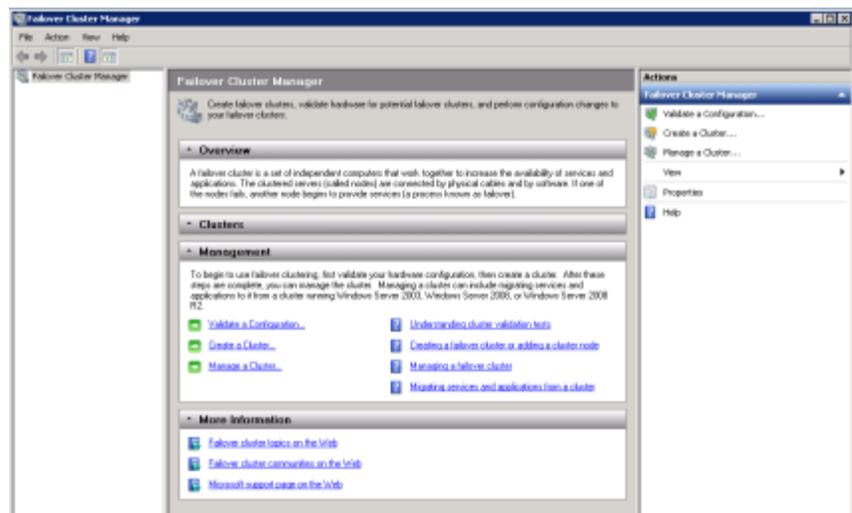


2. The wizard begins with an overview screen, and offers links to more information if needed. Click Next.

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3. Enter the fully qualified domain name of the server nodes for the new cluster. The validation wizard checks the readiness of all servers added to this list. Click Next.
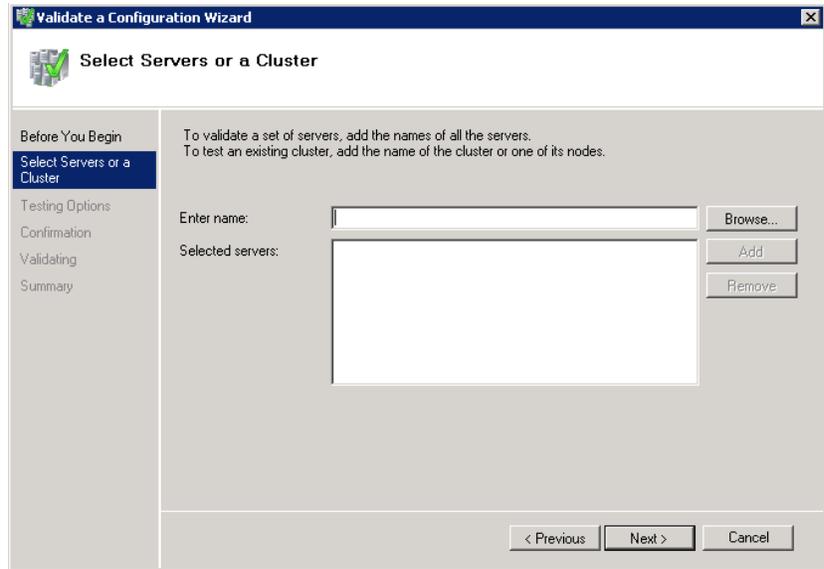


4. On the Testing Options screen, if this is the first time running a validation with the selected configuration, it is best to select Run all tests. If you are troubleshooting errors, the second option gives you the flexibility to quickly determine whether an error is fixed. Select the desired option, and click Next.
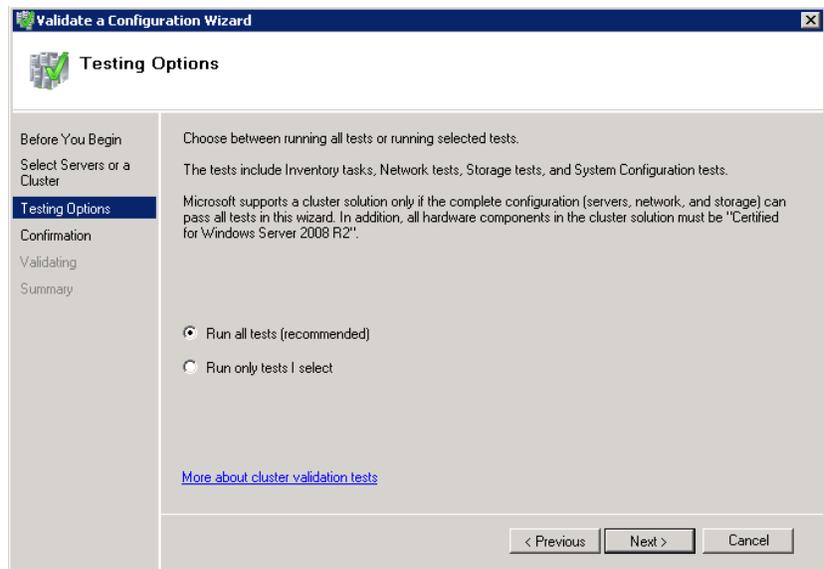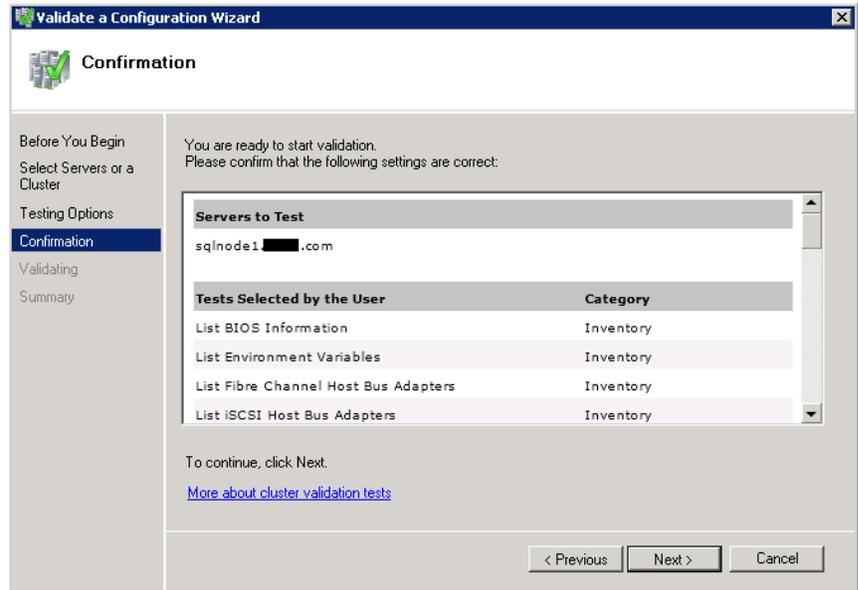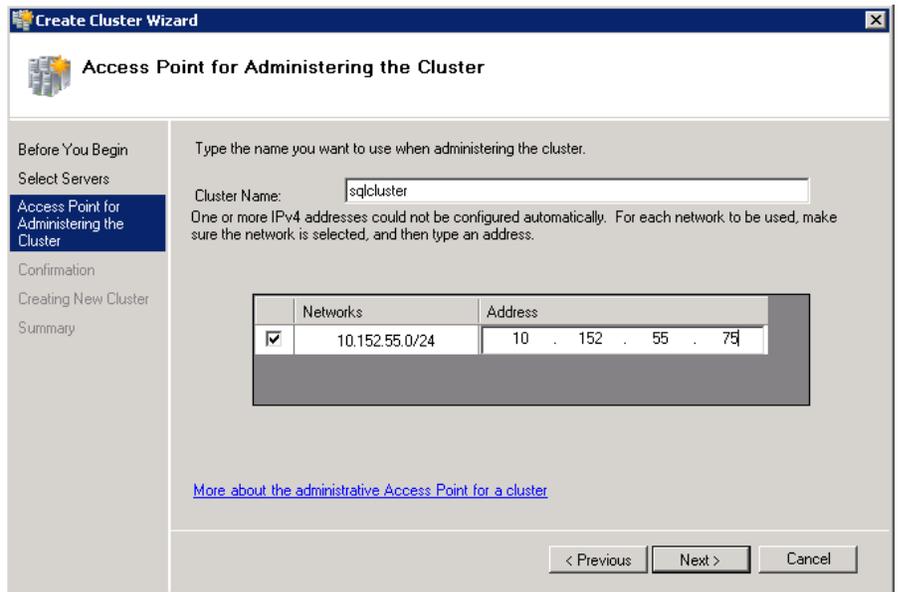
5. Click Next to begin the cluster validation. When the cluster validation is complete, review any issues, resolve them and run the validation wizard again. If you have no issues, move on the in process.

6. From the Failover Cluster Manager window, click Create a cluster…
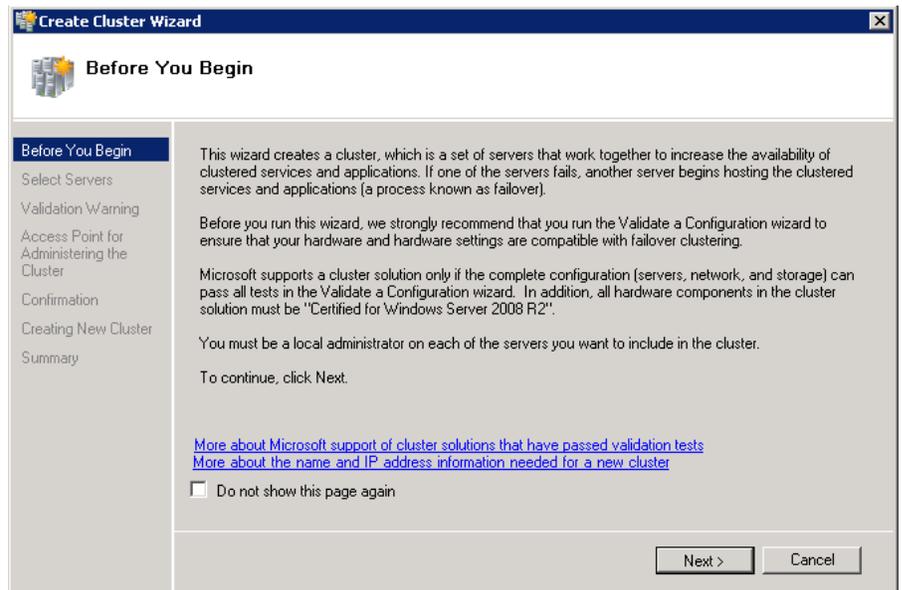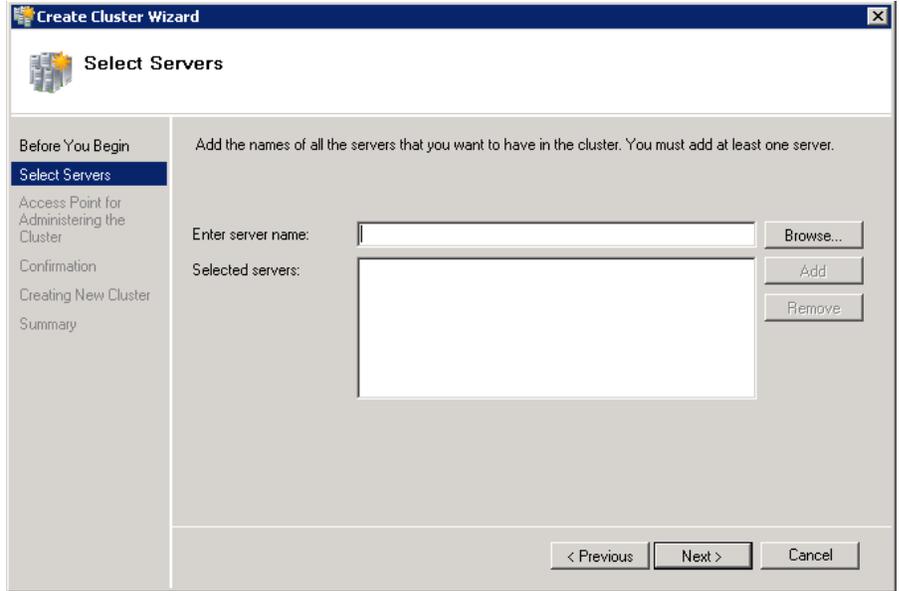
7. Add the applicable servers FQDNs in the Select Servers screen.



8. Assign the cluster name, choose the network, and set the static cluster IP address.

9. Click Next to confirm and let the Create Cluster Wizard complete the cluster creation.
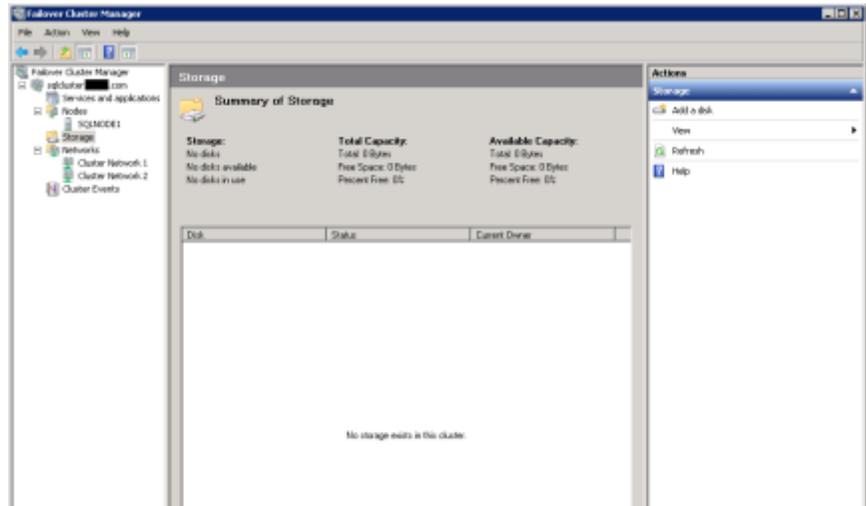


10. Next, add the shared storage disks to your cluster. This includes a small volume for MS DTC usage, and any or all database shared storage you wish to be available for later use by the SQL Server cluster installation process.

11. Click Storage in the left pane, and click Add a disk in the right pane. Select your applicable cluster volumes and add the volumes to the cluster.
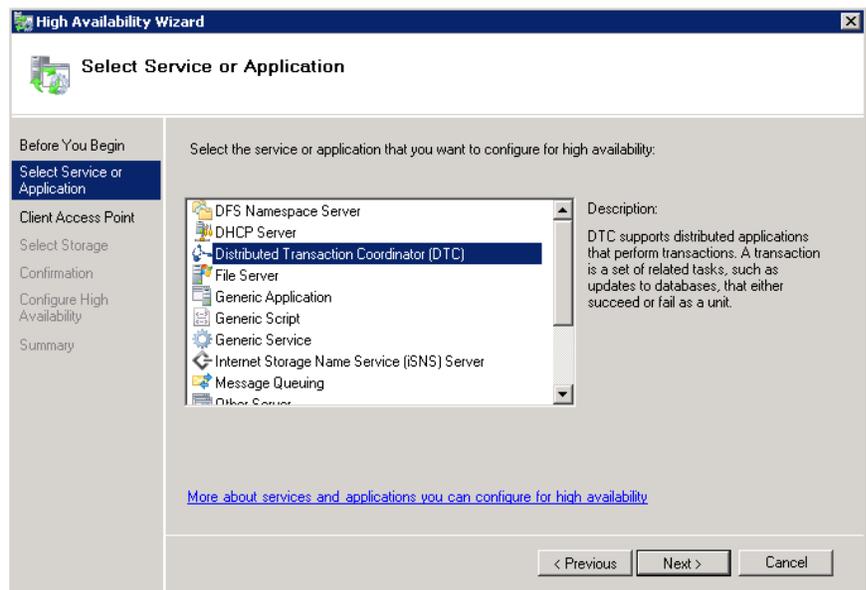
12. In the Failover Cluster Manager application, install Microsoft Distributed Transaction Coordinator (DTC). To do this, right-click Services and Applications and choose Configure a Service or Application.
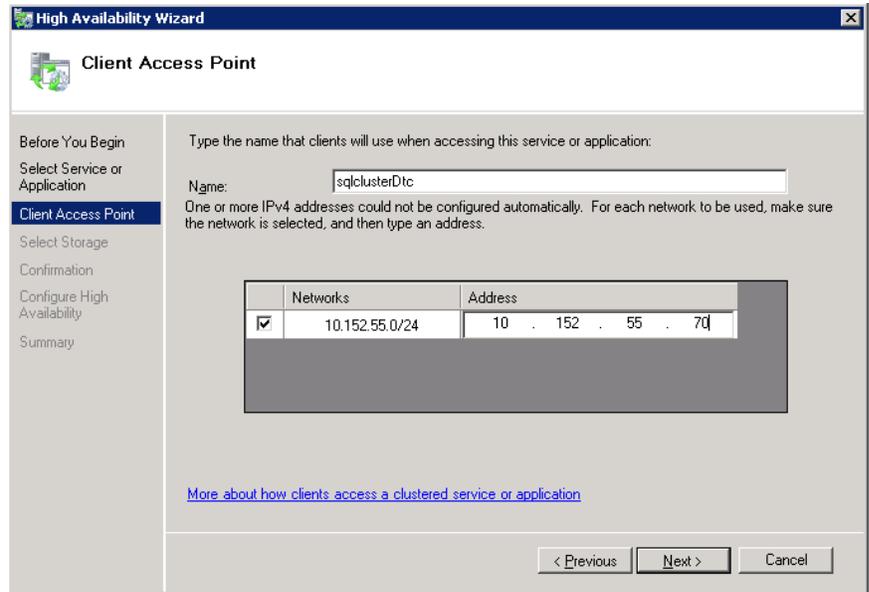


13. Name the DTC service and provide a static IP address. Click Next.
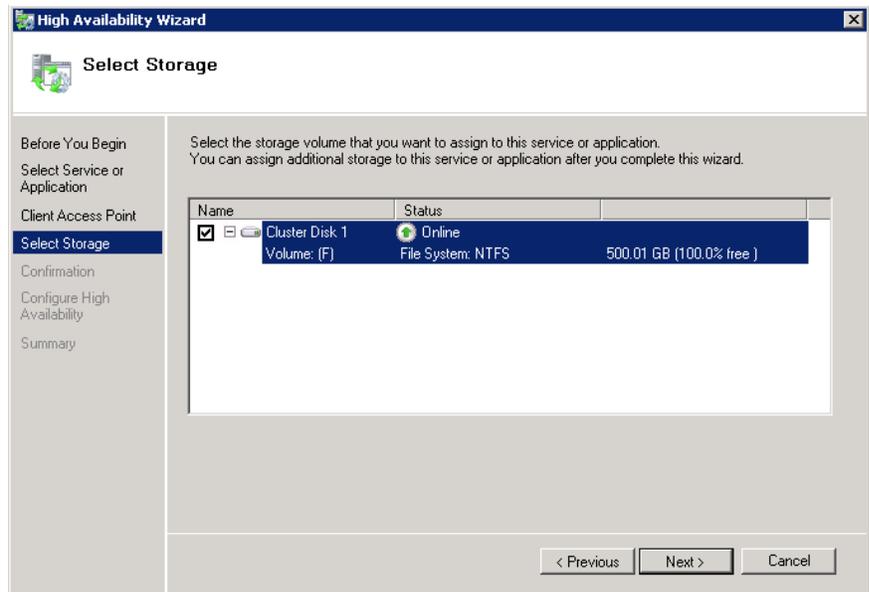
14. Select the cluster disk you wish to associate with the DTC service. To finish the DTC installation, click Next, and click Finish.

15. Finally, run the Add Node wizard from the Failover cluster Manager application. Right-click Nodes, and choose Add Node. Follow the prompts and enter the server name and applicable information to add other nodes to this Windows Failover Cluster.

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