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1 About This Guide

1.1 Purpose

This guide provides a more cost-effective simple clustering solution for companies who do not have the need to backup vast amounts of data. It utilizes Microsoft’s Windows Server Backup technology in conjunction with NEC’s EXPRESSCLUSTER X clustering software.

1.2 Using This Guide

This guide provides a hands-on “Quick Start” set of instructions to create your data cluster with Windows Server Backup and 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 Windows Server components.

1.3 Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>April 8, 2020</td>
<td>Initial Version</td>
</tr>
</tbody>
</table>

1.4 Evaluation Environment

This clustering method has been evaluated with the following OS and software:

- Windows Server 2019
- Windows Server Backup
- EXPRESSCLUSTER X 4.1 for Windows

1.5 For More Information

We have the following guides for instant support.

- **Getting Started Guide** – This guide is intended for all users. The guide covers topics such as product overview, system requirements, and known problems.
• **Installation and Configuration Guide** – Instructions for designing, installing, and configuring a cluster system with EXPRESSCLUSTER are covered in this guide.

• **Reference Guide** – The guide covers topics such as how to operate EXPRESSCLUSTER, function of each module, and troubleshooting.

• **Maintenance Guide** – This guide is intended for administrators and system administrators who want to build, operate, and maintain. The guide describes maintenance-related information for EXPRESSCLUSTER.

• **Hardware Feature Guide** – The guide describes features to work with specific hardware, serving as a supplement to the Installation and Configuration Guide.

2 Overview

- EXPRESSCLUSTER is installed on both servers.
- Windows Server Backup is only installed on the Primary server.
- Data on the Primary server, represented by the Database image, is backed up to the Backup drive on the same server using Windows Server Backup.
- The Backup drive on the Primary server is mirrored to the Secondary server using EXPRESSCLUSTER, adding redundancy to the data.
3 System Requirements and Planning

3.1 System Requirements

Two servers with Microsoft Windows 2019 Standard or Datacenter editions.

Two NICs per server, one for the cluster heartbeat and one for data mirroring.

Set up a Data Partition and Cluster Partition on the disk dedicated to data mirroring on both servers according to instructions in the EXPRESSCLUSTER X For More Information.

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 Appendix B: Example System Planning Worksheet for an example worksheet.

Machine #1: Primary Server (with Windows Server Backup and EXPRESSCLUSTER X)
Machine #2: Secondary Server (with EXPRESSCLUSTER X)

Table 1: System Network Configuration

<table>
<thead>
<tr>
<th>Machine</th>
<th>Hostname</th>
<th>Network</th>
<th>IP Address</th>
<th>Gateway</th>
<th>DNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td></td>
<td>NIC #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NIC #2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#2</td>
<td></td>
<td>NIC #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NIC #2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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>#2</td>
<td></td>
<td>Boot Partition:</td>
<td>Data Partition:</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>
</tbody>
</table>
4 EXPRESSCLUSTER X Installation

4.1 Install EXPRESSCLUSTER X on 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 4.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.

Note that license registration details can be found in the For More Information.

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 4.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 4.x for Windows product license. Select EXPRESSCLUSTER X Replicator 4.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 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 in the cluster

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 Cluster Manager

See the installation requirements section of the EXPRESSCLUSTER X For More Information for a compatible web browser if not using a popular version. For this guide, use the Primary Server for cluster management. If a Cluster Manager icon is on the desktop, double click it to launch the Cluster WebUI dashboard. It can also be launched by accessing port 29003 (default port number) of the Primary Server from the web browser of the cluster management machine, using the Primary Server's IP address. Example: http://10.0.0.3:29003.

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. After the Cluster WebUI window opens, select Config mode from the dropdown menu of the tool bar. Click Cluster generation wizard to start the wizard.
2. In the new window, type a Cluster Name (Example: wsb_cluster), select the default Language, and click Next.
3. In the next window, to add another server to the cluster, click Add.
4. Type the Server Name or the IP Address of Secondary Server, and then click OK.
5. 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: `wsb_failover`), click **Next**, and then click **Next**. (Two times total).
3. Change the **Failover Attribute** from **Automatic failover** to **Manual failover** in the **Group Attributes** window. Click **Next**.

   Note: the failover group will now only run on the **Primary** server.

### 5.5 Create mirror disk resource

1. In the **Group Resource** section of the **Cluster Generation Wizard**, to add a resource, click **Add**.
2. Click **Get License Info** to retrieve the active license for replication. (Note that there is no visible indication that it was successful).
3. To add a mirror disk resource, from the **Type** drop down menu, select **Mirror disk resource**, change **Name** to `wsb_md`, and then click **Next**.
4. Verify the **Follow the default dependency** box is selected, and then click **Next**.
5. Verify the default **Recovery Operation** options are correct, and then click **Next**.
6. Select the **Primary Server** name in the right pane and click **Add**.
7. Click **Connect** to populate the server partitions.
8. 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.

9. Repeat steps 6 – 8 for the **Secondary Server**.
10. Click **Finish**.
5.6 Add Script Resource

1. Download the Windows Server Backup script files for mounting and dismounting a volume from this link. Unzip the files into a local folder. Edit the file Start.bat and change the variable dataPartitionLetter to the same drive letter just set up for data mirroring (Example: dataPartitionLetter=X).
2. Click Add to add a script resource.
3. From the Type drop down menu, select Script resource, change Name to wsb_script, and click Next.
4. Verify the Follow the default dependency box is selected, and then click Next.
5. Verify the default Recovery Operation options are correct, and then click Next.
6. Select start.bat in the Details window and click Replace.
7. Browse to the files just downloaded, select start.bat, and click Open. Click Yes to replace the existing file.
8. Click Add to add the second script file.
9. Click Browse, change the file type from *.bat to All File (*.%), select start.ps1, and click Open. Click Save. The new file should be in the list.
10. Click Finish.
11. Click Finish, and then click Next.
12. Click Finish.
13. Click Yes to enable recovery action when an error occurs in a monitor resource.

5.7 Upload the Cluster Configuration and Start Cluster

1. In the Cluster WebUI window, click Apply the Configuration File. Click OK. Click OK. (Two times total).
2. After the upload is complete, change from Config mode to Operation mode and click on the Status tab.
3. Select Start cluster and click Start. Cluster information will display in a few seconds.
4. Click on the Mirror disks tab 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.

5. After the copy completes, click on the Status tab.
6. In the cluster Status window, all icons in the tree view should now be green. Refer to the figure below:

If the mirror disk resource or script resource under the primary server did not start (still gray), start the resource by clicking on the triangle button.

7. Confirm that the cluster is functioning
   7.1 Move the %failover group% to the Secondary Server.
   7.2 Move the %failover group% back to the Primary Server.

Note
These tests do not affect server functionality. They verify 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  Windows Server Backup

6.1 Install on the Primary Server

1. Login to the Primary Server with an Administrator account.
2. Verify that the failover group is running on the Primary Server.
3. Windows Server Backup can be installed from PowerShell or Windows Server Manager.

PowerShell Installation (Option 1)

1. Launch Windows PowerShell as Administrator.
2. Enter the command `Install-WindowsFeature Windows-Server-Backup` and press Enter.

Server Manager Installation (Option 2)

1. From Windows Server Manager click Add roles and features.
2. Click Next on the Before You Begin page (if this page is not skipped by default).
3. Choose Role-based or feature-based installation for the Installation Type. Click Next.
4. Select the current server for the destination server. Click Next.
5. Select Features in the left pane and check Windows Server Backup. Click Next.
6. Click Install in the Confirmation window.

6.2 Configure Backup Schedule

1. Click the Tools menu in Server Manager on the Primary server and select Windows Server Backup.
2. When the wbadmin console appears, click on Local Backup in the left pane. The right pane should display some actions to perform.
3. Click Backup Schedule to launch the Backup Schedule Wizard.
4. On the Getting Started page click Next.
5. For the Backup Configuration choose Custom and click Next.
6. Click Add Items to select files and folders to back up.
7. Navigate through the folders and check all files and folders to back up. Click OK when done.
8. Click Advanced Settings and add any files to exclude from backup if
necessary.

9. Click on the VSS Settings tab. Confirm that VSS copy Backup is selected and click OK. Click Next.

10. On the Specify Backup Time page set up a backup schedule. Click Next.

11. Select Backup to a volume on the Specify Destination Type page. Click Next.

   Note: The option Backup to a hard disk that is dedicated for backups is not supported by EXPRESSCLUSTER.

12. Click Add on the Select Destination Volume page to list available volumes.

13. Select the mirror disk volume which is managed by EXPRESSCLUSTER. Click OK and then Next.

   Example: Local disk (X:)

14. On the Confirmation page, verify that the backup items and the backup destination are correct. Click Finish.

15. The Summary page shows whether the backup schedule has been successfully configured or not. If successful, the time and date of the next backup will be shown. Click Close to exit the wizard.
7 Test backup and recovery

7.1 Quick backup
1. Launch the Windows Server Backup console.
2. Click on Local Backup in the left pane and then Backup Once in the right pane.
3. Select Scheduled backup options for Backup Options. Click Next.
4. If everything looks good, click Backup. The backup process can be monitored in the progress window. Backup time will vary depending on how much data is copied. EXPRESSCLUSTER will create a copy on the remote server in real time. Click Close when done.
5. The activity window of Windows Server Backup will show the status of the backup job.

Command line:  wadmin start backup
Enter ‘Y’ to use the scheduled backup configuration and return.

7.2 Recovery
1. Launch the Windows Server Backup console.
2. Click on Local Backup in the left pane and then Recover in the right pane to launch the recovery wizard.
3. Choose This server for the backup location and click Next.
4. In the Select Backup Date window select a backup date from the calendar and then a time. Available dates will be shown in bold. Click Next.
5. When prompted to Select Recovery Type, choose Files and Folders. Click Next.
6. Drill down through the folders under Available items and select the files or folders to recover in the Select Items to Recover window. Click Next.
7. In the Specify Recovery Options window, choose the Recovery destination and select other recovery options. Click Next.
8. Check the Confirmation window to verify that the items to recover are correct and then click Recover.
9. The Recovery Progress can be monitored in the next window. Click Close when done.
8 Appendix A: Useful Commands and Cmdlets

Included here are a few commands that are useful in testing to see the status of backups.

- Commands using *wbadmin utility*
  - *wbadmin get status* - Shows the status of the currently running backup or recovery operation. Returns error message if nothing is running.

- Commands using *PowerShell*
  - *Get-WBSummary* - Gets the history of backup operations on the computer.
  - *Get-WBJob* - Gets the current backup operation.

Although both PowerShell commands provide several data fields in their output, some of the more important ones and their values when a backup job, recovery job, or no job is running, are included in the table below.

<table>
<thead>
<tr>
<th>Command</th>
<th>Output Field Name</th>
<th>Backup Job Running Output</th>
<th>Recovery Job Running Output</th>
<th>No Job Running Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get-WBSummary</td>
<td>CurrentOperationStatus</td>
<td>BackupInProgress</td>
<td>RecoveryInProgress</td>
<td>NoOperationInProgress</td>
</tr>
<tr>
<td>Get-WBJob</td>
<td>JobType</td>
<td>Backup</td>
<td>FileRecovery</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>JobState</td>
<td>Running</td>
<td>Running</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Both commands output a numerical value for the result of the last backup (*LastBackupResultHR* and *HResult*). A 0-value indicates success.

The *Get-WBJob* command can also list the output from previous jobs. Syntax is: *Get-WBJob -Previous <number of jobs to retrieve>***
Appendix B: Example System Planning Worksheet

Machine #1: Primary Server (with Windows Server Backup and EXPRESSCLUSTER X)
Machine #2: Secondary Server (with EXPRESSCLUSTER X)

Table 1: System Network Configuration

<table>
<thead>
<tr>
<th>Machine</th>
<th>Hostname</th>
<th>Network</th>
<th>IP Address</th>
<th>Gateway</th>
<th>DNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Primary</td>
<td>NIC #1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NIC #2</td>
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<tr>
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<tr>
<td></td>
<td></td>
<td>NIC #2</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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>#1</td>
<td>Win Server 2019</td>
<td><strong>Boot Partition:</strong></td>
<td><strong>Cluster Partition:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drive Letter: C</td>
<td>Drive Letter: W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size: 250 GB</td>
<td>Size (&gt;= 1024 MB): 1 GB</td>
</tr>
<tr>
<td>#2</td>
<td>Win Server 2019</td>
<td><strong>Boot Partition:</strong></td>
<td><strong>Data Partition:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drive Letter: C</td>
<td>Drive Letter: X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size: 250 GB</td>
<td>Size: 500 GB</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>
</tbody>
</table>