EXPRESSCLUSTER X for Windows
Quick Start Guide for Windows Server 2016 Hyper-V

Version 1
Mar 27, 2018
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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 Windows Server 2016 Hyper-V cluster 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 Hyper-V.

1.2 Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mar 27, 2018</td>
<td>Initial Version</td>
</tr>
</tbody>
</table>

1.3 Evaluation Environment

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

- Windows Server 2016 Datacenter (Desktop Experience)
- Windows Server 2016 Hyper-V
- EXPRESSCLUSTER X 3.3 for Windows (internal version: 11.35)

1.4 For More Information

The following guides are available for instant support.

- **Getting Started Guide** – This guide explains general cluster concepts and overview of EXPRESSCLUSTER 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 above stated guides can also be found at http://www.nec.com/en/global/prod/expresscluster/en/support/manuals.html.
2 Overview

- EXPRESSCLUSTER is installed on the host OS (i.e. Windows Server 2016).
- The virtual machine (guest OS) files is saved on a partition controlled by mirror disk resource.
- The guest OS on the virtual machine is controlled by script resource.

Note:
This clustering method does not support the following capability.
- Take over checkpoints of the virtual machine
- Live Migration/Quick Migration
3  System Requirements and Planning

3.1 System Requirements

- Windows Server 2016 Hyper-V
  Refer to Microsoft website.
  https://docs.microsoft.com/en-us/windows-server/virtualization/hyper-v/system-requirements-for-hyper-v-on-windows

- EXPRESSCLUSTER
  Refer to EXPRESSCLUSTER X Getting Started Guide.

3.2 System Planning

Here are sample parameters for a cluster. In section 9.1, there is System Planning Worksheet. Fill out all tables to create a cluster.

Machine #1: Primary Server (Host OS)
Machine #2: Secondary Server (Host OS)
Machine #3: Virtual Machine (Guest OS)
Machine #4: Test Client Machine

Table 1: Network Configuration

<table>
<thead>
<tr>
<th>Machine</th>
<th>Hostname/Container Name</th>
<th>IP Address</th>
<th>Mirror Disk Connect</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>server1</td>
<td>192.168.0.11/24</td>
<td>mdc1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>192.168.1.11/24</td>
<td>Do Not Use</td>
</tr>
<tr>
<td>#2</td>
<td>server2</td>
<td>192.168.0.12/24</td>
<td>mdc1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>192.168.1.12/24</td>
<td>Do Not Use</td>
</tr>
<tr>
<td>#3</td>
<td>vm1</td>
<td>192.168.1.21/24</td>
<td>N/A</td>
</tr>
<tr>
<td>#4</td>
<td>client1</td>
<td>192.168.1.99/24</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### Table 2: OS and Disk Configuration

<table>
<thead>
<tr>
<th>Machine</th>
<th>OS</th>
<th>Mirror Disk</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Windows Server 2016 Datacenter</td>
<td><strong>Cluster Partition:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drive Letter: W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size: 17 MB</td>
</tr>
<tr>
<td>#2</td>
<td>Windows Server 2016 Datacenter</td>
<td><strong>Data Partition:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drive Letter: X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size: 10 GB</td>
</tr>
<tr>
<td>#3</td>
<td>Windows Server 2016 Datacenter</td>
<td>N/A</td>
</tr>
<tr>
<td>#4</td>
<td>Windows Server 2016 Datacenter</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table 3: 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>passw0rd</td>
</tr>
<tr>
<td>#2</td>
<td>Administrator</td>
<td>passw0rd</td>
</tr>
<tr>
<td>#3</td>
<td>Administrator</td>
<td>passw0rd</td>
</tr>
<tr>
<td>#4</td>
<td>Administrator</td>
<td>passw0rd</td>
</tr>
</tbody>
</table>
4 Hyper-V Setup

4.1 Install Hyper-V Role (Primary Server)

1. Launch Server Manager.
2. Click Manage and click Add Roles and Features.
3. Click Server Selection on left pane.
4. Click Server Roles on left pane.
5. Check Hyper-V and click Add Features.
6. Click Confirmation on left pane.
7. Click Install.
8. After installation is complete, restart OS.

4.2 Install Hyper-V Role (Secondary Server)

Perform all of the steps in section 4.1 on the secondary server.

4.3 Create Virtual Switch (Primary Server)

1. Launch Hyper-V Manager.
2. Click Virtual Switch Manager on right pane.
3. Select virtual switch type (e.g. External) and click Create Virtual Switch.
4. Enter Name (e.g. vswitch) and select actual network interface card (e.g. Broadcom NetXtreme Gigabit Ethernet). Click OK.

4.4 Create Virtual Switch (Secondary Server)

Perform all of the steps in section 4.3 on the secondary server. The virtual switch name must be the same as primary’s virtual switch (e.g. vswitch).
5 EXPRESSCLUSTER X Installation

5.1 Install EXPRESSCLUSTER X (Primary Server)

1. Insert the EXPRESSCLUSTER X CD-ROM into a CD-ROM drive on the primary server (container host).
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).
21. Restart the primary server.

5.2 Install EXPRESSCLUSTER X (Secondary Server)
Perform all of the steps in section 5.1 on the secondary server.

5.3 Confirm Connectivity Between Servers

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

6.1 Start WebManager

Confirm 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 (e.g. http://192.168.1.11:29003). When the security warning window displays, select the Always trust content from this publisher check box. Click Run.

6.2 Create Cluster

1. When WebManager 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 (e.g. 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 the 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.

6.3 Setup Network Configuration

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

6.4 Create Failover Group

1. To add a group, in the Cluster Generation Wizard, in the Group
2. In the next window, select failover for group Type. Name the group (e.g. failover-vm), click Next, and then click Next (two times total).
3. Select the default options for the Group Attribute Settings, and then click Next.

6.5 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.
3. To add a mirror disk resource, from the Type drop down menu, select mirror disk resource, and then click Next.
4. Confirm the Follow the default dependency box is selected, and then click Next.
5. Confirm the default options are correct, and then click Next.
6. Select the primary server name and click Add.
7. Click Connect to populate the server partitions.
8. Select the drive letter of the data partition for mirroring (e.g. X:) in the Data Partition box, and the drive letter of the cluster partition (e.g. W:) in the Cluster Partition box. Click OK.

Warning: 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.
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.

6.6 Upload the Cluster Configuration and Start Cluster

1. In WebManager 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

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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 WebManager 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.

8. Confirm that the cluster is functioning.
   - Move the %failover group% to the secondary server.
   - Move the %failover group% back to the primary server.

**Note:**
These tests do not affect server functionality. They confirm 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.
7 Hyper-V Cluster Setup

7.1 Create Virtual Machine

1. Move the %failover group% to the primary server.
2. Launch Hyper-V Manager on the primary server.
3. Click New and click Virtual Machine on right pane.
4. Click Specify Name and Location on left pane.
5. Enter the virtual machine name. Check Store the virtual machine in a different location and a directory on the mirror disk (e.g. X:\vm). Click Next.
6. Choose the generation of the virtual machine and click Next.
7. Specify the amount of memory and click Next.
8. Select the virtual switch and click Next.
9. Enter the VHDX file name and click Next.
10. Choose installation method and click Next.
11. Check the parameters and click Finish.
12. On Hyper-V Manager, select the virtual machine and click Start. And click Connect.
13. Install OS on the virtual machine.
14. After the installation is complete, shutdown the virtual machine.
15. Create a directory (e.g. X:\vm\vm1\bak) to take a backup of the virtual machine files.
16. Copy the all directories and files from the source to the destination.
   Source: X:\vm\vm1\Virtual Machines
   Destination: X:\vm\vm1\bak
17. On Hyper-V Manager, select the virtual machine and click Delete.

7.2 Add the Script Resource for Virtual Machine

1. Download the script files for Windows Server 2016 Hyper-V from the NEC web site:
2. Start WebManager and change to Config Mode.
3. Right-click on the %failover group%, and then click Add Resource.
4. From the Type drop down menu, select script resource. As the resource Name, enter script-vm and click Next.
5. Confirm the default dependency (Follow the default dependency box}
is checked), and then click **Next**.

6. Confirm the default options are correct, and then click **Next**.

7. Select **start.bat** in the left pane and click the **Replace** button.

8. Navigate to the scripts that were downloaded, select the new **start.bat** file, and click **Open**.

9. Click **Yes** to replace.

10. Select **stop.bat** in the left pane and click the **Replace** button.

11. Navigate to the scripts that were downloaded, select the new **stop.bat** file, and click **Open**.

12. Click **Yes** to replace.

13. Click **Add** and navigate to the scripts that were downloaded, select **SetEnvironment.bat**, click **Open**, and click **OK**.

14. Click **Add** and navigate to the scripts that were downloaded, select **start.ps1**, click **Open**, and click **OK**.

15. Click **Add** and navigate to the scripts that were downloaded, select **stop.ps1**, click **Open**, and click **OK**.

16. Click **Add** and navigate to the scripts that were downloaded, select **vmstate.ps1**, click **Open**, and click **OK**.

17. Check if the following files are displayed, and click **OK**.

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start script</td>
<td>start.bat</td>
</tr>
<tr>
<td>Stop script</td>
<td>stop.bat</td>
</tr>
<tr>
<td>User script SetEnvironment.bat</td>
<td></td>
</tr>
<tr>
<td>User script start.ps1</td>
<td></td>
</tr>
<tr>
<td>User script stop.ps1</td>
<td></td>
</tr>
<tr>
<td>User script vmstate.ps1</td>
<td></td>
</tr>
</tbody>
</table>

18. Select **SetEnvironment.bat**, click **Edit**, and change the following parameters. ID should be the same as folder name on the DestPath (e.g. **X:\vm\vm1\bak\12345678-ABCD-1234-ABCD-12345678ABC**).

   ```
   set VM=vm1
   set ID=12345678-ABCD-1234-ABCD-123456789ABC
   set SourcePath=X:\vm\vm1\Virtual Machine
   set DestPath=X:\vm\vm1\bak
   ```

19. Click the **Tuning** button.

20. Enter 0 for **Normal Return Value** for the **start** and **stop** sections. Click **OK**, and click **Finish**.

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7.3 Add Custom Monitor Resource

1. Right-click on the Monitors, and then click Add Monitor Resource.
2. From the Type drop down menu, select custom monitor. Click Next.
3. Select Active for Monitor Timing, and click the Browse button to select the Target Resource. Select the recently configured script resource (e.g. script-vm) and click OK. Click Next.
4. Click Replace, navigate to the scripts that were downloaded. Select the new genw.bat and click Yes.
5. Click Edit and check the following path name. Click Next.
   ```
   cd "C:\Program Files\EXPRESSCLUSTER\scripts\<failover group name>\<script resource name>"
   ```
6. Click the Browse button to select the script resource (e.g. script-vm) for Recovery Target and click OK.
7. Click Finish.

7.4 Upload the Cluster Configuration

1. Click the File menu, and then Apply the Configuration File. Click OK on the confirmation message popup. If the changes are applied 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.
4. Confirm that all icons of group resources and monitor resources are green.
5. Confirm that the virtual machine is running.

```
PS> Get-VM -VMName <virtual machine name>
Name    State    CPUUsage(%) ...
-----    -----    ---------------- ...
vm1     Running 10    ...
```
8  Verify Functionality

8.1 Move the Failover Group

1. Using WebManager, move the `%failover_group%` from the primary server to the secondary server and confirm the following.
   - The virtual machine on the primary server should be in a stopped state.
   - The virtual machine on the secondary server should be started.
   - The client can access to the virtual machine.

2. Using WebManager, move the `%failover_group%` back to the primary server and confirm the following.
   - The virtual machine on the primary server should be started.
   - The virtual machine on the secondary server should be in a stopped state.
   - The client can access to the virtual machine.

8.2 Failover on Server Shutdown

1. Restart the primary server and confirm the following.
   - The virtual machine on the secondary server should be started.
   - The client can access to the virtual machine.

2. After the primary server comes back to the cluster, restart the secondary server and confirm the following.
   - The virtual machine on the primary server should be started.
   - The client can access to the virtual machine.
Appendix

9.1 System Planning Worksheet

Machine #1: Primary Server (Host OS)
Machine #2: Secondary Server (Host OS)
Machine #3: Virtual Machine (Guest OS)
Machine #4: Test Client Machine

Table 1: Network Configuration

<table>
<thead>
<tr>
<th>Machine</th>
<th>Hostname/Container Name</th>
<th>IP Address</th>
<th>Mirror Disk Connect</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#3</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: OS and Disk Configuration

<table>
<thead>
<tr>
<th>Machine</th>
<th>OS</th>
<th>Mirror Disk</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td></td>
<td>Cluster Partition:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drive Letter:</td>
</tr>
<tr>
<td>#2</td>
<td></td>
<td>Data Partition:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drive Letter:</td>
</tr>
<tr>
<td>#3</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: 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>
<tr>
<td>#4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>