Using SANDeploy iSCSI SAN for Windows Server 2008 Clustering

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www.sandeploy.com

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Overview

High-availability clusters (also known as HA Clusters or Failover Clusters) are computer clusters that are implemented primarily for the purpose of providing high availability of services which the cluster provides. They operate by having redundant computers or nodes which are then used to provide service when system components fail. Normally, if a server with a particular application crashes, the application will be unavailable until someone fixes the crashed server. HA clustering remedies this situation by detecting hardware/software faults, and immediately restarting the application on another system without requiring administrative intervention, a process known as Failover. As part of this process, clustering software may configure the node before starting the application on it. For example, appropriate file systems may need to be imported and mounted, network hardware may have to be configured, and some supporting applications may need to be running as well.

A SCSI-3 compatible external storage is necessary for using Windows Server 2008 Clustering. SANDeploy offers a SCSI-3 compatible iSCSI storage service, that enable to create an external shared storage in Microsoft Windows environment without extra hardware needed.



Figure 1, SANDeploy Offers shared-storage array for Windows Server 2008 Cluster

This document gives users detailed step-by-step instructions on configuring SANDeploy iSCSI SAN for Windows Server 2008 or Windows Server 2008 R2 failover clusters. Failover clustering needs two or more computers use a few external storages such as iSCSI disks. With SANDeploy, you can quickly create a series of shared disks for clustering. Before to do so, prepare the following three computers or virtual machine in Hyper-v:

| Name | IP Address | Detail |
|-----------|---------------------------------|-------------------|
| 08DC | 192.168.0.100 / 192.168.100.100 | Domain Controller |
| 08Node1 | 192.168.0.101 / 192.168.100.101 | Failover Node 1 |
| 08Node2 | 192.168.0.102 / 192.168.100.102 | Failover Node 2 |
| SANServer | 192.168.0.3 / 192.168.100.3 | SANDeploy Server |

Configuring on Domain Controller

Network Adapter

For working in clustering environment, the network adapter must be assigned a static IP address. Select the **Internet Protocol Version 4(TCP/IPv4)** and then press the **Properties** button, the **Internet Protocol Version 4 (TCP/IPv4)** dialog is shown. As Active Directory requires DNS, an address must be provided, in this case we can specify itself IP address. DNS will be installed later after installed Active Directory.

Set the first network adapter, this adapter will connect to external network.

| Internet Protocol Version 4 (TCP/IPv | /4) Properties | | |
|---|-------------------|--|--|
| General | | | |
| You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings. | | | |
| C Obtain an IP address automatical | ly | | |
| Use the following IP address: | | | |
| IP address: | 192.168.0.200 | | |
| S <u>u</u> bnet mask: | 255.255.255.0 | | |
| Default gateway: | 192.168.0.1 | | |
| C Obtain DNS server address auton | natically | | |
| • Use the following DNS server add | resses: | | |
| Preferred DNS server: | 192.168.0.1 | | |
| Alternate DNS server: | · · · | | |
| Vaļidate settings upon exit | Ad <u>v</u> anced | | |
| | OK Cancel | | |

Type the IP address and DNS server address.

Set the second network adapter, this adapter will connect to internal network.

| Internet Protocol Version 4 (TCP/IP | v4) Properties 🛛 💽 🗙 |
|---|--|
| You can get IP settings assigned autor this capability. Otherwise, you need to for the appropriate IP settings. | matically if your network supports ask your network administrator |
| O Obtain an IP address automatica | lly |
| □ Use the following IP address: | |
| IP address: | 192 . 168 . 100 . 100 |
| S <u>u</u> bnet mask: | 255.255.255.0 |
| Default gateway: | 192.168.100.1 |
| C Obtain DNS server address auto | matically |
| Use the following DNS server add | dresses: |
| Preferred DNS server: | 127.0.0.1 |
| <u>A</u> lternate DNS server: | · · · |
| Validate settings upon exit | Ad <u>v</u> anced |
| | OK Cancel |

Type the IP address and DNS server address.

Press the **OK** button to continue.

Install Active Directory

Select **Start->Run** and type **dcpromo** in the **Open** input box.

| 🖅 Run | | × |
|---------------|---|---|
| | Type the name of a program, folder, document, or Internet resource, and Windows will open it for you. | |
| <u>O</u> pen: | dcpromo 💌 | |
| | 🚱 This task will be created with administrative privileges. | |
| | | |
| | OK Cancel <u>B</u> rowse | |

Press the **OK** button to continue.

The Active Directory Domain Services Installation Wizard appears.

| active Directory Domain | Services Installation Wizard | × |
|-------------------------|---|---|
| | Welcome to the Active Directory Domain Services Installation Wizard This wizard helps you install Active Directory Domain Services (AD DS) on this server, making the server an | |
| | Active Directory domain controller. To continue, click Next. Use advanced mode installation Learn more about the additional options that are available in advanced mode installation. | |
| | More about <u>Active Directory Domain Services</u> | |
| | < <u>B</u> ack <u>N</u> ext > Cancel | |

Press the **Next** button to continue.

The Active Directory Domain Services Installation Wizard is shown, before to do next, please read the

introducing instructions carefully.

| Active Directory Domain Services Installation Wizard |
|---|
| Operating System Compatibility Improved security settings in Windows Server 2008 and Windows Server 2008 R2 affect older versions of Windows |
| Windows Server 2008 and "Windows Server 2008 R2" domain controllers have a new more secure default for the security setting named "Allow cryptography algorithms compatible with Windows NT 4.0." This setting prevents Microsoft Windows and non-Microsoft SMB "clients" from using weaker NT 4.0 style cryptography algorithms when establishing security channel sessions against Windows Server 2008 or "Windows Server 2008 R2" domain controllers. As a result of this new default, operations or applications that require a security channel serviced by Windows Server 2008 or "Windows Server 2008 R2" domain controllers might fail. Platforms impacted by this change include Windows NT 4.0, as well as non-Microsoft SMB "clients" and network-attached storage (NAS) devices that do not support stronger cryptography algorithms. Some operations on clients running versions of Windows performed by the Active Directory Migration Tool or Windows Deployment Services. For more information about this setting, see Knowledge Base article 942564 (http://go.microsoft.com/fwlink/?Linkld=104751). |
| < <u>B</u> ack <u>N</u> ext > Cancel |

Press the **Next** button to continue.

Because we are creating Active Directory, Select the **Create a new domain in a new forest** option.

| Active Directory Domain Services Installation Wizard | × |
|---|--------|
| Choose a Deployment Configuration You can create a domain controller for an existing forest or for a new forest. | |
| C Existing forest | |
| f C $ar d$ dd a domain controller to an existing domain | |
| C Greate a new domain in an existing forest This server will become the first domain controller in the new domain. | |
| • Create a new domain in a new forest | |
| More about possible deployment configurations | |
| | |
| | |
| | |
| < Back Next > | Cancel |
| < <u>B</u> ack <u>N</u> ext > | Cancel |

Press the **Next** button to continue.

Specify the name of Forest Root Domain.

| \overline Active Directory Domain Services Installation Wizard | × |
|--|-------|
| Name the Forest Root Domain The first domain in the forest is the forest root domain. Its name is also the name of the forest. | |
| Type the fully qualified domain name (FQDN) of the new forest root domain. | |
| EQDN of the forest root domain: | _ |
| SANDeploy.Local | |
| Example: corp.contoso.com | |
| | |
| | |
| | |
| | |
| | |
| < <u>B</u> ack <u>N</u> ext > C | ancel |
| | |

Type the domain name.

Press the **Next** button to continue.

Select the Forest functional level.

| \overline Active Directory Domain Services Installation Wizard | × |
|--|--------|
| Set Forest Functional Level Select the forest functional level. | |
| Eorest functional level: | |
| Windows Server 2008 R2 | • |
| Details: | |
| The Windows Server 2008 R2 forest functional level provides all the features that are available in the Windows Server 2008 forest functional level, plus the following additional feature: Recycle Bin, which, when it is enabled, provides the ability to restore deleted objects in their entirety while Active Directory Domain Services is running. Any new domains that are created in this forest will operate by default at the Windows Server 2008 R2 domain functional level. | × • |
| You will be able to add only domain controllers that are running Windows Server 2008 R2 or later to this forest. | |
| More about <u>domain and forest functional levels</u> | |
| < <u>B</u> ack <u>N</u> ext > | Cancel |

Select Windows Server 2008 or Windows Server 2008 R2 if building Windows Server 2008 R2 clustering.

Press the **Next** button to continue.

Select the additional options for this domain controller.

| ive Directory Domain Services Installation Wizard | |
|--|----------|
| ditional Domain Controller Options | |
| Select additional options for this domain controller. | |
| DNS server | |
| 🔽 <u>G</u> lobal catalog | |
| <u>Bead-only domain controller (RODC)</u> | |
| Additional information: | |
| cannot be an RODC. We recommend that you install the DNS Server service on the first domain controller | <u> </u> |
| we recommend that you install the DNS Server service on the first domain controller. | <u> </u> |
| More about additional domain controller options | <u>×</u> |
| More about additional domain controller options | <u>~</u> |
| More about additional domain controller options | <u>▲</u> |
| More about additional domain controller options | ▲ |

Keep the selection of the **DNS Server**.

Press the **Next** button to continue.

The Active Directory Domain Services Installation Wizard appears.

| Active | Directory Domain Services Installation Wizard | \times |
|---------|--|----------|
| <u></u> | A delegation for this DNS server cannot be created because the authoritative parent zone cannot be found or it does not run Windows DNS server. If you are integrating with an existing DNS infrastructure, you should manually create a delegation to this DNS server in the parent zone to ensure reliable name resolution from outside the domain "KernSafe.Local". Otherwise, no action is required. Do you want to continue? | |
| | <u>Y</u> es | |

Press the **Yes** button to continue.

Customize the directories for Database folder, Log files folder and SYSVOL folder.

| Active Directory Domain Services Installation Wizard | × |
|---|----------------|
| Location for Database, Log Files, and SYSVOL Specify the folders that will contain the Active Directory domain controlle database, log files, and SYSVOL. | er 📃 |
| For better performance and recoverability, store the database and log fil volumes. | es on separate |
| Database folder: | |
| C:\Windows\NTDS | Browse |
| Log files folder: | |
| C:\Windows\NTDS | Browse |
| SYSVOL folder: | |
| C:\Windows\SYSVOL | Browse |
| , More about <u>placing Active Directory Domain Services files</u> | |
| < <u>B</u> ack <u>N</u> ext > | Cancel |

Press the **Next** button to continue.

Specify the **Directory Services Restore Mode Administrator Password**.

| Active Directory Domain | Services Installation Wizard | X | | |
|--|--|--------|--|--|
| Directory Services Resto | ore Mode Administrator Password | | | |
| The Directory Services F Administrator account. | Restore Mode Administrator account is different from the | domain | | |
| Assign a password for the controller is started in Dire choose a strong password | Assign a password for the Administrator account that will be used when this domain controller is started in Directory Services Restore Mode. We recommend that you choose a strong password. | | | |
| Password: | ••••• | | | |
| <u>C</u> onfirm password: | ••••• | | | |
| More about <u>Directory Ser</u> | rvices Restore Mode password | | | |
| | | | | |

Press the **Next** button to continue.

Check all of the parameters are correct; press the **Back** button if any change is required.

| Review your selections: Configure this server as the first Active Directory domain controller in a new forest. The new domain name is "SANDeploy.Local". This is also the name of the new forest. The NetBIOS name of the domain is "SANDEPLOY". Forest Functional Level: Windows Server 2008 Domain Functional Level: Windows Server 2008 Site: Default-First-Site-Name To change an ention, click Back. To begin the operation, click Next | 11111 |
|--|----------|
| Review your selections: Configure this server as the first Active Directory domain controller in a new forest. The new domain name is "SANDeploy.Local". This is also the name of the new forest. The NetBIOS name of the domain is "SANDEPLOY". Forest Functional Level: Windows Server 2008 Domain Functional Level: Windows Server 2008 Site: Default-First-Site-Name | _ |
| Configure this server as the first Active Directory domain controller in a new forest. The new domain name is "SANDeploy.Local". This is also the name of the new forest. The NetBIOS name of the domain is "SANDEPLOY". Forest Functional Level: Windows Server 2008 Domain Functional Level: Windows Server 2008 Site: Default-First-Site-Name To change an option, click Back. To begin the operation, click Next | |
| The new domain name is "SANDeploy.Local". This is also the name of the new forest. The NetBIOS name of the domain is "SANDEPLOY". Forest Functional Level: Windows Server 2008 Domain Functional Level: Windows Server 2008 Site: Default-First-Site-Name | _ |
| The NetBIOS name of the domain is "SANDEPLOY". Forest Functional Level: Windows Server 2008 Domain Functional Level: Windows Server 2008 Site: Default-First-Site-Name | |
| Forest Functional Level: Windows Server 2008 Domain Functional Level: Windows Server 2008 Site: Default-First-Site-Name | |
| Domain Functional Level: Windows Server 2008 Site: Default-First-Site-Name | |
| Site: Default-First-Site-Name | |
| To change an option, click Back. To begin the operation, click Next | T |
| To change an option, click back. To begin the operation, click Next. | |
| These settings can be exported to an answer file for use with other unattended operations. More about <u>using an answer file</u> | 3 |

Press the **Next** button to continue.

After a while, Active Directory Domain Services Installation is completed.



Press the Finish Button to close the wizard.

Restart is required.



Press the **Restart Now** button to restart the computer.

Install DNS

Use administrator role to log on to the Domain controller machine and launch the DNS Manager.



Right click on the **Reverse Lookup Zone** in the left tree view and then select **New Zone...** menu item.

The New Zone Wizard appears.



Press the **Next** button to continue.

Select zone type.

| New Zone Wizard | × |
|---|---|
| Zone Type The DNS server supports various types of zones and storage. | - |
| Select the type of zone you want to create: Primary zone Creates a serve of a zero that can be undated directly on this server. | |
| Secondary zone Creates a copy of a zone that exists on another server. This option helps balance the processing load of primary servers and provides fault tolerance. | |
| Stub zone Creates a copy of a zone containing only Name Server (NS), Start of Authority (SOA), and possibly glue Host (A) records. A server containing a stub zone is not authoritative for that zone. | |
| Store the zone in Active Directory (available only if DNS server is a writeable domain controller) | |
| < Back Next > Cancel | |

Select the **Primary zone** and keep the selection of **Store the zone in Active Directory**.

Press the **Next** button to continue.

Select zone replication scope.

| New Zone Wizard | × |
|---|------|
| Active Directory Zone Replication Scope You can select how you want DNS data replicated throughout your network. | |
| Select how you want zone data replicated: | |
| \bigcirc To all DNS servers running on domain controllers in this forest: SANDeploy.Local | |
| To all DNS servers running on domain controllers in this domain: SANDeploy.Local | |
| To all domain controllers in this domain (for Windows 2000 compatibility): SANDeploy.Local | |
| O To all domain controllers specified in the scope of this directory partition: | |
| | ~ |
| | |
| | |
| | |
| < <u>B</u> ack <u>N</u> ext > Car | icel |
| | |

Keep the default selection.

Press the **Next** button to continue.

Choose reverse lookup zone name.



Select IPv4 Reverse Lookup Zone.

Press the **Next** button to continue.

Type the network ID or zone name.

| New Zone Wizard | × |
|--|---|
| Reverse Lookup Zone Name A reverse lookup zone translates IP addres | ses into DNS names. |
| To identify the reverse lookup zone, type to Network ID: 192 .168 .100 . The network ID is the portion of the IP in network ID in its normal (not reversed) If you use a zero in the network ID, it will network ID 10 would create zone 10.in- zone 0.10.in-addr.arpa. | he network ID or the name of the zone. addresses that belongs to this zone. Enter the order. vill appear in the zone name. For example, addr.arpa, and network ID 10.0 would create |
| C Reverse lookup zone name: |] |
| | < <u>B</u> ack <u>N</u> ext > Cancel |

Select the Network ID and then type IP address in the Network ID.

Press the **Next** button to continue.

Specify dynamic update options.

| New Zone Wizard |
|---|
| Dynamic Update You can specify that this DNS zone accepts secure, nonsecure, or no dynamic updates. |
| Dynamic updates enable DNS client computers to register and dynamically update their resource records with a DNS server whenever changes occur. Select the type of dynamic updates you want to allow: |
| Allow only secure dynamic updates (recommended for Active Directory) This option is available only for Active Directory-integrated zones. Allow both nonsecure and secure dynamic updates Dynamic updates of resource records are accepted from any client. This option is a significant security vulnerability because updates can be accepted from untrusted sources. |
| O Do not allow dynamic updates Dynamic updates of resource records are not accepted by this zone. You must update these records manually. |
| < Back Next > Cancel |

Press the **Next** button to continue.

Check all the parameters all required, press the **Back** button if any change is required.



Press the Finish button to close the New Zone Wizard.

Right click on the SANDeploy.Local in the left tree view of DNS Manager, then select New Host (A or

AAA)... menu item.

| 🛔 DNS Manager | | | | |
|---|---|--|--|--|
| File Action View Help | | | | |
| 🗢 🔿 🙋 🔜 🚺 🔂 📾 | ? 🖬 🗄 🗐 🖬 | | | |
| DNS OBDC OBDC OBDC OBDC OBDC OBDC OBDC OBDC | Name msdcs sites tcp udp Data File es nt folder) anger (MX) | Type Start of Authority (SOA) Name Server (NS) Host (A) Host (A) Host (A) | Data [47], 08dc.kernsafe.local., 08dc.kernsafe.local. 192.168.0.197 192.168.0.197 192.168.0.197 | static static 1/12/2010 9: static static |
| | | | | |
| ۱ | • | | | Þ |
| Create a new host resource record. | | | | |

The **New Host** dialog appears.



Type host name in the Name and IP address in the IP address field for the **08Node1** machine.

Check the Create associated pointer (PTR) record checkbox.

Press the Add Host button to add 08Node1 DNS record.

| New Host | × |
|---|---|
| Name (uses parent domain name if blank): | |
| 08Node2 | |
| Fully qualified domain name (FQDN): | |
| 08Node2.SANDeploy.Local. | 1 |
| IP address: | |
| 192.168.100.102 | |
| Create associated pointer (PTR) record | |
| Allow any authenticated user to update DNS records with the same owner name | |
| | |
| | |
| | |
| Add <u>H</u> ost Done | |

Type host name in the Name and IP address in the IP address field for the **08Node2** machine.

Check the Create associated pointer (PTR) record checkbox.

Press the Add Host button to add 08Node2 DNS record.

Press the **Done** button to close **New Host** dialog.

Now we will see the two records in the **DNS Manager**.

| 🛔 DNS Manager | | | | |
|--|---|--|---|--|
| Eile <u>A</u> ction <u>V</u> iew <u>H</u> elp | | | | |
| 🗢 🔿 🖄 🖬 🔀 🖬 🙆 | 2 🖬 🗄 🗐 🖬 | | | |
| DNS OBDC Global Logs Forward Lookup Zones Conditional Forward Lookup Zones Conditional Forwarders Output Conditional Forwarders | Name msdcs sites tcp udp DomainDnsZones ForestDnsZones (same as parent folder) (same as parent folder) 08dc win-fibs404jq4d 08Node1 08Node2 | Type Start of Authority (SOA) Name Server (NS) Host (A) Host (A) Host (A) Host (A) Host (A) | Data [47], 08dc.sandeploy.local., 08dc.sandeploy.local. 192.168.0.200 192.168.0.200 192.168.0.200 192.168.100.101 192.168.100.102 | static static 10/8/2010 2: static static |
| | | | | <u> </u> |

Configuring on SANDeploy Server

Network Adapter

For working in clustering environment, the network adapter must be assigned a static IP address. Select the **Internet Protocol Version 4(TCP/IPv4)** and then press the **Properties** button, the **Internet Protocol Version 4 (TCP/IPv4)** dialog appears.

| Internet Protocol Version 4 (TCP/IPv4) Properties | | | |
|---|---------------|--|--|
| General | | | |
| You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings. | | | |
| O Obtain an IP address automatical | ly | | |
| Use the following IP address: | | | |
| IP address: | 192.168.0.3 | | |
| Subnet mask: | 255.255.255.0 | | |
| Default gateway: | 192.168.0.1 | | |
| C Obtain DNS server address autor | natically | | |
| Use the following DNS server add | resses: | | |
| Preferred DNS server: | 192.168.0.1 | | |
| Alternate DNS server: | | | |
| Validate settings upon exit Advanced | | | |
| | OK Cancel | | |

Set the second network adapter of Domain Controller as shown in the figure. IP address is set as 192.168.100.3 and Subnet mask is set as 255.255.255.0.

Preparing Quorum Volume

Click Start->Administrative Tools->SANDeploy Server (SANDeploy Boot Server) to launch the **SANDeploy management console**, right click on the **Virtual Volumes** tree node, and then select the **Create Virtual Volume...** menu item. the **Create Virtual Volume Wizard** appears.

Select Storage Media type



Choose Standard Image file.

Press the **Next** button to continue.

Select image file.

| Create Virtual Volume Wizard | × |
|--|----------------|
| Select Image File Please choose a regular disk image file | |
| C Use existing image file • Create a r | new image file |
| R:\Quorum.img | Browse |
| Enter Device size (MB): | |
| 2048 | |
| | |
| | |
| | |
| | |
| < <u>B</u> ack | Next > Cancel |

Select **Create a new image file** or **Use existing image file** if you already have a one.

Specify the device size.

Press the **Next** button to continue.

Set cache settings.

| Create Virtual Volume W | izard 📃 🔀 |
|--------------------------------------|--------------------------------------|
| High Speed Cache Choose enable or | Setting disable high speed cache. |
| Cache Parameters | cache on this volume |
| Cache size in MBs | 512 |
| Cache block expiry peri | od time in ms: 5000 |
| | |
| | |
| | |
| | < Back Next > Cancel |

Cache option is optionally for this project.

Choose or not choose **Enable high speed cache on this volume**.

Specify Cache size.

Specify Cache block expiry period time.

Press the **Next** button to continue.

Set Write-Back Cache settings.

| Create Virtual Volume Wizard |
|--|
| Write-Back Cache Setting Select a folder for saving the temporaly data of each clients |
| Enable write-back cache for this volume Write-Back Cache Parameters Select a folder to stora temporary client data: C:\Temp\ Quota for each client in MBs 2048 |
| < <u>B</u> ack <u>N</u> ext > Cancel |

This option has no sense to use on this session.

Do not select Enable write-back cache on this volume.

Press the **Next** button to continue.

| Create Virtual Volume Wizard | × |
|--|--------|
| Finish Congratulations, the target is being createdyou have completed all the configurations | - |
| Description iqn. 2008-08. com. sandeploy. volume: Quorum | |
| | |
| | |
| < <u>B</u> ack Finish | Cancel |

Type description in the **Description** field.

Press the **Finish** button to complete quorum virtual volume creating.

Preparing Standard Volume

In the **SANDeploy management console**, right click on the **Virtual Volumes** tree node, and then select the **Create Virtual Volume...** menu item. the **Create Virtual Volume Wizard** appears.

Select Storage Media type

| Create Virtual Volume Wizard |
|--|
| Select iSCSI Storage Media Please choose an appropriate media in the following list |
| Standard Image file |
| C Physical disk |
| C Virtual CD/DVD Image File |
| C Physical CD/DVD/RW Drive |
| |
| |
| |
| |
| < <u>B</u> ack <u>N</u> ext > Cancel |

Choose Standard Image file.

Press the **Next** button to continue.

Select image file.

| Create Virtual Volume Wizard | × |
|--|--------|
| Select Image File Please choose a regular disk image file | - |
| O Use existing image file • <u>C</u> reate a new image file | |
| R:\Standard.img Brows | se |
| Enter Device size (MB): 10240 | |
| < <u>B</u> ack Next > | Cancel |

Select Create a new image file or Use existing image file if you already have a one.

Specify the device size.

Press the **Next** button to continue.

Set cache settings.

| Create Virtual Volume Wizard |
|---|
| High Speed Cache Setting Choose enable or disable high speed cache. |
| Cache Parameters Cache size in MBs Cache block expiry period time in ms: 5000 |
| < <u>Back</u> Cancel |

Cache option is optionally for this project.

Choose or not choose Enable high speed cache on this volume.

Specify Cache size.

Specify Cache block expiry period time.

Press the **Next** button to continue.

Set Write-Back Cache settings.

| Create Virtual Volume Wizard |
|--|
| Write-Back Cache Setting Select a folder for saving the temporaly data of each clients |
| Enable write-back cache for this volume Write-Back Cache Parameters Select a folder to stora temporary client data: C:\Temp\ Quota for each client in MBs 2048 |
| < <u>Back</u> <u>N</u> ext > Cancel |

This option has no sense to use on this session.

Do not select Enable write-back cache on this volume.

Press the **Next** button to continue.

| Create Virtual Volume Wizard | × |
|--|--------|
| Finish Congratulations, the target is being createdyou have completed all the configurations | |
| Description iqn. 2008-08. com. sandeploy. volume: Standard | - |
| | |
| | |
| < Back Finish | Cancel |
Type description in the **Description** field.

Press the **Finish** button to complete quorum virtual volume creating.

Preparing iSCSI Target

In the **SANDeploy Management Console**, right click on the **iSCSI Targets** node of left tree, then select the **Create Target...** menu item. The **Create iSCSI Target Wizard** appears.

Select LUNs.

| Create iSCSI Target Wizard Select LUN Please choose at least one LUN in the follo | owing list |
|--|----------------------|
| Available Volumes: iqn.2008-08.com.sandeploy.volume:Standard iqn.2008-08.com.sandeploy.volume:Quorum | Selected Volumes: |
| | < Back Next > Cancel |

Select the two volumes that we just created a few minutes ago.

| Create iSCSI Target Wizard | × |
|---|--|
| Select LUN Please choose at least one LUN in the f | ollowing list |
| Available Volumes: | Selected Volumes: |
| | Induition Service Come Service |
| | |
| | |
| | , |
| | < <u>B</u> ack <u>N</u> ext > Cancel |

Press the **Next** button to continue.

| Create iSCSI Target Wizard | × |
|--|--------------------------------------|
| Set iSCSI Target Authorization Please at least one CHAP group | |
| Available Groups: | Selected Administrator's Groups: |
| | Anonymous |
| | < |
| | |
| | |
| | >> |
| | |
| | |
| | |
| | < <u>B</u> ack <u>N</u> ext > Cancel |

Choose a CHAP user's group to obtain administrator's access right. We select **Anonymous** (no CHAP authorization) as a demo.

Press the **Next** button to continue.

Specify Target Name.

| Create iSCSI Target Wizard | × |
|---|------------------------------|
| Finish Enter target name to finish iSCSI target creating | |
| TargetName: iqn.2008-08.com.sandeploy:SANServer.SAN0 | |
| | |
| | |
| | |
| | < <u>B</u> ack Finish Cancel |

Type the target name.

Press the **Finish** button to complete the iSCSI target creating.

Configuring on Cluster Node 1

Network Adapter

For working in clustering environment, the network adapter must be assigned a static IP address. Select the **Internet Protocol Version 4(TCP/IPv4)** and then press the **Properties** button, the **Internet Protocol Version 4 (TCP/IPv4)** dialog appears.

| Internet Protocol Version 4 (TCP/IPv | 4) Properties | ? × |
|---|--|------|
| General | | |
| You can get IP settings assigned autom this capability. Otherwise, you need to for the appropriate IP settings. | natically if your network supports ask your network administrator | |
| O Obtain an IP address automatical | ly | |
| • Use the following IP address: | | ٦ [|
| IP address: | 192.168.0.101 | |
| Subnet mask: | 255 . 255 . 255 . 0 | |
| Default gateway: | 192.168.0.1 | |
| C Obtain DNS server address autor | natically | |
| □ Use the following DNS server add | resses: | ٦ I. |
| Preferred DNS server: | 192.168.0.1 | |
| Alternate DNS server: | | |
| Validate settings upon exit | Ad <u>v</u> anced | |
| | OK Cance | |

Type in the IP address, Subnet mask, Default gateway and Preferred NDS server.

Set the second network adapter of 08Node1.

| Internet Protocol Version 4 (TCP/IP | v4) Properties |
|---|--|
| General | |
| You can get IP settings assigned autor this capability. Otherwise, you need to for the appropriate IP settings. | matically if your network supports ask your network administrator |
| O Obtain an IP address automatica | lly |
| • Use the following IP address: | |
| IP address: | 192.168.100.101 |
| Subnet mask: | 255.255.255.0 |
| Default gateway: | 192.168.100.1 |
| C Obtain DNS server address auto | matically |
| • Us <u>e</u> the following DNS server add | dresses: |
| Preferred DNS server: | 192 . 168 . 100 . 100 |
| Alternate DNS server: | |
| Validate settings upon exit | Ad <u>v</u> anced |
| | OK Cancel |

Type in the IP address and Subnet mask.

Press the **OK** button to change IP address.

Join to the domain

Press the **OK** button to change IP address.

Open System Properties page.



Click on the Change settings link, the System Properties Dialog appears.

| System Properties | | × |
|--|---|---|
| Computer Name Hardware | e Advanced Remote | |
| Windows uses t on the network. | the following information to identify your computer | |
| Computer <u>d</u> escription: | | |
| | For example: "IIS Production Server" or "Accounting Server". | |
| Full computer name: | WIN-B6I8J17Q80Q | |
| Workgroup: | WORKGROUP | |
| To rename this computer of workgroup, click Change. | or change its domain or Change | |
| | OK Cancel Apply | |

1

| System Properties | <u>×</u> |
|--|---|
| Computer Name Hardwa | are Advanced Remote |
| Windows uses on the network | the following information to identify your computer c. |
| Computer description: | |
| | For example: "IIS Production Server" or "Accounting Server". |
| Full computer name: | WIN-761UGR36DM5 |
| Workgroup: | WORKGROUP |
| To rename this computer workgroup, click Change | r or change its domain or <u>G</u> hange |
| | OK Cancel Apply |

Press the Change ... button.

| Computer Name/Domain Changes | × |
|---|----|
| You can change the name and the membership of this computer. Changes might affect access to network resources <u>More information</u> | ş. |
| Computer name: | |
| 08Node1 | |
| Full computer name: 08Node1 | |
| More | |
| Member of | |
| • Domain: | |
| sandeploy.local | |
| C Workgroup: | |
| WORKGROUP | |
| OK Cancel | |

Type 08Node1 in the **Computer name** and sandeploy.local in the **Domain**.

Press the **OK** button to change computer name and join the domain.

Domain controller account is required to join the domain.

| Windows Securit | τ γ | X |
|---|--|---|
| Computer Nar Enter the name computer from t | ne/Domain Changes and password of an account with permission to remove this he domain. | |
| | User name Password Domain: SANDeploy.Local | |
| | OK Cancel | 1 |

Type your user name and password.

Press the **OK** button to continue.

If successful, the **Computer Name/Domain Changes** notification dialog is shown as below.



Press the **OK** button to continue.

Restart is required.

| Microsoft Windows | × |
|--|----|
| You must restart your computer to apply these change | 5 |
| Before restarting, save any open files and close all programs. | |
| Restart Now Restart Lat | er |

Press the **Restart Now** button to restart the computer.

Log in to iSCSI disks

Lunch the Administrative Tools -> Microsoft iSCSI initiator.

| argets | Discover | y I | Favorite | Targets | Volumes | and Device | s RAD | ius į | Config | uration | ĺ |
|--|---|---|--|---|---|---|---------|---------|--|-------------------|---|
| Quick C To disc DNS na | Connect cover and l ame of the | og o tar | on to a ta get and t | arget usir then click | ng a basic (Quick Con | connection, nect. | type th | ne IP a | address | or | |
| <u>T</u> arget | : | | | | | | | Qui | ick Cont | nect | |
| Discove | ered targe | ts | | | | | | | <u>R</u> efre | sh | 1 |
| Name | : | | | | | | Statu | JS | | | ī |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
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| | | | | | | | | | | | |
| | | | | | | | | | | | |
| To con click Co | nect using | adv | vanced o | ptions, s | elect a tarç | get and the | n | | Conne | ect | |
| To con click Co To corr then d | nect using onnect. npletely dis lick Disconr | adv scon | vanced oj nect a ta | ptions, s irget, sel | elect a targ | get and the get and | n | | Cogne Disconr | ect nect | |
| To con click Co To corr then d For tar select | nnect using onnect. npletely dis lick Disconr rget prope the target | adv scon nect rties and | vanced oj nect a ta ., includir l click Pro | ptions, s Irget, sel Ing config Iperties. | elect a targ lect the tar uration of s | get and the get and sessions, | n | P | Cogne Disconr roperti | ect nect | |
| To con click Co To corr then d For tar select For cor the tar | nect using onnect. npletely dis lick Disconr rget prope the target nfiguration rget and th | con nect and nof (| vanced og nect a ta , includir l click Pro devices a click Devi | ptions, s irget, sel ng config iperties. associate ces. | elect a targ lect the tar uration of s d with a ta | get and the get and sessions, rget, select | n | ! | Cogne Disconr ropertii De <u>v</u> ices | ect nect es | |
| To con click Co To com then d For tar select For con the tar | nect using onnect. hpletely dis lick Disconr rget prope the target nfiguration rget and th | adv con nect and nen of | vanced oj nect a ta , indudir l dick Pro devices a dick Devi | ptions, s irget, sel ing config iperties. associate ces. | elect a targ lect the tar uration of s d with a ta | get and the get and sessions, rget, select | n | ! | Conne Disconr roperti De <u>v</u> ice: | ect nect es | |
| To con dick Co To corr then d For tar select For cor the tar | nect using onnect. npletely dis lick Disconr rget prope the target nfiguration rget and th oout basic | adv scon nect and nen iscs | vanced og nect a ta ; includir l click Pro devices a click Devi | ptions, s rget, sel ng config perties. associate ces. | elect a targ lect the tar uration of s d with a ta | get and the get and sessions, rget, select | n | ! | Conne Disconr Poperti Device | ect es s | |
| To con dick Co To con then d For tar select For con the tar | npect using onnect. npletely dis lick Disconr rget prope the target nfiguration rget and th <u>pout basic</u> | adv rties and iscs | vanced oj nect a ta , i ndudin l dick Pro devices a dick Devi dick Devi | ptions, s rget, sel ng config perties. associate ces. <u>tions an</u> | elect a targ lect the tar uration of s d with a ta <u>d targets</u> | get and the get and sessions, rget, selec | n | ! | Co <u>n</u> ne Disconr roperti De <u>v</u> ice: | ect est s | |
| To con click Co To corr then d For tar select For cor the tar | npect using onnect. npletely dis lick Disconr rget prope the target nfiguration rget and th | adv con nect and iscs | vanced oj nect a ta , includin l click Pro devices a click Devi | ptions, s ng config perties. associate ces. | elect a targ lect the tar uration of s d with a ta <u>d targets</u> | get and the get and sessions, rget, selec | n | ! | Cogne Disconr roperti Deyice: | ect es s | |
| To con click Co To corr then d For tar select For cor the tar | nect using onnect. npletely dis lick Disconr rget prope the target nfiguration rget and th <u>pout basic</u> | adv con rties and iscs | vanced oj nect a ta ; includin l click Pro devices a click Devi | ptions, s inget, sel ng config iperties. associate ces. | elect a targ lect the tar uration of s d with a ta <u>d targets</u> | get and the get and sessions, rget, selec | t | | Cogne Disconr roperti Deyjce | ect nect es | |

Select the **Discovery** page.

| scs | I Initi | iator Prop | erties | | | | | | | × |
|-----|---------|----------------|-------------------|---------------|----------------|-----------------|-----|-----------------|-------------|---|
| Та | rgets | Discovery | Favorit | te Targets | Volur | nes and Devices | RAD | IUS Co | nfiguration | |
| | | | | | | | | , | | |
| Γ | Targe | t portals — | | | | | | Def | and a | |
| | The s | system will lo | ok for <u>T</u> a | argets on fol | lowin | g portals: | | Rein | esn | |
| | Addr | ess | Por | t | Ada | pter | | IP ad | dress | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | To ad | ld a target p | ortal, di | ck Discover F | Portal | | | Discover | Portal | |
| | To re | move a targ | et portal | , select the | addre | ess above and | | Rem | | |
| | then | click Remove | e. ' | | | | _ | Rem | ove | |
| | | | | | | | | | | |
| Г | iSNS s | ervers | | | | | | | . 1 | |
| | The s | system is reg | istered o | on the follow | ing <u>i</u> S | NS servers: | | Refr | esh | |
| | Name | e | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | To ad | ld an iSNS se | erver, di | ck Add Serve | er. | | | A <u>d</u> d Se | rver | |
| | To re | move an iSN | S server | , select the | serve | r above and | | Rom | 0110 | |
| | then | click Remove | 2. | , | | | _ | кеш | ove | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | More | e about Disc | overy an | nd iSNS | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | or I | 0 | ancel | - Apelu | |
| | | | | | | UK | | ancel | | |

Press the **Discovery Portal** button, the **Discovery Target Portal** dialog appears.

| Discover Target Portal | × |
|--|------------------------------------|
| Enter the IP address or DNS name and p want to add. | ort number of the portal you |
| To change the default settings of the disc the Advanced button. | covery of the target portal, click |
| IP address or DNS name: | Port: (Default is 3260.) |
| 192.168.0.3 | 3260 |
| <u>A</u> dvanced | <u>O</u> K <u>C</u> ancel |

Type IP address or NDS name and Port of the SANDeploy Server in the required fields.

Press the **OK** button to add.

Select the Targets page.

-

| CSI Initia | tor Prop | erties | | | | | | | | |
|------------------------|----------------------------|---------------------------------|-------------------------|-----------------------|-----------|---------|---------|---------|---------------|-----|
| Targets [| Discovery | Favorite Ta | argets | Volume | s and De | vices | RADIU | IS Co | nfiguratio | n |
| Quick Co | nnect | | | | | | | | | |
| To disco DNS nam | ver and log ie of the t | g on to a targ arget and th | get using en click (| g a basio Quick Co | c connect | ion, ty | pe the | IP add | ress or | |
| <u>T</u> arget: | | | | | | | | Quick (| Connect., | , |
| Discover | ed tar <u>q</u> ets | | | | | | | Re | efresh | |
| Name | | | | | | | Status | | | |
| ian.200 | 8-08.com. | sandeplov:S | ANServe | er.SAN0 | | | Inactiv | e | | - 1 |
| To conne | ect using a | dvanced opt | ions, sel | lect a ta | arget and | then | | Co | nnect | |
| click Con | nect. | | | | | | _ | | <u></u> | |
| To comp then clic | etely disco Disconne | onnect a targ ct. | jet, sele | ct the ta | arget and | ł | | Disc | connect | |
| For targe select th | et properti e target a | es, including nd click Prop | configu erties. | ration o | fsession | s, | | Prop | erties | |
| For confi the targe | guration o et and the | of devices as n click Device | sociated es. | with a t | target, s | elect | | Dey | <u>/</u> ices | |
| More abo | ut basic iSi | CSI connecti | ons and | <u>targets</u> | | | | | |] |
| | | | | | | | | | | |

Select the target just added and then press the **Connect** button.

| Connect To Target | × |
|---|---|
| Target name: iqn.2008-08.com.sandeploy:SANServer.SAN0 | |
| Add this connection to the list of Favorite Targets. This will make the system automatically attempt to restore the connection every time this computer restarts. | |
| Enable multi-path | |
| Advanced OK Cancel | |

Keep selection of **the Add this connection to the list of Favorite Targets**.

Press the **OK** button to continue.

If successful, the logged on targets are shown in the figure.

| 51 IIIIU | ator Prop | -rues | | | |
|--------------------------------|---|---|---|------------|------------------|
| argets | Discovery | Favorite Targets | Volumes and Devices | s RADIUS | S Configuration |
| Quick C To disc DNS na | onnect over and log me of the t | g on to a target us arget and then clic | ing a basic connection, k Quick Connect. | type the I | P address or |
| <u>T</u> arget: | | | | 9 | Quick Connect |
| Discove | red tar <u>g</u> ets | | | | Refresh |
| Name | | | | Status | |
| ian.20 | 08-08.com. | sandeplov:SANSer | ver.SAN0 | Connect | ted |
| To conr | nect using a | dvanced options. | select a target and the | n | Connect |
| click Co | nnect. | arance options, | | | Connect |
| To com then cli | pletely disco ck Disconne | onnect a target, se ct. | lect the target and | _ | Disconnect |
| For tar | get properti be target a | es, including config nd click Properties | guration of sessions, | | Properties |
| | ne target a | | | | |
| For con the targ | ifiguration of get and the | of devices associati n click Devices. | ed with a target, select | : | De <u>v</u> ices |
| For con the tary More ab | infiguration of get and the out basic iSi | of devices associat n dick Devices. <u>CSI connections ar</u> | ed with a target, select id targets | | De <u>v</u> ices |

Launch the Windows Computer Management Console.

An Initialize Disk dialog is shown.



Keep the selection of the tow disks.

Select partition style for the selected disks.

Press the **OK** button to continue.

| 🛃 Computer Management | | | | |
|-------------------------------------|--------------------------------------|-------------------------|---|-------------------|
| <u>File Action View H</u> elp | | | | |
| 🗢 🔿 🔰 🖬 🚺 🖬 | e B | | | - |
| Computer Management (Local) | Volume Layout | Type File System | Status | Actions |
| 🖃 🎁 System Tools | 📼 (C:) Simple | Basic NTFS | Healthy (System, Boot, Page File, Active, Crash | Disk Management 🔺 |
| H I I I I I I I I I I I I I I I I I | | | | More Actions |
| Shared Folders | | | | |
| 🛨 🌉 Local Users and Groups | | | | |
| • O Performance | | | | |
| Device Manager | | | | |
| Disk Management | | | | |
| E Services and Applications | | | | |
| | Disk 1 Basic 2.00 GB Online | 2.00 GB Unallocated | | |
| | Disk 2 | | | |
| | Basic 10.00 GB Online | 10.00 GB Unallocated | | |
| | | Primary partiti | ion | |
| | | | |] |
|] | | | | |

Right click on the Disks and then select New Simple Volume, partition and format the two disks followed by wizard.

If successful, the new volumes created are shown in the figure below.

| 🖶 Computer Management | | | | | |
|--|-------------------|--------------------|---|-----------------|----------|
| <u>File Action View H</u> elp | | | | | |
| 🗢 🔿 🙋 🖬 🚺 🚺 | X 📽 🖻 🍳 🛚 | V | | | |
| Computer Management (Local) | Volume Layout | Type File System | Status Healthy (System Boot Bage File Active C | Actions | |
| Task Scheduler | Q Simple | Basic NTFS | Healthy (Primary Partition) | Disk Management | ^ |
| Event Viewer Shared Folders | ⊡St Simple | Basic NTFS | Healthy (Primary Partition) | More Actions | • |
| Image: Shared Folders Ima | | | | | |
| ⊕ Performance | | | | | |
| Device Manager Storage | | | | | |
| 🔤 📑 Disk Management | • | | | | |
| E Services and Applications | | | | | |
| | Basic | Ouorum (0:) | | | |
| | 2.00 GB Online | 2.00 GB NTFS | Partition | | |
| | - Chilling | Including (Finding | | | |
| | Disk 2 |] | | | |
| | Basic | Standard (S:) | | - | |
| | Online | Healthy (Primary | Partition) | | |
| | | | | | |
| | Unallocated | Primary partiti | ion | - | |
| 1 | | | | | |

Installing Failover Clustering Service

Launch the Windows Server manager Console.



Select the Features node from the left tree view.



Click the Add Features link, the Add Features Wizard appears.

| Select Features | |
|---|---|
| | |
| Features Select one or more features to install on this server. Confirmation Eeatures: Progress Image: | Description: Failover Clustering allows multiple servers to work together to provide high availability of services and applications. Failover Clustering is often used for file and print services, database and mail applications. |

Select the Failover Clustering.

Press the **Next** button to continue.



Press the Install button to install the Failover Clustering feature.

The installation of the Failover Clustering is going on.

| Add Features Wizard | |
|---------------------|--|
| Installation Progr | ress |
| Features | The following roles, role services, or features are being installed: |
| Confirmation | Failover Clustering |
| Progress | |
| Results | |
| | |
| | |
| | |
| | |
| | |
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| | |
| | |
| | |
| | |
| | |
| | Markalling |
| | < Previous Next > Install Cancel |

If successful, the wizard will complete and show as the figure below.



Press the Close button.

Configuring on Cluster Node 2

Network Adapter

For working in clustering environment, the network adapter must be assigned a static IP address. Select the **Internet Protocol Version 4(TCP/IPv4)** and then press the **Properties** button, the **Internet Protocol Version 4 (TCP/IPv4)** appears.

| Internet Protocol Version 4 (TCP/IPv | 4) Properties | ? × |
|---|--|-----|
| General | | |
| You can get IP settings assigned autom this capability. Otherwise, you need to for the appropriate IP settings. | natically if your network supports ask your network administrator | |
| O Obtain an IP address automatical | ly | |
| • Use the following IP address: | | - I |
| IP address: | 192.168.0.102 | |
| Subnet mask: | 255 . 255 . 255 . 0 | |
| Default gateway: | 192.168.0.1 | |
| C Obtain DNS server address autor | natically | |
| • Use the following DNS server add | resses: | - I |
| Preferred DNS server: | 192.168.0.1 | |
| <u>A</u> lternate DNS server: | | |
| Validate settings upon exit | Ad <u>v</u> anced | |
| | OK Cano | el |

Type in the IP address, Subnet mask, Default gateway and Preferred NDS server.

Set the second network adapter of 08Node2.

| Internet Protocol Version 4 (TCP/IP | v4) Properties |
|---|--|
| General | |
| You can get IP settings assigned autor this capability. Otherwise, you need to for the appropriate IP settings. | natically if your network supports ask your network administrator |
| O Obtain an IP address automatica | lly |
| ○ Use the following IP address: | |
| IP address: | 192 . 168 . 100 . 102 |
| Subnet mask: | 255.255.255.0 |
| Default gateway: | 192.168.100.1 |
| C Obtain DNS server address auto | matically |
| Use the following DNS server add | dresses: |
| Preferred DNS server: | 192 . 168 . 100 . 100 |
| Alternate DNS server: | |
| Validate settings upon exit | Ad <u>v</u> anced |
| | OK Cancel |

Type in the IP address and Subnet mask.

Press the **OK** button to change IP address.

Join to the domain

Press the **OK** button to change IP address.

Open System Properties page.



Click on the Change settings link, the System Properties Dialog appears.

a

| System Properties | | × |
|---|---|---|
| Computer Name Hardwar | re Advanced Remote | |
| Windows uses on the network | the following information to identify your computer | |
| Computer <u>d</u> escription: | | |
| | For example: "IIS Production Server" or "Accounting Server". | |
| Full computer name: | WIN-B6I8J17Q79P | |
| Workgroup: | WORKGROUP | |
| To rename this computer workgroup, click Change. | or change its domain or <u>C</u> hange | |
| | OK Cancel Apply | |

Press the Change ... button.

| Computer Name/Domain Changes | × |
|---|----|
| You can change the name and the membership of this computer. Changes might affect access to network resources <u>More information</u> | F. |
| Computer name: | |
| 08Node2 | |
| Full computer name: 08Node2 | |
| <u>M</u> ore | |
| Member of | |
| • Domain: | |
| sandeploy.local | |
| C Workgroup: | |
| WORKGROUP | |
| OK Cancel | |

Type 08Node2 in the **Computer name** and sandeploy.local in the **Domain**.

Press the **OK** button to change computer name and join the domain.

Domain controller account is required to join the domain.

| Windows Security | × |
|--|---|
| Computer Name/Domain Changes Enter the name and password of an account with permission to remove this computer from the domain. | |
| User name Password Domain: SANDeploy.Local | |
| | |
| OK Cancel | |

Type your user name and password.

Press the **OK** button to continue.

If successful, the **Computer Name/Domain Changes** notification dialog is shown as below.



Press the **OK** button to continue.

Restart is required.

| Microsoft Windows | × |
|--|---|
| You must restart your computer to apply these changes | |
| Before restarting, save any open files and close all programs. | |
| | |
| Restart Now Restart Later | |

Press **the Restart Now** button to restart the computer.

Log in to iSCSI disks

Lunch the Administrative Tools -> Microsoft iSCSI initiator.

| argets | Discovery | / Fave | orite Targe | ts Volum | nes and Devi | ces R | ADIUS | Configur | ration |
|--|--|--|--|---|---|----------|----------|--|----------------|
| Quick C To disc DNS na | Connect cover and le ame of the | og on to target | a target u and then d | using a ba lick Quick (| sic connectio Connect. | on, type | e the IP | address o | or |
| <u>T</u> arget | : [| | | | | | Qu | uick Conne | ect |
| Discove | ered tar <u>g</u> et | s | | | | | | <u>R</u> efresh | ו ו |
| Name | : | | | | | St | atus | | |
| | | | | | | | | | |
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| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| To con click Co | nect using | advanc | ed options | , select a | target and t | hen | | Connec | t |
| To con click Co To com then cl | nect using onnect. npletely dis lick Disconn | advanc connect iect. | t a target, s | , select a select the | target and t | hen | | Connect Disconne | t |
| To con click Co To corr then cl For tar select | nect using onnect. Inpletely dis lick Disconn rget proper the target | advanc connect lect. ties, ind | ed options t a target, s cluding con k Propertie | , select a select the figuration s. | target and t target and of sessions, | hen | | Co <u>n</u> ned Disconne Properties | t |
| To con click Co To com then cl For tar select For con the tar | nect using onnect. npletely dis ick Disconn get proper the target nfiguration get and th | advanc connect ect. ties, ind and clic of devi en click | t a target, s cluding con k Propertie ces associa Devices. | , select a select the figuration is. ated with a | target and t target and of sessions, a target, sele | hen | | Connect Disconne Properties De <u>v</u> ices, | t :ct :, |
| To con dick Co To corr then d For tar select For cor the tar | nect using onnect. npletely dis ick Disconn get proper the target nfiguration get and th | advanc connect ect. ties, ind and clic of devi en click | t a target, s cluding con k Propertie ces associa Devices. | , select a select the figuration is. ated with a | target and t target and of sessions, a target, sele | hen | | Co <u>n</u> ned Disconne Properties De <u>v</u> ices, | t :ct : |
| To con dick Co To corr then d For tar select For cor the tar | nect using onnect. Inpletely dis ick Disconn rget proper the target nfiguration rget and th | advanc connect ect. ties, in and clic of devi en click <u>SCSI co</u> | t a target, s duding con k Propertie ces associa Devices. | , select a select the figuration s. ated with a <u>and targe</u> | target and t target and of sessions, a target, sele <u>ts</u> | ect | | Connect Disconne Properties Devices. | t :ct : |
| To con dick Co To corr then d For tar select For cor the tar | nect using onnect. npletely dis ick Disconn get proper the target nfiguration get and th | advanc connect ect. ties, in and clic of devi en click <u>SCSI co</u> | t a target, s duding con k Propertie ces associa Devices. | , select a select the figuration is. ated with a and targe | target and t target and of sessions, a target, sele ts | ect | | Connect Disconne Properties De <u>v</u> ices. | t :ct : |
| To con dick Co To cor then d For tar select For cor the tar | nect using onnect. npletely dis ick Disconn get proper the target nfiguration get and th | advanc connect ect. ties, ind and clic of devi en click | t a target, s duding con k Propertie ces associa Devices. | , select a select the figuration s. ated with a <u>and targe</u> | target and t target and of sessions, a target, sele ts | ect | | Connect Disconne Properties Devices, | t |
| To con dick Co To cor then d For tar select For cor the tar | nect using onnect. npletely dis ick Disconn get proper the target nfiguration get and th | advanc connect ect. ties, ind and clic of devi en click | t a target, s duding con k Propertie ces associa Devices. | , select a select the figuration s. ated with a and targe | target and t target and of sessions, a target, sele | ect | | Connect Disconne Properties Devices, | t |

Select the **Discovery** page.

| scs | I Init | iator Prop | erties | | | | | | | × | |
|-----|--|---------------|-------------|---------------|----------------|-----------------|--------|------------------|------------|---|--|
| Та | rgets | Discovery | Favorite | Targets | Volun | nes and Devices | s RA | DIUS Con | figuration | | |
| | | | | | | | | | | | |
| Γ | Target portals | | | | | | | | ah I | | |
| | The system will look for <u>T</u> argets on following portals: | | | | | | | | sn | | |
| | Address Port Adapter IP address | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | To ad | ld a target p | ortal, clid | k Discover F | Portal | | | Discover E | ortal | | |
| | To re | move a targ | et portal, | select the a | addre | ss above and | Ē | Domo | | | |
| | then | click Remove | e. ' ' | | | | _ | Menno | VC | | |
| | | | | | | | | | | | |
| Г | iSNS s | ervers | | | | | | | . 1 | | |
| | The s | system is reg | istered or | n the follow | ing <u>i</u> S | NS servers: | | Refre | esh | | |
| | Name | e | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | To ad | ld an iSNS se | erver, did | k Add Serve | er. | | | A <u>d</u> d Ser | ver | | |
| | To re | move an iSN | S server, | select the : | serve | r above and | Ē | Demo | | | |
| | then dick Remove. | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | More | e about Disc | overy and | <u>l iSNS</u> | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | 1 | OK | | Cancel | úpelu | | |
| | | | | | | OK | | Cancer | עולים | | |

Press the **Discovery Portal** button, the **Discovery Target Portal** dialog is shown.

| Discover Target Portal | × |
|--|------------------------------------|
| Enter the IP address or DNS name and p want to add. | ort number of the portal you |
| To change the default settings of the dist the Advanced button. | covery of the target portal, click |
| IP address or DNS name: | Port: (Default is 3260.) |
| 192.168.0.3 | 3260 |
| <u>A</u> dvanced | <u>O</u> K <u>C</u> ancel |

Type IP address or NDS name and Port of the SANDeploy Server in the required fields.

Press the **OK** button to add.

Select the Targets page.

| .51 Initi | ator Prop | perties | | | | | | | |
|------------------------------|------------------------------------|----------------------------|-----------------------------|-----------------------|-------------------|-----------|----------|------------------|-----|
| argets | Discovery | Favori | te Targets | Volume | s and Dev | ices R/ | ADIUS | Configurat | ion |
| Quick C To disc DNS na | onnect over and lo me of the | og on to a target an | target usir d then click | ng a basi Quick Co | c connectionnect. | on, type | the IP a | address or | |
| <u>T</u> arget | - | | | | | | Qu | ick Connect | |
| Discove | ered target | is —— | | | | | | <u>R</u> efresh | 1 |
| Name | | | | | | Sta | atus | | |
| ign. 20 | 08-08.con | n.sandeplo | v:SANSer | ver.SAN0 |) | Ina | ctive | | |
| To con | nect using | advanced | options, s | elect a ta | arget and t | then | | Connect | |
| click Co | nnect. | | | | | | | | |
| To com then cli | pletely dis ick Disconn | connect a lect. | target, sel | lect the t | arget and | | | Disconnect | |
| For tar select f | get proper the target | ties, inclu and click F | ding config Properties. | uration o | fsessions | , | E | properties | |
| For cor the tar | nfiguration get and th | of device en click De | s associate evices. | d with a | target, sel | lect | | De <u>v</u> ices | |
| More ab | out basic i | SCSI conn | ections and | d targets | l | | | | |
| | | | | | | | | | |

Select the targets just added and then press the **Connect** button.

| Connect To Target | × |
|---|---|
| Target name: iqn.2008-08.com.sandeploy:SANServer.SAN0 | |
| Add this connection to the list of Favorite Targets. This will make the system automatically attempt to restore the connection every time this computer restarts. | |
| Enable multi-path | |
| Advanced OK Cancel | |

Keep selection of **the Add this connection to the list of Favorite Targets**.

Press the **OK** button to continue.

If successful, the logged on targets are shown in the figure.
| SI Initiator | Prope | rties | | | | | | | |
|--|---------------------------|-------------------------------------|------------------------|-------------------------|------------|----------|---------------|------------|---|
| Fargets Disc | overy | Favorite Targ | ets Vo | olumes and | Devices | RADIU | IS Con | figuration | |
| Quick Conne To discover DNS name o | ct and log f the ta | on to a targe rget and then | t using a click Qui | basic con ick Connec | nection, t | type the | IP addre | ess or | |
| <u>T</u> arget: | | | | | | | Quick C | onnect,., | |
| Discovered t | ar <u>q</u> ets | | | | | | Re | fresh | 1 |
| Name | | | | | | Status | | | |
| ian. 2008-0 | 8.com.s | andeplov:SAN | Server. | SAN0 | | Connec | :ted | | |
| To connect (| using av | wanced option | | t a target | and then | | | | 1 |
| dick Connec | t. | wanced option | is, selec | ta target | | _ | Cor | inect |] |
| To complete then click Dis | ly disco sconneo | nnect a target t. | , select | the target | and | | <u>D</u> isco | onnect | |
| For target p select the ta | ropertie arget ar | es, including co d click Propert | nfigurat ies. | tion of ses | sions, | | Prope | rties | |
| For configur the target a | ation of nd ther | devices asso dick Devices. | ciated wi | ith a targe | t, select | | De <u>v</u> i | ices | |
| More about b | asic iSC | SI connection | s and ta | <u>rgets</u> | | | | | |
| | | | | | | | | | |

Launch the Windows Computer Management Console.

| 🛃 Computer Management | | | | | <u>- 🗆 ×</u> |
|----------------------------------|---------------|------------------|--|-------------------|--------------|
| <u>File Action View H</u> elp | | | | | |
| 🗢 🔿 🖄 🖬 🚺 | e 😼 | | | - | |
| Computer Management (Local) | Volume Layout | Type File System | Status | Actions | |
| 🖃 🎁 System Tools | 📼 (C:) Simple | Basic NTFS | Healthy (System, Boot, Page File, Active, Cras | h Disk Management | _ |
| Task Scheduler | | | | More Actions | <u> </u> |
| Event viewer Shared Folders | | | | More Actions | |
| Local Users and Groups | | | | | |
| Performance | | | | | |
| 🚔 Device Manager | | | | | |
| 🖃 🔚 Storage | | | | | |
| Disk Management | • | | | | |
| E Services and Applications | | | | | |
| | Basic | | | - | |
| | 10.00 GB | 10.00 GB | | | |
| | Offline 🕕 | | | | |
| | Help | | | | |
| | Disk 2 | | | | |
| | Basic | | | | |
| | 2.00 GB | 2.00 GB | | | |
| | Help | | | | |
| | | | | -1 | |
| | Unallocated | Primary partit | ion | 1 | |
| | , | | | -, | |
| 1 | | | J | | |

Right click on the **Disk1** and then select the **Online** menu item, bring **Disk1** online.

Right click on the **Disk2** and then select the **Online** menu item, brings **Disk2** online.

| 🛃 Computer Management | | | | | l × |
|-----------------------------|-------------------|--------------------------------|--|--------------------------------|-----|
| Eile Action View Help | | | | | |
| 🗢 🔿 🔰 🖬 🚺 👪 | | | | | |
| Computer Management (Local) | Volume Layout | Type File System | Status | Actions | |
| System Tools Task Scheduler | (C:) Simple I | Basic NTFS | Healthy (System, Boot, Page File, Active, Cr | ^{ash} Disk Management | |
| Event Viewer | St. Simple | Basic NTES | Healthy (Primary Partition) | More Actions | • |
| 🕀 👸 Shared Folders | | | ricelarly (rinkery rendering | | |
| Local Users and Groups | | | | | |
| Device Manager | | | | | |
| 🖃 🔠 Storage | | | | | |
| Disk Management | • | | | | |
| Services and Applications | Disk 1 | | | | |
| | Basic 10.00 GB | Standard (S:) 10.00 GB NTES | | | |
| | Online | Healthy (Primary I | Partition) | | |
| | | <u> </u> | | | |
| | Disk 2 | | | | |
| | 2.00 GB | 2.00 GB NTFS | | | |
| | Online | Healthy (Primary I | Partition) | | |
| | | <u>P</u> | | - | |
| | Unallocated | Primary partiti | on | | |
| | | | | | |

Right on the Disk1 and then select the **Change Driver Letter and Paths...** menu item, change the letter of Disk1 to S:.

Right on the Disk2 and then select the **Change Driver Letter and Paths...** menu item, change the letter of Disk2 to Q:.

Installing Failover Clustering Service

Launch the Windows Server manager Console.



Select the Features node from the left tree view.



Click the Add Features link, the Add Features Wizard is shown.

| Select Features | |
|---|---|
| | |
| Features Select one or more features to install on this server. Confirmation Eeatures: Progress Image: | Description: Failover Clustering allows multiple servers to work together to provide high availability of services and applications. Failover Clustering is often used for file and print services, database and mail applications. |

Select the Failover Clustering.

Press the **Next** button to continue.



Press the Install button to install the Failover Clustering feature.

The installation of the Failover Clustering is going on.

| Add Features Wizard | |
|---------------------|--|
| Installation Progr | ress |
| Features | The following roles, role services, or features are being installed: |
| Confirmation | Failover Clustering |
| Progress | |
| Results | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | Markalling |
| | < Previous Next > Install Cancel |

If successful, the wizard will complete and show as the figure below.



Press the Close button.

Configuring Failover Clustering

Validate a Configuration

Node that this step is not necessary for creating a cluster, but it ensures that the configuration is suitable for failover clustering.

Launch to the Windows Failover Cluster Manager console in node 1 or node 2 machines.



Click on the Validate a Configuration... link.

The Validate a Configuration Wizard appears.

| 👹 Validate a Configu | ration Wizard | × |
|--|---|---|
| Before Y | ou Begin | |
| Before You Begin Select Servers or a Cluster Testing Options Confirmation Validating Summary | This wizard runs validation tests to determine whether this configuration of servers and attached storage is set up correctly to support failover. A cluster solution is supported by Microsoft only if the complete configuration (servers, network, and storage) passes all tests in this wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2". If you want to validate a set of unclustered servers, you need to know the names of the servers. Important: the storage connected to the selected servers will be unavailable during validation tests. If you want to validate an existing failover cluster, you need to know the name of the cluster or one of its nodes. You must be a local administrator on each of the servers you want to validate. To continue, click Next. More about preparing your hardware for validation More about cluster validation tests. Image: Do not show this page again | |
| | Next > Cancel | |

Press the **Next** button to continue.

Add nodes to the cluster.

| 👹 Validate a Configu | ration Wizard | | × |
|--|---|---|---|
| Select Se | ervers or a Cluster | | |
| Before You Begin Select Servers or a Cluster | To validate a set of server To test an existing cluster, | rs, add the names of all the servers. , add the name of the cluster or one of its nodes. | |
| Testing Options Confirmation Validating Summary | Enter name: Selected servers: | < Previous Next > | <u>B</u> rowse Add <u>R</u> emove |
| | | < Previous Next > | Cancel |

Press the **Browse** button, the Select **Computers dialog** appears.

| Select Computers | ? × |
|---|----------------------|
| Select this object type: | |
| Computers | <u>O</u> bject Types |
| From this location: | |
| SANDeploy.Local | Locations |
| Enter the object names to select (<u>examples</u>): | |
| | Check Names |
| | |
| | |
| Advanced | OK Cancel |

Press the **Advanced...** button.

| Select Compute | rs | | | ? × |
|--------------------------|---------------|---|----|-----------------|
| Select this object | t type: | | | |
| Computers | | | | Object Types |
| From this location | 1: | | | |
| SANDeploy.Loc | al | | | Locations |
| Common Querie | es | | | |
| N <u>a</u> me: | Starts with 💌 | | | <u>C</u> olumns |
| Description: | Starts with 💌 | | | Find Now |
| Disa <u>b</u> led a | accounts | | | Stop |
| 🔲 Non e <u>x</u> pir | ing password | | | |
| Days since la | st logon: |] | | 9 7 |
| | | | | |
| | | | | |
| Search res <u>u</u> lts: | | | OK | Cancel |
| Name (RDN) | In Folder | | | |
| 08DC | SANDeploy.Loc | | | |
| 08NODE1 | SANDeploy.Loc | | | |
| 08NODE2 | SANDeploy.Loc | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| 08NODE1 | SANDeploy.Loc | | | |

Select the **08NODE1** item and then press the **OK** button to add.

| Select Computers | | <u>?</u> × |
|--|----|--------------|
| Select this object type: | | |
| Computers | | Object Types |
| From this location: | | |
| SANDeploy.Local | | Locations |
| Enter the object names to select (examples): | | |
| 08NODE1 | | Check Names |
| | | |
| | | |
| <u>A</u> dvanced | OK | Cancel |

Press the **OK** button.

| 👹 Validate a Configu | uration Wizard | × |
|--|---|---|
| Select Se | ervers or a Cluster | |
| Before You Begin Select Servers or a Cluster | To validate a set of servers, add the names of all the servers. To test an existing cluster, add the name of the cluster or one of its nodes. | |
| Testing Options Confirmation Validating Summary | Enter name: Browse Selected servers: 08node 1.kemsafe.local Add Remove Remove Image: Selected servers: Selected servers: Cancel | |

Press the **Browse...** button and add **08NODE2** by through the same way.

| 👹 Validate a Configu | ration Wizard | | × |
|---|--|---|---|
| Select Se | ervers or a Cluster | | |
| Before You Begin Select Servers or a Cluster | To validate a set of server To test an existing cluster | rs, add the names of all the servers. , add the name of the cluster or one of its nodes. | |
| Cluster Testing Options Confirmation Validating Summary | <u>E</u> nter name: <u>S</u> elected servers: | 08node1.sandeploy.local 08node2.sandeploy.local | <u>B</u> rowse <u>A</u> dd <u>R</u> emove |
| | | < <u>P</u> revious <u>N</u> ext > | Cancel |

Press the **Next** button to continue.

| 🖏 Validate a Configuration Wizard | | | |
|-----------------------------------|--|---|--|
| Testing C | Options | | |
| Before You Begin | Choose between running all tests or running selected tests. | | |
| Select Servers or a Cluster | The tests include Inventory tasks, Network tests, Storage tests, and System Configuration tests. | | |
| Testing Options | Microsoft supports a cluster solution only if the complete configuration (servers, network, and storage) can pass all tests in this wizard. In addition, all hardware components in the cluster solution must be "Certified | | |
| Confirmation | for Windows Server 2008 R2". | | |
| Validating | | | |
| Summary | | | |
| | Run <u>all</u> tests (recommended) Run only tests I <u>s</u>elect | | |
| | More about cluster validation tests | | |
| | < <u>P</u> revious <u>N</u> ext > Cancel | I | |

Select Run all tests (recommended).

Press the **Next** button to continue.

| 🖏 Validate a Configuration Wizard | | | × |
|--|--|---------------------------------------|----------|
| Confirma | tion | | |
| Before You Begin Select Servers or a Cluster | You are ready to start validation. Please confirm that the following settings are correct | : | |
| Testing Options | Servers to Test | | |
| Confirmation | 08node1.sandeploy.local | | |
| Validating | 08node2.sandeploy.local | | |
| Summary | | | _ |
| | Tests Selected by the User | Category | |
| | List BIOS Information | Inventory | |
| | List Environment Variables | Inventory | |
| | List Fibre Channel Host Bus Adapters | Inventory | • |
| | To continue, click Next. More about cluster validation tests | | |
| | | < <u>P</u> revious <u>N</u> ext > Car | ncel |

Press the **Next** button to continue.

If successful, all the tests include SCSI-3 Persistent Reservation are valid and shown as the figure below.

| 👹 Validate a Configu | ration Wizard | × |
|--|--|---|
| Summary | , | |
| Before You Begin Select Servers or a Cluster | Testing has completed successfully and the configuration is suit | able for clustering. |
| Testing Options | Validate Microsoft MPIO-based disks | Success |
| Validating | Validate Multiple Arbitration | Success |
| Summary | Validate SCSI device Vital Product Data (VPD) | Success |
| | Validate SCSI-3 Persistent Reservation | Success |
| | Validate Simultaneous Failover | Success |
| | To view the report created by the wizard, click View Report. To close this wizard, click Finish. <u>Create the clust</u> | <u>Vi</u> ew Report er now using the validated nodes |
| | More about cluster validation tests | |
| | | <u>F</u> inish |

Press the **Finish** button to complete configuration validation.

Create a Failover Cluster

Click on the **Create a Cluster...** item in the **Actions** panel of **Failover Cluster Manager**.



The Create Cluster Wizard appears.

| 🚏 Create Cluster Wizard 🔀 🔀 | | | |
|---|---|---|--|
| Before Y | ou Begin | | |
| Before You Begin Select Servers Validation Warning Access Point for Administering the Cluster Confirmation Creating New Cluster Summary | This wizard creates a cluster, which is a set of servers that work together to increase the availability of clustered services and applications. If one of the servers fails, another server begins hosting the clustered services and applications (a process known as failover). Before you run this wizard, we strongly recommend that you run the Validate a Configuration wizard to ensure that your hardware and hardware settings are compatible with failover clustering. Microsoft supports a cluster solution only if the complete configuration (servers, network, and storage) can pass all tests in the Validate a Configuration wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2". You must be a local administrator on each of the servers you want to include in the cluster. To continue, click Next. More about Microsoft support of cluster solutions that have passed validation tests More about the name and IP address information needed for a new cluster. | | |
| | Next > Cancel |] | |

Press the **Next** button to continue.

| 🚏 Create Cluster Wizard 🔀 🔀 | | | |
|---------------------------------------|----------------------------|--|---|
| Select Se | ervers | | |
| Before You Begin | Add the names of all the s | ervers that you want to have in the cluster. You must add at least one server. | |
| Select Servers | | | |
| Validation Warning | | | |
| Access Point for Administering the | Enter server name: | Browse | |
| Cluster | Selected servers: | Add | |
| Confirmation | | Remove | 1 |
| Creating New Cluster | | | - |
| Summary | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | < <u>Previous</u> <u>Next</u> > Cancel | |

Press the Browse... button and the Add button to add nodes to this cluster.

| 🚏 Create Cluster Wizard | | | |
|---|---------------------------|---|---|
| Select Se | ervers | | |
| Before You Begin Select Servers Access Point for Administering the | Add the names of all the | servers that you want to have in the cluster. You must add at least one server. | |
| Cluster | Enter server name: | <u>B</u> rowse | 1 |
| Confirmation Creating New Cluster Summary | <u>S</u> elected servers: | 08node1.sandeploy.local Add <u>Add</u> <u>Remove</u> | |
| | | < <u>P</u> revious <u>N</u> ext > Cancel | |

Press the **Next** button to continue.

Specify IP address for the cluster.

| 🚏 Create Cluster Wizard | | | × | | |
|--|--|----------------------------------|--|--|--|
| Access P | oint for A | dmi | nistering the Cluste | ۶r | |
| Before You Begin Select Servers Access Point for Administering the Cluster Confirmation | Type the Cluster N One or mo sure the n | name ame: re IPv etwork | you want to use when admini SANDeployCluster 4 addresses could not be cor t is selected, and then type ar | stering the cluster. figured automatically. For each network to be used, make n address. | |
| Creating New Cluster | | | Networks | Address | |
| Summary | | ◄ | 192.168.100.0/24 | 192.168.100.150 | |
| | | | 192.168.0.0/24 | 192.168.0.150 | |
| | More abo | ut the | administrative Access Poin | t for a cluster < <u>P</u> revious <u>N</u> ext > Cancel | |

Type an IP address in the **Address** field.

Press the **Next** button to continue.

| 矒 Create Cluster Wiz | zard | | × |
|---|--|--|--------|
| Confirma | tion | | |
| Before You Begin Select Servers | You are ready to create a The wizard will create you | a cluster. ur cluster with the following settings: | |
| Access Point for Administering the Cluster Confirmation Creating New Cluster Summary | Cluster: Node: Node: IP Address: IP Address: To continue, click Next. | SANDeployCluster 08node1.sandeploy.local 08node2.sandeploy.local 192.168.100.150 192.168.0.150 | × |
| | | < Previous Next > | Cancel |

Press the **Next** button to continue or press the **Previous** button if any changes are needed.

If successful, the **Create Cluster Wizard** complete as shown in the figure below.



Press the Finish button to continue.



Now the creation of the cluster is completed, expand the cluster node and select the Storage node, it will shown as the figure below, both cluster disk are shown online.

Contact

| Support: | <pre>support@sandeploy.com</pre> |
|---------------|--|
| Sales: | sales@sandeploy.com |
| Home Page: | http://www.sandeploy.com/ |
| Product Page: | http://www.sandeploy.com/products.html |

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