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1 About This Guide

1.1 Using This Guide

This guide provides a hands-on “Quick Start” set of instructions to create Active/Standby cluster system for iSCSI Target Server with EXPRESSCLUSTER X for Windows. The guide assumes users have Microsoft Windows system administration knowledge and skills with experience in installation and configuration of Microsoft Windows operating systems, networks, and iSCSI Target Server.

1.2 Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>July, 2016</td>
<td>Initial Version</td>
</tr>
</tbody>
</table>

1.3 Evaluation Environment

This iSCSI Target Server clustering method has been evaluated with the following OS and software.

- Windows Server 2012 R2
- EXPRESSCLUSTER X 3.3 for Windows

1.4 For More Information

We have the following guides for instant support.

- **Getting Started Guide** – This guide explains general cluster concepts and overview of EXPRESSCLUSTER X functionality.

- **Installation and Configuration Guide** – This guide explains EXPRESSCLUSTER X installation and configuration procedures in detail.

- **Reference Guide** – This is a reference of commands that can be put in EXPRESSCLUSTER X scripts and maintenance commands that can be executed from the server command prompt.
The guides listed above can also be found at
2 Overview

The general procedure to deploy EXPRESSCLUSTER X on two servers (referred to as Primary and Secondary), each with an iSCSI virtual disk which is mirrored between the servers, consists of the following major steps:

1. Perform system planning to determine requirements and specify configuration settings prior to the start of actual system installation and configuration.
2. Prepare the Secondary server, including OS installation and configuration.
3. Set up a Data Partition and Cluster Partition on both servers according to instructions in the EXPRESSCLUSTER X Installation and Configuration Guide.
4. Install and configure EXPRESSCLUSTER X on the Primary and Secondary server.
5. Create and configure the EXPRESSCLUSTER X failover group to enable continuous protection and automatic recovery of the iSCSI virtual disk.
6. Upload the configuration file and start the cluster to complete deployment.

![Diagram of iSCSI Target Server setup]

- Domain Controller
- iSCSI Client Machine
- Primary Server
- Standby Server
- iSCSI Virtual Disk/MD
- Interconnect
- Replication
- Public
3 System Requirements and Planning

3.1 System Requirements

Both Windows Server 2012 R2 servers in the cluster require the installation of the iSCSI Target Server service. It can be installed using the Add Roles and Features Wizard in Server Manager, under the File and Storage Services section.

3.2 System Planning

Fill out the tables of the worksheet below to use for reference in the configuration sections of this guide. See also 9.2 Example System Planning Worksheet for an example worksheet.

Machine #1: Primary Server (with iSCSI Target Server)
Machine #2: Secondary Server (with iSCSI Target Server)
Machine #3: Test Client Machine (with iSCSI Initiator)

Table 1: System Network Configuration

<table>
<thead>
<tr>
<th>Machine</th>
<th>Hostname</th>
<th>Network</th>
<th>IP Address</th>
<th>DNS</th>
<th>MDC¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>NIC #1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NIC #2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#2</td>
<td>NIC #1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NIC #2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td>NIC #1</td>
<td></td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

Floating IP (FIP) Address : ____________________________
Virtual Computer Name (vcom) : __________________________
iSCSI Target Name : __________________________

¹ MDC (Mirror Disk Connect) is network for data mirroring.
### Table 2: System OS and Disk Configuration

<table>
<thead>
<tr>
<th>Machine</th>
<th>OS</th>
<th>Disk 0 (OS)</th>
<th>Disk 1 (Data)</th>
</tr>
</thead>
<tbody>
<tr>
<td>#3</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3: System Logins and Passwords

<table>
<thead>
<tr>
<th>Machine</th>
<th>Login</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4 EXPRESSCLUSTER X Installation

4.1 Install EXPRESSCLUSTER X on the Primary Server

1. Insert the EXPRESSCLUSTER X CD-ROM into a CD-ROM drive on the server.
2. In the pop-up window, click NEC EXPRESSCLUSTER for Windows.
3. Click on NEC EXPRESSCLUSTER X 3.x for Windows.
4. In the Welcome window, click Next.
5. In the Choose Destination Location window, click Next.
6. In the next window, click Install.
7. In the Port Number window, if necessary, modify the default port numbers. Click Next.
8. In the Filter Settings of Shared Disk window, click Next.
9. Click Yes in the Confirmation window to skip shared disk filtering.
10. In the License Manager window, click Register.
11. In the License Registration window, click Register with License Information.
12. In the Product Selection window, select the OS and Product/Trial types. For Product Name, click EXPRESSCLUSTER X 3.x for Windows. Click Next.
13. In the License Unit Selection window, depending on the type of license, enter the number of CPU or Node Units. Click Next.
14. In the License Key Entry window, enter the Serial No. and License Key. Click Next.
15. In the License Registration Confirmation window, confirm the information entered is correct. Click Next.
16. Click OK. If the license registration fails, start again from step 10.
17. Repeat steps 10 – 16 again for the EXPRESSCLUSTER X Replicator 3.x for Windows product license. Select EXPRESSCLUSTER X Replicator 3.x for Windows as the Product Name in step 12.
18. When the licenses have been successfully registered, click Finish.
19. On the InstallShield Wizard Complete window, click the No, I will restart my computer later option button, and then click Finish.
20. In the next window, click Exit. Click Exit. (Two times total).
4.2 Install EXPRESSCLUSTER X on the Secondary Server

Perform all of the steps in Section 4.1 on the Secondary Server.

4.3 Restart the Primary and Secondary Servers

First restart the Primary Server, and then restart the Secondary Server.

4.4 Confirm Connectivity between Servers

Ping the servers in the cluster to verify that there are no issues in connectivity. Also be sure that the ports used by EXPRESSCLUSTER are able to communicate through the Windows Firewall.
5 Base Cluster Setup

5.1 Start WebManager

Verify that Java Runtime Environment (JRE) is installed on a machine to be used for cluster management. See the installation requirements section of the EXPRESSCLUSTER X Getting Started Guide for a compatible version. For this guide, use the Primary Server for cluster management. Install JRE if necessary. Then start by accessing port 29003 of the Primary Server from the web browser of the cluster management machine, using the Primary Server’s IP address. Example: http://10.0.0.2:29003. When the security warning window displays, select the Always trust content from this publisher check box. Click Run.

5.2 Create a Cluster

For all of the steps in the cluster creation project, refer to Table 1 for the IP addresses and server names.

1. When the cluster manager is opened for the first time, there is a pop-up window with two options. Click Start cluster generation wizard.
2. In the confirmation window, click Start Cluster Generation Wizard for standard edition.
3. In the new window, type a Cluster Name (Example: iscsi_cluster), and click Next.
4. In the next window, to add another server to the cluster, click Add.
5. Type the Server Name or the IP Address of Secondary Server, and then click OK.
6. Both servers are now on the list. If the Primary Server is not in the top (Master Server) position, then move it up. Click Next.

5.3 Set Up the Network Configuration

1. EXPRESSCLUSTER X automatically detects the IP addresses of the servers. The primary network (Interconnect) is for heartbeat and mirroring the data; set the MDC on this row as mdc1. The secondary (Public) network is for heartbeat only. Click Next.
2. In the NP Resolution window, click Next.
5.4 Create a Failover Group

1. To add a group, in the Cluster Generation Wizard, in the Group section, click Add.
2. In the next window, select failover for group Type. Name the group (Example: iscsi_failover), click Next, and then click Next. (Two times total).
3. Select the default options for the Group Attribute Settings, and then click Next.

5.5 Create Resources for Base Cluster

1. In the Group Resource section of the Cluster Generation Wizard, to add a resource, click Add.
2. To add a floating IP address resource, from the Type drop down menu, select floating ip resource, and then click Next.
3. Verify the Follow the default dependency box is selected, and then click Next.
4. Verify the default options are correct, and then click Next.
5. Enter the floating IP address in the IP Address field and click Finish.
6. Add a virtual computer name resource by clicking Add.
7. From the Type drop down menu, select virtual computer name resource, and then click Next.
8. Uncheck the Follow the default dependency box.
9. Select the recently created floating ip resource in the right pane and click Add. Click Next.
10. Verify the default options are correct, and then click Next.
11. Enter the Virtual Computer Name chosen earlier (Example: vcom).
12. From the drop down menu under Target FIP Resource Name, select the floating IP address. Click Finish.
13. Add a mirror disk resource by clicking Add.
14. Click Get License Info to retrieve the active license for replication. (Note that there is no visible indication that it was successful).
15. To add a mirror disk resource, from the Type drop down menu, select mirror disk resource, and then click Next.
16. Verify the Follow the default dependency box is selected, and then click Next.
17. Verify the default options are correct, and then click Next.
18. Select the Primary Server name and click Add.
19. Click Connect to populate the server partitions.
20. Select the drive letter of the data partition for mirroring (Example: X) in the Data Partition box, and the drive letter of the cluster partition (Example: W) in the Cluster Partition box. Click OK.

Note:
Specify different partitions for data partition and cluster partition. If the same partition is specified, data on the mirror disk may be corrupted.

22. Click Finish.
23. Click Finish, and then click Next.
24. Click Finish.
25. Click Yes to enable recovery action when an error occurs in a monitor resource.

5.6 Upload the Cluster Configuration and Start Cluster

1. In the Cluster Manager window, click the File menu and then Apply the Configuration File. Click OK. Click OK. (Two times total).
2. After the upload is complete, change from Config Mode to Operation Mode.
3. Restart Cluster Manager. Click the Service menu, and then click Restart Manager. Click OK.
4. Click the Service menu, and then click Start Cluster. Click OK.
5. When the cluster tree displays after a few seconds, in the left pane of the Cluster Manager window, expand the %failover group% section, right click %mirror disk%, and click Details to monitor the disk synchronization progress. Mirror disk copy starts automatically, replicating data from the Primary Server to the Secondary Server.

Note:
This step may take a while depending on the size of the data on the mirror disk partition.

6. After the copy completes, in the Mirror Disk Helper window, click
Close.

7. In the Cluster Manager window, all icons in the tree view should now be green. Refer to the figure below:

8. Move the %failover group% to the Secondary Server to verify that all group resources and monitor resources can be activated on Secondary Server. After verification, move the %failover group% back to the Primary Server.

Note:
These tests do not affect server functionality. It verifies that the mirror disks on each server in the cluster are functioning properly. The mirror disk is now controlled by EXPRESSCLUSTER X and is only accessible from the active server.
6 iSCSI Target Server Installation

6.1 Install iSCSI Target Server on the Primary Server

Do the following steps to install iSCSI Target Server.

1. Open a PowerShell window with Administrative rights.
2. If iSCSI Target Server role has not been installed, enter the following command.
   \[PS> Install-WindowsFeature FS-iSCSITarget-Server\]
3. Create a directory on the mirror disk for the iSCSI virtual disk (Example: X:\iSCSIVirtualDisks).
4. Run the following command to create a virtual disk.
   \[PS> New-IscsiVirtualDisk -Path "<drive letter>:<folder>\name>.vhdx" -Size <size>\]
   **Example:**
   \[PS> New-IscsiVirtualDisk -Path "X:\iSCSIVirtualDisks\lun1.vhdx" -Size 20GB\]
5. Run the following command to create an iSCSI Target.
   \[PS> New-IscsiServerTarget <target name> -InitiatorIds "IPAddress:<client IP address>"\]
   **Example:**
   \[PS> New-IscsiServerTarget Target1 -InitiatorIds "IPAddress:10.0.0.101"\]
6. Run the following command to change iSCSI Target IQN.
   \[PS> Set-IscsiServerTarget <target name> -TargetIqn "iqn.1991-05.com.microsoft:<vcom name>-<target name>-target"\]
   **Example:**
   \[PS> Set-IscsiServerTarget Target1 -TargetIqn "iqn.1991-05.com.microsoft:vcom-Target1-target"\]
7. Run the following command to assign the VHDX to the Target.
PS> Add-IscsiVirtualDiskTargetMapping <target name> "<path to vhdx>\<name>.vhdx"

Example:
PS> Add-IscsiVirtualDiskTargetMapping Target1 "X:\iSCSIVirtualDisks\lun1.vhdx"

8. Run the following command to stop Microsoft iSCSI Software Target service (wintarget).
   PS> Stop-Service wintarget

6.2 Install iSCSI Target Server on the Secondary Server

Do the following steps to install iSCSI Target Server.
1. Move the %failover_group% to the Secondary Server.
2. Open a PowerShell window with Administrative rights on the Secondary Server.
3. If iSCSI Target has not been installed, enter the following command.
   PS> Install-WindowsFeature FS-iSCSITarget-Server

4. Run the following command to import iSCSI virtual disk (VHDX).
   PS> Import-IscsiVirtualDisk -Path "<path to vhdx>\<name>.vhdx"

Example:
PS> Import-IscsiVirtualDisk -Path "X:\iSCSIVirtualDisks\lun1.vhdx"

5. Run the following command to create an iSCSI Target (using the same name on Primary Server).
   PS> New-IscsiServerTarget <target name> -InitiatorIds "IPAddress:<client IP address>"

Example:
PS> New-IscsiServerTarget Target1 -InitiatorIds "IPAddress:10.0.0.101"

6. Run the following command to change iSCSI Target IQN.
PS> Set-IscsiServerTarget <target name> -TargetIqn "iqn.1991-05.com.microsoft:<vcom name>-<target name>-target"

Example:
PS> Set-IscsiServerTarget Target1 -TargetIqn "iqn.1991-05.com.microsoft:vcom-Target1-target"

7. Run the following command to assign the VHDX to the Target.
PS> Add-IscsiVirtualDiskTargetMapping <target name> "<path to vhdx>¥<name>.vhdx"

Example:
PS> Add-IscsiVirtualDiskTargetMapping Target1 "X:¥iSCSIVirtualDisks¥lun1.vhdx"

8. Run the following command to stop Microsoft iSCSI Software Target service (wintarget).
PS> Stop-Service wintarget
7 iSCSI Target Server Cluster Setup

7.1 Add the First Set of Scripts

1. Download the script files for iSCSI Target Server clustering from the EXPRESSCLUSTER web site.
2. Unzip sample_scripts_iSCSITarget.zip and check if there are following folders and files.
   
   **script-wintarget1**
   - Control-Wintarget.ps1
   - start.bat
   - stop.bat

   **script-wintarget2**
   - Control-Wintarget.ps1
   - start.bat
   - stop.bat

3. Start the EXPRESSCLUSTER X **Cluster Manager**.
4. In the Cluster Manager window, change to **Config Mode**.
5. Right-click on the **%failover group%**, and then click **Add Resource**.
6. From the **Type** drop down menu, select **script resource**. As the resource **Name**, enter **script-wintarget1**. Click **Next**.
7. Uncheck the **Follow the default dependency** box, and then click **Next**.
8. Verify the default options are correct, and then click **Next**.
9. Select **start.bat** in the left pane and click the **Replace** button.
10. Navigate to the scripts that were downloaded, open the **script-wintarget1** folder, select the new **start.bat** file, and click **Open**.
11. Click **Yes** to replace.
12. Select **stop.bat** in the left pane and click the **Replace** button.
13. Navigate to the scripts that were downloaded, open the **script-wintarget1** folder, select the new **stop.bat** file, and click **Open**.
14. Click **Yes** to replace.
15. Click **Add** button.
16. Navigate to the scripts that were downloaded, open the **script-wintarget1** folder, select the **Control-Wintarget.ps1** file, and
7.2 Add the Second Set of Scripts

1. Right-click on the %failover group%, and then click Add Resource.
2. From the Type drop down menu, select script resource. As the resource Name, enter script-wintarget2. Click Next.
3. Uncheck the Follow the default dependency box.
4. Select the %mirror disk% resource in the right pane and click Add. Click Next.
5. Verify the default options are correct, and then click Next.
6. Select start.bat in the left pane and click the Replace button.
7. Navigate to the scripts that were downloaded, open the script-wintarget2 folder, select the new start.bat file, and click Open.
8. Click Yes to replace.
9. Select stop.bat in the left pane and click the Replace button.
10. Navigate to the scripts that were downloaded, open the script-wintarget2 folder, select the new stop.bat file, and click Open.
11. Click Yes to replace.
12. Click Add button.
13. Navigate to the scripts that were downloaded, open the script-wintarget2 folder, select the Control-Wintarget.ps1 file, and click Open.
14. Click OK to add.
15. Click the Tuning button.
16. Enter 0 for Normal Return Value for the start and stop sections. Click OK.
17. Click Finish.

7.3 Change Dependency of Resources

1. Click on the %failover_group% in the left pane.
2. Select the Resources tab in the right pane.
3. Right-click on the %mirror_disk% resource and select Properties. Select the **Dependency** tab and uncheck **Follow the default dependency**. Select **script-wintarget1** in the right pane, and click **Add**. Click **OK**.

4. Right-click on the %fip% resource and select Properties. Select the **Dependency** tab and uncheck **Follow the default dependency**. Select **script-wintarget2** in the right pane, and click **Add**. Click **OK**.

5. Click the **Entire Dependency** tab in the right pane and check the dependencies.

<table>
<thead>
<tr>
<th>Depth</th>
<th>Name</th>
<th>Resource Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>script-wintarget1</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; script resource</td>
</tr>
<tr>
<td>1</td>
<td>md</td>
<td>Mirror disk resource</td>
</tr>
<tr>
<td>2</td>
<td>script-wintarget2</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; script resource</td>
</tr>
<tr>
<td>3</td>
<td>fip</td>
<td>Floating IP resource</td>
</tr>
<tr>
<td>4</td>
<td>vcom</td>
<td>Virtual computer name resource</td>
</tr>
</tbody>
</table>

7.4 Upload the Cluster Configuration

1. In the **Cluster Manager** window, click the File menu, and then **Apply the Configuration File**. Click **OK** on confirmation message popup. If the upload ends successfully, click **OK**.

2. After the upload is complete, change to the **Operation Mode**.

3. Right-click on the %failover_group% and select **Start**. Select the **Primary Server** to start the group on and click **OK**.
8 iSCSI Initiator Setup

This chapter shows iSCSI Initiator setup example with Windows OS (ex. Windows Server 2012 R2, Windows 7).

1. Logon the client machine.
2. Open Control Panel.
3. Click iSCSI Initiator.
4. Enter the floating IP address (ex. 10.0.0.4) for Target on Targets tab and click Quick Connect.
5. Check if the iSCSI Target IQN shows on Discovered targets and Status is Connected.
6. Open Disk Management (diskmgmt.msc) and initialize disk.
7. Format disk and check if it is available to create folders and files.

Note:
This iSCSI Target clustering method is NOT suitable as a shared disk for Windows Server Failover Cluster (WSFC). Because it is needed to recover iSCSI Initiator connection manually on WSFC environment after failover.

Note:
When Linux iSCSI Initiator is used, it is recommended to increase the disk timeout. If it takes longer than disk timeout to complete failover/failback, the device that provided by iSCSI Target will be remounted with read-only mode and it is needed to dismount and mount the device manually to clear read-only mode.
9 Appendix

9.1 Test Cluster and Verify Functionality

9.1.1 Move the Failover Group

1. Using Cluster Manager, move the %failover_group% from the Primary Server to the Secondary Server. Verify that the iSCSI Initiator on the client maintains its connection to the iSCSI Target, which is now on the Secondary Server, and that the iSCSI virtual disk can be accessed by the client.

2. Move the %failover_group% back to the Primary Server. Verify that the iSCSI Initiator on the client maintains its connection to the iSCSI Target, which is now back on the Primary Server, and that the iSCSI virtual disk can be accessed by the client.

9.1.2 Failover on Server Shutdown

1. Shutdown the Primary Server manually or through Cluster Manager. This will initiate an automatic failover to the Secondary Server. The iSCSI Initiator on the client should maintain its connection to the iSCSI Target which is now on the Secondary Server. The iSCSI virtual disk should still be accessible by the client.

2. Return the Primary Server to the cluster by turning its power back on. Move the %failover_group% back to the Primary Server.

9.2 Example System Planning Worksheet

Machine #1: Primary Server
Machine #2: Secondary Server
Machine #3: Test Client Machine

Table 1: System Network Configuration

<table>
<thead>
<tr>
<th>Machine</th>
<th>Hostname</th>
<th>Network</th>
<th>IP Address</th>
<th>DNS</th>
<th>MDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Primary</td>
<td>NIC #1</td>
<td>10.0.0.2</td>
<td>10.0.0.1</td>
<td>Do Not Use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NIC #2</td>
<td>192.168.1.2</td>
<td>--------</td>
<td>mdc1</td>
</tr>
<tr>
<td>#2</td>
<td>Secondary</td>
<td>NIC #1</td>
<td>10.0.0.3</td>
<td>10.0.0.1</td>
<td>Do Not Use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NIC #2</td>
<td>192.168.1.3</td>
<td>--------</td>
<td>mdc1</td>
</tr>
<tr>
<td>#3</td>
<td>Test-Client</td>
<td>NIC #1</td>
<td>10.0.0.101</td>
<td>10.0.0.1</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Floating IP (FIP) Address : 10.0.0.4
Virtual Computer Name (vcom) : vcom
iSCSI Target Name : Target1

Table 2: System OS and Disk Configuration

<table>
<thead>
<tr>
<th>Machine</th>
<th>OS</th>
<th>Disk 0 (OS)</th>
<th>Disk 1 (Data)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Size: 250GB</td>
<td>Size (&gt; 17 MB): 24MB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size: 250GB</td>
<td>Size: 50GB</td>
</tr>
<tr>
<td>#3</td>
<td>Windows 7</td>
<td>C: 150GB</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 3: System Logins and Passwords

<table>
<thead>
<tr>
<th>Machine</th>
<th>Login</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Administrator</td>
<td>Admin1234</td>
</tr>
<tr>
<td>#2</td>
<td>Administrator</td>
<td>Admin1234</td>
</tr>
<tr>
<td>#3</td>
<td>User1</td>
<td>User1234</td>
</tr>
</tbody>
</table>