Deployment guide:

Configuring a failover cluster on the Dell™ PowerEdge™ VRTX

Principled Technologies®

DELL

Microsoft

A Principled Technologies deployment guide commissioned by Dell Inc.

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INTRODUCTION

Refreshing or deploying a new IT solution for your business can seem like an overwhelming task. Selecting the correct hardware combination of servers, networking, and storage that are guaranteed to work together can take up lots of time to purchase, put together, and subsequently, manage. The new Dell PowerEdge VRTX shared infrastructure offers an alternative to the hassle by offering a compact solution for small businesses or remote offices that is easy to configure, delivers the performance they require, streamlines management and maintenance, provides all necessary hardware resources in one spot, and maintains high availability. When paired with Microsoft® Windows Server® 2012 Hyper-V™ and Failover Clustering, the Dell PowerEdge VRTX provides the redundant hardware for a highly available all-in-one solution. But how do you configure a failover cluster on your new infrastructure to keep your data online?

In this guide, we take you through the simple, straightforward process of configuring a failover cluster using Microsoft Windows Server 2012 Hyper-V on the Dell PowerEdge VRTX. We configured a failover cluster on the Dell PowerEdge VRTX in our labs, so we provide each step we took along with any best practices we recommend. First, read more about the components of the Dell PowerEdge VRTX. Then, continue on for overview of how to configure a failover cluster (for detailed steps, see the corresponding appendices).

ABOUT THE COMPONENTS
About the Dell PowerEdge VRTX

The Dell PowerEdge VRTX is a shared infrastructure solution in a 5U rack-able tower chassis. Designed to be quiet under normal operating conditions, the Dell PowerEdge VRTX can be stowed under a desk in a small office without disrupting conversations. Its four bays house M520 or M620 server nodes, providing a space-saving alternative to having four separate tower or rack servers. In addition to space savings, the Dell PowerEdge VRTX provides administrators with a unified interface, the Chassis Management Controller (CMC), for performing routine systems management tasks. The Dell PowerEdge VRTX chassis supports up to 48 TB of shared internal storage that is presentable as virtual drives to single or multiple compute nodes, and provides optional pass-through and eight PCIe slots for additional device connectivity. The chassis integrated storage can be configured with 25 bays for 2.5-inch drives or with 12 bays for 3.5-inch drives. The Dell PowerEdge VRTX integrated switch contains multiple external network ports for easy expansion or integration into any computing environment.

For more information about the Dell PowerEdge VRTX, visit www.dell.com/poweredge.

About the Dell PowerEdge M620 server nodes

The Dell PowerEdge M620 has features optimized for performance, density, and energy efficiency.

- **Processors.** The Dell PowerEdge M620 is powered by two Intel® Xeon® E5-2600-series processors, which incorporate the very latest in processor technology from Intel. The powerful processors provide the performance you need for your essential mainstream tasks. The Intel Xeon E5-2600-series processor gives you up to eight cores per processor, or up to 16 cores per server.

- **Memory.** The Dell PowerEdge M620 holds up to 768GB DDR3 RAM (up to 1,600 MHz) across 24 DIMM slots per server.

- **Management.** The Dell PowerEdge M620, like all late-model Dell servers, comes with the Dell Lifecycle Controller. This tool simplifies server management by providing a single interface for management functions and by storing critical system information in the system itself. There are no CDs or USB keys to keep track of for drivers or firmware.

About the Intel Xeon processor E5 family

The new Intel Xeon processor E5 family, which comes standard in new Dell PowerEdge servers, incorporates new technology and features to meet the computing demands of the present and future. The Intel Xeon processor E5 family delivers intelligent and adaptive performance using such features as Intel Turbo Boost Technology 2.0, Intel Advanced Vector Extension, Intel Integrated I/O, and Intel Data Direct I/O Technology. These new processors also feature Intel Trusted Execution Technology (Intel TXT) and utilize Intel Advance Encryption Standard New Instructions (Intel AES-NI) to help keep your data safe.

For more information about the Intel Xeon processor E5 family, visit www.intel.com.

About Microsoft Windows Server 2012 Hyper-V

Windows Server 2012, the latest release of this server OS from Microsoft, includes many new features and enhancements. According to Microsoft, Windows Server 2012 focuses on four core areas:

- **Beyond virtualization.** Windows Server 2012 provides a robust and dynamic virtualization platform through Hyper-V, and includes new features that provide flexible options for delivering cloud services.

- **The power of many servers, the simplicity of one.** Windows Server 2012 offers features that allow for high availability and ease of management for multiple-server infrastructures.

- **Every app, any cloud**. Windows Server 2012 delivers a scalable and flexible Web and application platform by providing a consistent and open set of tools and frameworks that apply to applications on-premises, in the cloud, or in a hybrid environment.

- **Modern work style, enabled.** Microsoft Windows Server 2012 empowers users and IT staff with remote access to data, applications, and simpler management tools while strengthening security and compliance.

WE SHOW YOU HOW – CONFIGURING A FAILOVER CLUSTER ON THE DELL POWEREDGE VRTX

In this section, we present an overview of configuring a Microsoft Windows Server 2012 Hyper-V failover cluster on the Dell PowerEdge VRTX. After you successfully set up a failover cluster, see our guides on setting up highly available Microsoft Exchange Server 2013 and Microsoft SQL Server 2012 environments on the Dell PowerEdge VRTX.[1]

Preparing the Chassis Management Controller

First, configure the Dell Chassis Management Console. Complete the following steps using the front LCD panel and the arrow buttons located to the right of the screen (see Figure 1).

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[1] For our Exchange Server 2013 guide, see www.principledtechnologies.com/Dell/VRTX_Exchange_0613.pdf. For our SQL Server 2013 guide, see www.principledtechnologies.com/Dell/VRTX_SQL_0613.pdf.

Figure 1: View of the front LCD panel and arrow buttons.

1. Arrow down to Network Settings, and press the center button on the front display.

2. Arrow down to Quick Setup (DHCP), and press the center button on the front display.

3. Press the center button to confirm setup.

Within the CMC user interface, you have the option of updating firmware of the CMC controller, the Dell PowerEdge VRTX system board, and node-specific firmware. While this step is optional, we include it as best practice. We updated the CMC and the chassis mainboard firmware. For more details, see Appendix A.

4. Obtain the latest Dell PowerEdge VRTX system firmware from Dell.

5. Log into the CMC GUI and access the Controller update section (see Figure 2).
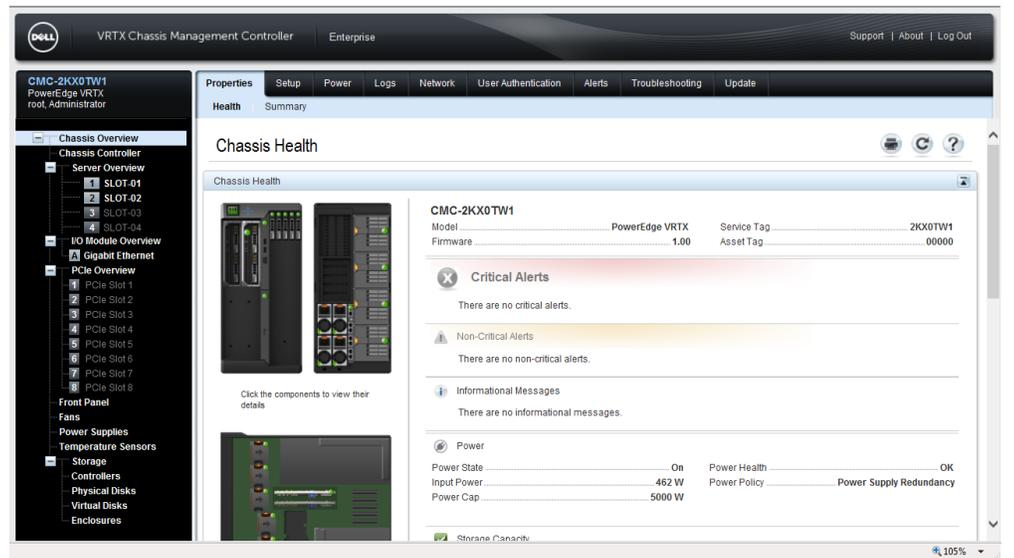
Figure 2: The CMC GUI.

6. Update CMC firmware. Wait for the update to complete for both the primary and backup CMC (see Figure 3).
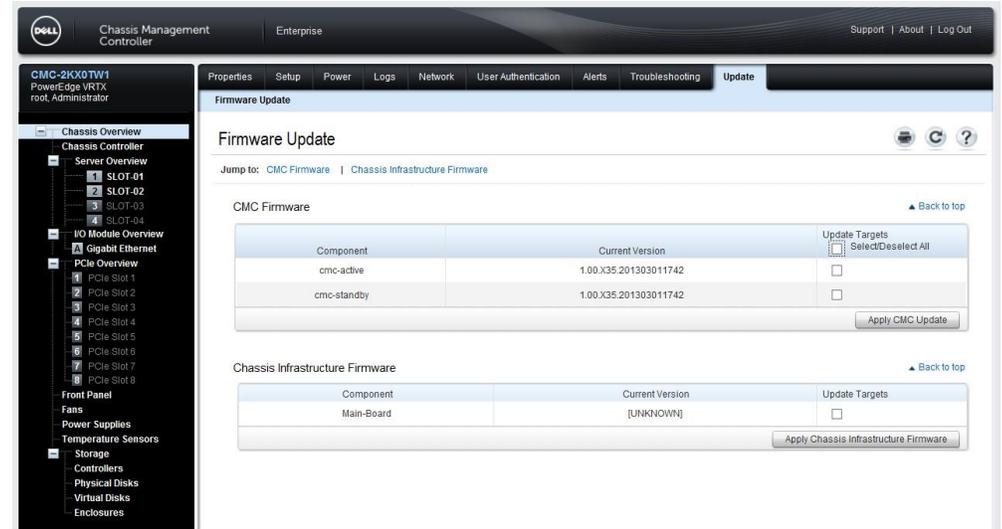
Figure 3: Updating the CMC firmware.

7. After the server becomes available, log into the CMC GUI again and access the Controller update section.

8. Update the chassis mainboard firmware (see Figure 4).
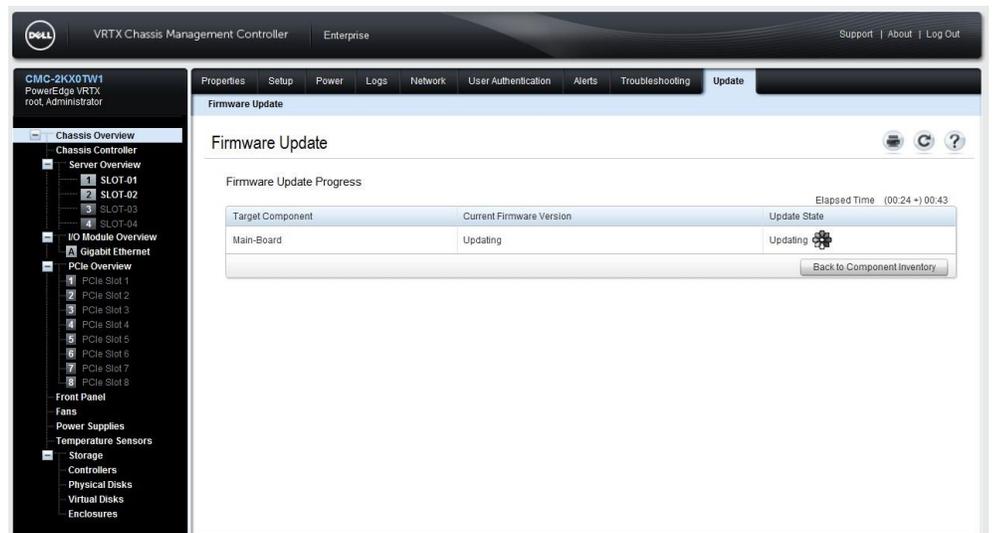
Figure 4: Updating the chassis firmware.

9. Within the CMC user interface, expand the Storage section.

10. Enable multiple host access functionality. With this feature, you can assign access for a single LUN to multiple servers in the chassis for use in a failover cluster. Please note that you must configure multiple access LUNs as shared storage within the OS (e.g., cluster shared volumes). Assign a single host to any LUNs you do not plan on configuring as shared volumes.

11. Create a virtual disk, select the appropriate RAID level, then create the appropriate number of volumes and add a dedicated hot-spare drive to each. Alternatively, you may assign a global hot-spare to both volumes. For our testing, we selected RAID 10, and created two volumes: one for the virtual hard disks of the VMs that will be hosted on the failover cluster, and a small second volume to act as a quorum disk witness between the two server nodes. For more information on the quorum disk witness requirements, see technet.microsoft.com\en-us\library\jj612870.aspx

12. Grant access to the virtual disk to each node. Figure 5 shows the access granted to each node in the CMC Web interface.
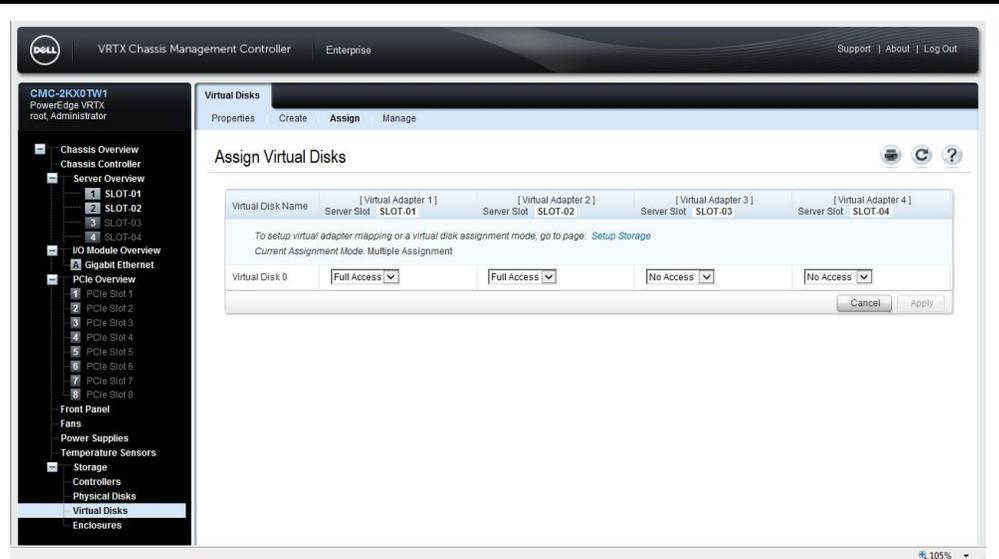
Figure 5: Assigning virtual disks.

For more details on configuring shared storage, see <u>Appendix B.</u>

Networking overview

This Dell PowerEdge VRTX configuration requires two networks. The first is a public/VM network, which connects the Dell PowerEdge VRTX server nodes and any VMs on the Dell PowerEdge VRTX infrastructure to the existing network and Active Directory domain controller server. The second network is the Live Migration network, which comprises only the clustered servers and allows VMs to move from one server node to another without having to shut down. On each of our Dell PowerEdge M620 server nodes, we assigned one NIC port to the public/VM network, and another NIC port to the Live Migration network.

The infrastructure consists of a Windows Server Failover Cluster with two Dell PowerEdge servers, each running Windows Server 2012 Datacenter, and two Active Directory domain controllers (one of which is a virtual machine hosted in the cluster).

Figure 6 shows the sample network configuration that we used for the Dell PowerEdge VRTX failover clustering.

Server	NIC	IP Address	Traffic type
ADServer	1	192.168.1.1	Public/VM
VirtualADServer	1	192.168.1.10	Public/VM
TestCluster	1	192.168.1.50	Public/VM
ServerNode1	1	192.168.1.11	Public/VM
	2	192.168.2.11	Live Migration
ServerNode2	1	192.168.1.12	Public/VM
	2	192.168.2.12	Live Migration

Figure 6: Network configuration for the Dell PowerEdge VRTX failover clustering.

Setting up the Live Migration network in the Dell CMC

First, select a private network address range for your Dell PowerEdge VRTX environment. You will use this range for manually assigning address for Live Migration interfaces. For this guide, we chose 192.168.2.0 with a subnet mask of 255.255.255.0. This range is for network interfaces within VLAN 1000, and communicates only within the chassis switch. We used the CMC to access and configure networking. Complete the following steps:

1. From the CMC user interface, click the Gigabit Ethernet section (see Figure 7).
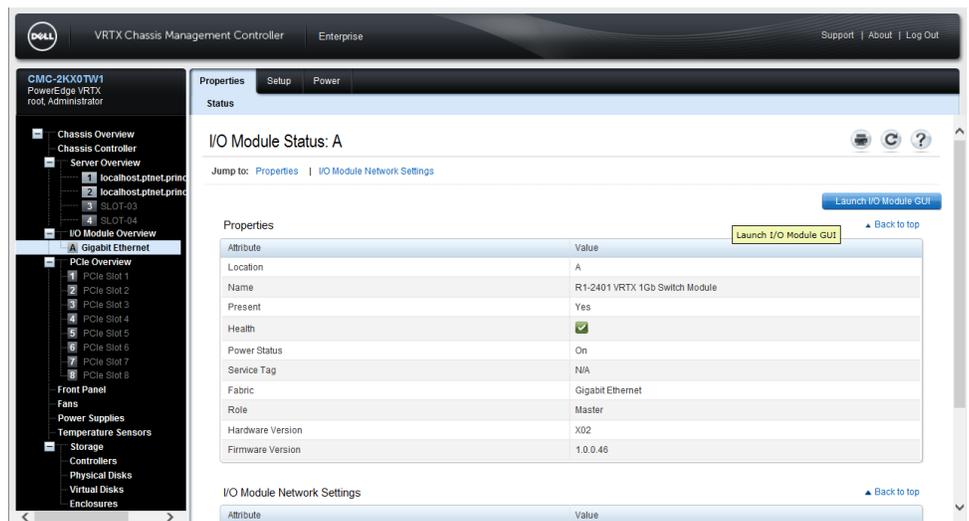
Figure 7: Launching the I/O Module GUI.

2. Launch the switch Web GUI. Log in with administrator credentials, and locate the section on VLAN management

3. Using the Web console, create a Live Migration VLAN. Figure 8 shows the VLAN ID and type of traffic assigned to each VLAN.

VLAN ID	Traffic type	Ports assigned to this VLAN
1	Main traffic (default)	All external ports and all internals except for ports identified as Live Migration ports
1000	Live Migration	One port on each node dedicated to Live Migration

Figure 8: Sample VLAN configuration.

4. Assign a port from each node to the Live Migration VLAN.

5. Copy the running configuration to the startup configuration in the switch by clicking the floppy disk icon. This will save and subsequently reload the current switch configuration in the event of power loss of the switches.

6. Logout and close the browser window to return to the CMC Web interface.

For step-by-step instructions on how to create a VLAN and assign ports to it or saving the running configuration, see the corresponding sections in Appendix C.

Installing and configuring Windows Server 2012

This guide assumes you already have an Active Directory (AD) domain controller server. You will need to ensure that the Dell PowerEdge VRTX enclosure is physically connected to a network with access to the domain controller. In the sections that follow, we detail how to set up the Dell PowerEdge VRTX infrastructure, configure the server nodes, create the Windows Server 2012 Hyper-V failover cluster, and create a virtual machine that we will assign as a secondary Active Directory domain controller.

Install Windows Server 2012 Datacenter with GUI from the installation DVD onto each Dell PowerEdge server, and perform the following operations in each one. When you set up the virtual AD server later, you will repeat these steps. (For more detail, see Appendix D.)

1. Perform all Windows Updates.

2. Assign an appropriate name to the server.

3. Assign appropriate IP addresses to the server's NICs' ports.

Creating storage access and installing Hyper-V

Perform the following on each of the Dell PowerEdge servers.

1. Install the Shared PERC 8 driver from Dell.

2. Initialize the shared storage disk(s) and create a new simple NTFS volume with no drive letter or drive path for each disk. Take them offline afterwards.

3. Install the Hyper-V role.

4. Join the existing domain, restart the server, and log into Windows with the domain administrator account.

Creating virtual switches for the public/VM and Live Migration networks

Perform this on each of the Dell PowerEdge servers.

1. In Hyper-V, create virtual switches for one port on each NIC, using the same names in each server node. In Figure 9, NIC1 refers to the internal NIC, while NIC2 refers to the mezzanine card NIC.

Virtual switch names	NIC1/Port1 (public/VM)	NIC2/Port1 (Live Migration)
Server Node 1	VirtualSwitch1	VirtualSwitch2
Server Node 2	VirtualSwitch1	VirtualSwitch2

Figure 9: Virtual switch naming configuration.

Setting up the failover cluster

Set up the Failover Clustering feature in each node, making sure to attach the disks you made available previously. Complete the following steps.

1. Add the Failover Clustering feature to each node.

2. In order to be able to use the shared storage, modify a registry key to allow for RAID bus types. To do so, add a registry DWORD `AllowBusTypeRAID – 0x00000001` to HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\ClusDisk\Parameters in each node. (See Figure 10.)
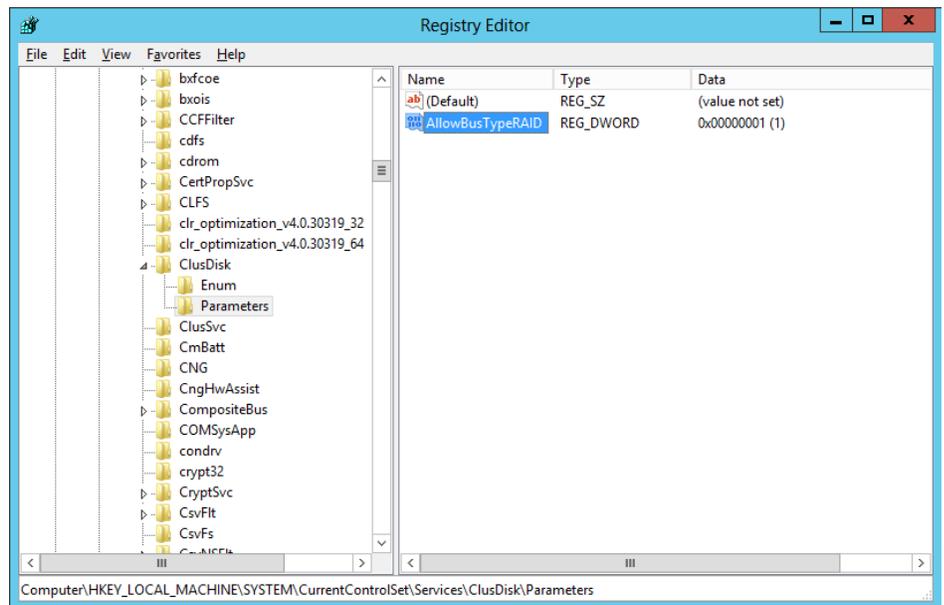
Figure 10: The registry edit to allow RAID bus types in the cluster.

3. In Failover Cluster Manager, run the Validate a Cluster test, including each of the server nodes in the test.

4. When it passes, choose to create the cluster.

5. Give it an appropriate name, and at the end of the wizard, choose to include all available storage, which should be the disk(s) initialized earlier.

6. In Failover Cluster Manager, at the Disks screen, assign each cluster disk to Cluster Shared Volumes.

7. In Failover Cluster Manager, go to Live Migration Settings and select the network specified for Live Migration, making sure that it moves to the top of the network list.

8. In Failover Cluster Manager, select the cluster and click More Actions→Configure Cluster Quorum Settings. Use the wizard to assign the previously configured disk to be the quorum disk witness.

9. Download and install Update for Windows Server 2012 (KB2803748), a hotfix to prevent Microsoft Management Console crashes in Failover Cluster Manager, and restart.

Setting up a virtual machine

Create a Microsoft Windows Server 2012 virtual machine on one of the Dell PowerEdge VRTX server nodes in Hyper-V, and join it to the existing domain. For more detail, see Appendix E.

1. On one of the server nodes, launch Hyper-V Manager, and add a new virtual machine.

2. Assign it an appropriate name, startup memory, networking, and virtual hard disk.

3. Install Windows Server 2012 to the VM.

4. In the VM, perform the steps in the Installing and configuring Windows Server 2012 section above.

5. Join the existing domain.

Promoting the secondary domain controller

To configure your virtual machine as a virtual Active Directory Domain Controller server, perform these final steps. For more detail, see Appendix F.

1. Install the Active Directory Domain Services role, and join the existing domain.

2. Promote the virtual machine to a domain controller.

SUMMING IT ALL UP

As this guide has shown, setting up a failover cluster on the Dell PowerEdge VRTX is a straightforward process. In very little time, you can deploy Dell PowerEdge VRTX with up to four M-series servers, switches, and storage in a redundant configuration using Microsoft Windows Server 2012 Hyper-V. By setting up a failover cluster on your compact Dell PowerEdge VRTX, you can maximize server uptime to keep your business moving.

APPENDIX A – UPDATING DELL POWEREDGE VRTX FIRMWARE

1. On another machine, download any applicable Dell PowerEdge VRTX updates from Dell.

2. Open a Web browser, and enter the address listed for the CMC IP on the front LCD display.

3. Log in with the username `root` and the password `calvin`. Note that these are the default username and password.

   a. On first login, select whether you wish to keep or modify the password. We would recommend changing the password for security reasons. For our testing, we chose to keep the default password.
   b. Check the Do not show this warning again checkbox.
   c. Click Continue.

4. Update the Dell PowerEdge VRTX CMC firmware

   a. Click Chassis Overview→Update.
   b. Click the boxes for cmc-active and cmc-standby.
   c. Click Apply CMC Update.
   d. Click Browse, and select the vrtx_cmc.bin image to apply. Click Open.
   e. Click Begin Firmware Update. The image uploads to the CMC. After the upload completes, the CMC restarts and the firmware update is applied. During this period, you will hear increased fan activity from the Dell PowerEdge VRTX chassis.

5. When the firmware update is complete, click Refresh on your browser and log in with the appropriate credentials.

6. Update the Dell PowerEdge VRTX Chassis Mainboard firmware:

   a. Click Chassis Overview→Update.
   b. Click the box for Main-Board.
   c. Click Apply Chassis Infrastructure Firmware.
   d. Click Browse, and select the mainboard-xxx.bin image to apply. Click Open.

7. Click Begin Firmware Update. The image uploads to the CMC. After the upload completes, the CMC restarts and the firmware update is applied. During this period, you will hear increased fan activity from the Dell PowerEdge VRTX chassis. The Dell PowerEdge VRTX Chassis Management Controller page will be available after the update has completed.

APPENDIX B – CONFIGURING SHARED STORAGE

Here we detail how to add a virtual disk in a RAID configuration with a physical disk assigned to be a hot spare. For our testing purposes, we created a RAID 10 virtual disk, but you can apply this guide to alternate virtual disk configurations.

1. Open a Web browser, and enter the address listed for the CMC IP on the front LCD display.

2. Log in with the appropriate credentials.

3. Expand Storage.

4. Click Storage.

5. Click the Setup tab.

   a. Under Assignment Mode, select the radio button for Multiple Assignment, and click Apply.

   b. Click OK to confirm Operation Successful.

6. Configure virtual disks:

   a. Click Storage→Virtual Disks.

   b. On the Virtual Disks tab, click Create.

      i. For Choose a virtual disk type, select the appropriate RAID level. For our testing, we used RAID 10.

      ii. Scroll down to select the appropriate physical disks. For our testing this was 0:0:0 – 0:0:3.

      iii. Set the size of the first virtual disk (to be used for the VM virtual hard drives), and click Create Virtual Disk.

      iv. Click OK to confirm Operation Successful.

      v. Repeat steps I through iv for the second volume (to be used as the disk quorum).

   c. On the Virtual Disks tab, click Manage.

      i. In the same row as the virtual disk you just created (Virtual Disk 0 in our testing), from the Virtual Disk Actions drop-down menu, select Initialize: Fast.

      ii. Click Apply.

      iii. Click OK to confirm Operation Successful.

      iv. In the same row as the virtual disk you just created (Virtual Disk 0 in our testing), from the Virtual Disk Actions drop-down menu, select Assign Dedicated Hotspare – Unassigned Physical Disk 0:0:4 (or an available disk).

      v. Repeat steps i through iv for the second virtual disk.

      vi. Click Apply.

      vii. Click OK to confirm Operation Successful.

    d. On the Virtual Disks tab, click Assign.

        i. Use the drop-down menu for all virtual disks and SLOT 01 to select Full Access.

        ii. Use the drop-down menu for all virtual disks and SLOT 02 to select Full Access.

        iii. Click Apply.

        iv. Click OK to confirm Operation Successful.

APPENDIX C – NETWORK CONFIGURATION

1. Open a Web browser, and enter the address listed for the CMC IP on the front LCD display.

2. Log in with the appropriate credentials.

3. Expand I/O Module Overview.

4. Click Gigabit Ethernet.

5. Click the Properties tab.

6. Click the Launch I/O Module GUI button**.**

7. Log in with the appropriate credentials.

8. Click Submit.

9. Expand Switching→VLAN, and click VLAN Membership.

    a. Under the VLAN Membership tab, click Add.

    b. Enter a VLAN ID number (`1000`).

    c. Enter a VLAN Name (`Live Migration`).

    d. Click Apply.

10. Click Switching→VLAN→Port Settings.

    a. Under the Port Settings tab, click Edit.

    b. Select the Internal Port radio button.

    c. After the screen populates, use the drop-down menu to select gi1/3.

    d. In the VLAN list, click 1, and click Remove.

    e. Enter `1000` in the VLAN list box, and click Add.

    f. Click Apply.

    g. Use the drop-down menu to select gi2/3.

    h. In the VLAN list, click 1, and click Remove.

    i. In the VLAN list, enter `1000`, and click Add.

    j. Click Apply.

11. In the upper-right of the configuration pane, click the floppy drive icon to save all new settings to start-up configuration.

12. Click Logout.

13. Click OK.

APPENDIX D – CONFIGURING WINDOWS SERVER 2012

Perform the following preparatory steps on each server after installing Windows Server 2012 Datacenter Edition.

1. In Server Manager, open Windows Update.

2. In the Windows Update window, click the Check for updates button.

3. Install all of the Important and Optional updates, and click the Restart Now button when the updates finish.

4. After the server restarts, run Windows Update again.

5. Repeat steps 1 through 4 until Windows Update finds no more updates to install.

6. Once Windows is fully updated, navigate to Local Server in Server Manager.

7. Click the hyperlink next to Computer name.

8. In the Computer Name tab, click the Change… button.

9. Under Computer name, provide a suitable name for the server. For our testing, we named the Dell PowerEdge VRTX server nodes `ServerNode1` and `ServerNode2` and the secondary domain controller virtual machine `VirtualADServer`.

10. To confirm, click OK.

11. In the pop-up window, click OK.

12. Close the System Properties window.

13. At the next pop-up, choose to Restart Later.

14. In the Local Server screen's Properties frame, click the hyperlink next to Ethernet.

15. This step will vary depending on which server is being configured:

    a. For the secondary domain controller virtual machine, right-click the NIC, and select Properties. Select the Internet Protocol Version 4 (TCP/IPv4), and click Properties. Provide an appropriate IP address in the subnet in which the domain will reside. For our setup, we gave VirtualADServer an IP of `192.168.1.10`, subnet mask of `255.255.255.0`, default gateway of `192.168.1.1`, and preferred DNS server of `192.168.1.1`.

    b. For each of the Dell PowerEdge VRTX server nodes, the internal and mezzanine NIC's ports will have different configurations:

i. Right-click the internal NIC's first port, and select Properties. Select Internet Protocol Version 4 (TCP/IPv4), and click Properties. Provide an appropriate IP address in the public/VM network, as well as a subnet mask, default gateway, and DNS server. Click OK to save these settings. For our setup, we gave ServerNode1's internal NIC's first port an IP address of `192.168.1.11`, subnet mask of `255.255.255.0`, default gateway of `192.168.1.1`, and preferred DNS server of `192.168.1.1`. We gave ServerNode2's internal NIC's first port the same addresses except its IP address, which was `192.168.1.12`.

ii. Right-click the mezzanine NIC's first port, and select Properties. Select Internet Protocol Version 4 (TCP/IPv4), and click Properties. For the mezzanine NIC's ports, we didn't need to provide a default gateway or DNS server, so provide an appropriate IP address in the Live Migration network. Click OK to save these settings. We gave ServerNode1's mezzanine NIC's first port an IP address of `192.168.2.11`. We gave ServerNode2's mezzanine NIC's first port an IP address of `192.168.2.12`.

16. Restart the server.

Preparing the storage and adding the Hyper-V role

Complete the following steps on each Dell PowerEdge VRTX server node. Here, you ensure that your storage is accessible, add the Hyper-V role, and join the domain.

1. Log into Windows with the domain administrator account.

2. After acquiring the Shared PERC 8 driver from Dell, navigate to the executable and launch it.

3. On the SAS RAID: Shared PERC8 Driver window, click Continue.

4. Click OK after selecting the extraction directory.

5. After extracting the files, right-click on percsas2.inf and click Install.

6. When the installation prompts you, click Restart Now.

7. After logging back into Windows, press Windows key + X, and click Disk Management.

8. On the first server node you perform this on, an Initialize Disk pop-up window appears. Select the MBR (Master Boot Record) radio button, and click OK.

9. Right-click the Unallocated side of the disk's row, and click New Simple Volume.

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10. At the first screen of the New Simple Volume Wizard, click Next.

11. At the Specify Volume Size screen, leave the defaults, and click Next.

12. At the Assign Drive Letter or Path screen, select the Do not assign a drive letter or drive path radio button, and click Next.

13. At the Format Partition screen, provide an appropriate Volume label, and click Next.

14. Click Finish.

15. Right-click the left side of each of these new simple volumes and take them offline.

16. Close Disk Management.

17. From Server Manager, click Manage→Add Roles and Features.

18. At the Before You Begin screen, click Next.

19. At the Installation Type screen, click Next.

20. At the Server Selection screen, click Next.

21. At the Server Roles screen, check the box for Hyper-V, and click Add Features in the pop-up that appears.

22. Click Next.

23. At the Features screen, click Next.

24. At the Hyper-V screen, click Next.

25. At the Virtual Switches screen, click Next.

26. At the Migration screen, leave the defaults, and click Next.

27. At the Default Stores screen, click Next.

28. At the Confirmation screen, click Install.

29. At the Results screen, click Close.

30. In Server Manager, click the WORKGROUP hyperlink next to Workgroup.

31. In the System Properties window, click the Change… button.

32. In the Member of section, select the Domain radio button and enter the domain name in the field. For our purposes, this was `test.local`.

33. Click OK.

34. In the Windows Security window that appears, enter the domain administrator credentials, and click OK.

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35. In the window that appears, click OK.

36. In the next window, click OK.

37. In the System Properties window, click Close.

38. When the installation prompts you, click Restart Now.

39. After the server restarts, log into Windows with the domain administrator credentials.

Setting up virtual switches for public/VM and Live Migration networks

We show how to create virtual switches for each of the networks to be used in the cluster. Repeat these steps on each node, creating four virtual switches in all, with two distinct names.

1. In Hyper-V Manager, click Virtual Switch Manager.

2. In the left pane, select New virtual network switch. Leave External highlighted, and click Create Virtual Switch.

3. Enter a name for the virtual switch. This name must be identical between both nodes. Use the drop-down menu to select an appropriate adapter for each network. We named the public/VM network's virtual switches `VirtualSwitch1`, and used the internal network adapters' first ports. We named the Live Migration network's virtual switches `VirtualSwitch2`, and used the mezzanine cards' first ports.

Installing the Failover Clustering feature and allowing RAID bus types

Perform the following steps on each Dell PowerEdge server. For more information on this registry edit, see support.microsoft.com/kb/2839292.

4. From Server Manager, click Manage→Add Roles and Features.

5. At the Before You Begin screen, click Next.

6. At the Installation Type screen, click Next.

7. At the Server Selection screen, click Next.

8. At the Server Roles screen, click Next.

9. At the Features screen, click the box for Failover Clustering, click Add Features in the window that pops up, and click Next.

10. At the Confirmation screen, click Install.

11. When installation finishes, click Close.

12. Press the Windows key and type `regedit` and press Enter.

13. Navigate to HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\ClusDisk\Parameters in the Registry Editor.

14. Click Edit→New→DWORD (32-bit) Value.

15. Enter `AllowBusTypeRAID` as the name.

16. Right-click the new DWORD and click Modify.

17. In the Value data field, enter `1` and click OK.

18. Close the Registry Editor.

Validating and creating the failover cluster

Here we validate the cluster configuration and create the cluster.

1. Now, on either Dell PowerEdge server, click Tools→Failover Cluster Manager.

2. At the Before You Begin screen, click Next.

3. In the Select Servers or a Cluster screen, enter the names of each Dell PowerEdge VRTX server node in the Enter name field, clicking the Add button after each. Click Next when finished.

4. At the Testing Options screen, click Next.

5. At the Confirmation page, click Next.

6. After the testing completes successfully, make sure the Create a cluster now using the validated nodes box is checked.

7. Click Finish.

8. At the Before You Begin screen, click Next.

9. At the Access Point for Administering the Cluster screen, give the cluster an appropriate name, an appropriate IP address, and click Next. We used the name `TestCluster` and an IP address of `192.168.1.50`.

10. Click Next.

11. At the Confirmation screen, make sure the Add all eligible storage to the cluster box is checked, and click Next.

12. At the Summary screen, click Finish.

13. Open Failover Clustering Manager.

14. Navigate to Storage→Disks, and click Add Disk.

15. Select all the available disks, and click OK.

16. In the Disks pane in FCM, right-click each Cluster Disk, and select Add to Cluster Shared Volumes.

17. In Failover Cluster Manager, right-click Networks, and select Live Migration Settings.

18. Click the boxes for the networks set aside for Live Migration, as outlined in the overview.

19. Highlight each network, clicking the Up button on the right until they are at the top of the list, and click OK.

20. The disk to be used for quorum may be automatically assigned. If not, select the cluster and click More Actions→Configure Cluster Quorum Settings.
    a. Click Next.
    b. Select Advanced quorum configuration and witness selection and click Next.
    c. Select All nodes and click Next.
    d. Leave the Allow cluster to dynamically manage the assignment of node votes checkbox checked and click Next.
    e. Select Configure a disk witness and click Next.
    f. Select the disk to be used for quorum and click Next.
    g. Click Next.
    h. Click Finish.

21. Close Failover Clustering Manager.

22. Acquire Update for Windows Server 2012 (KB2803748) from http://www.microsoft.com/en-us/download/confirmation.aspx?id=36468 .

23. Launch the standalone update installer file in both Dell PowerEdge VRTX server nodes.

24. When the update installer completes its operations, click Restart Now.

APPENDIX E – SETTING UP VIRTUAL MACHINES

We created a virtual machine in our Hyper-V failover cluster on one of the Dell PowerEdge VRTX server nodes, installing Windows Server 2012 and joining the existing domain.

1. From Server Manager, click Tools→Hyper-V Manager.

2. In the Actions pane on the right, click New→Virtual Machine.

3. At the Before You Begin screen, click Next.

4. Provide an appropriate name for the virtual machine. In our configuration, we called it `VirtualADServer`. Click Next.

5. Enter `4096` for the startup memory, and click Next.

6. At the Configure Networking screen, select the virtual switches (created in the Hyper-V setup) from the drop-down menu, and click Next.

7. At the Connect Virtual Hard Disk screen, create an appropriately sized virtual hard disk, browse and select cluster storage volume as the location, and click Next.

8. At the Installation Options screen, click the Install an operating system from a boot CD/DVD-ROM radio button, and provide the location of the Windows Server 2012 Datacenter installation DVD there. Click Next.

9. At the Summary screen, click Finish.

10. From here, perform the Windows Server 2012 Configuration steps from above on the virtual machine.

11. In Server Manager, in the Local Server screen, click the WORKGROUP hyperlink.

12. In System Properties, click the Change… button.

13. Click the Domain radio button and enter the domain name. For our configuration, this was `test.local`.

14. Enter the domain administrator credentials.

15. Click OK at the welcome pop-up.

16. When the installation prompts you, close the remaining windows and choose to Restart Now.

17. When the server restart completes, log into Windows with the domain administrator credentials.

APPENDIX F – PROMOTING THE SECONDARY DOMAIN CONTROLLER

Here we show how to install the Active Directory Domain Services role onto a virtual machine, as well as how to promote it to a secondary domain controller.

1. In Server Manager, click Manage→Add Roles and Features.

2. At the Before You Begin screen, click Next.

3. At the Installation Type screen, click Next.

4. At the Server Selection screen, click Next.

5. At the Server Roles screen, click the box for Active Directory Domain Services.

6. In the window that pops up, click Add Features.

7. Click Next.

8. At the Features screen, click Next.

9. At the AD DS screen, click Next.

10. At the Confirmation screen, click Install.

11. When installation completes, click the Promote this server to a domain controller hyperlink.

12. At the Deployment Configuration screen, select the Add a domain controller to an existing domain radio button, and provide the existing domain name in the Domain field. For our configuration, this was `test.local`.

13. You should be logged into the domain administrator account, so the Supply the credentials to perform this operation section should already have the domain administrator's username displayed. For us, this was `TEST\Administrator`.

14. Click Next.

15. Supply the already configured password to the Directory Services Restore Mode fields on the Domain Controller Options screen, and click Next.

16. At the DNS Options screen, click Next.

17. At the Additional Options screen, click Next.

18. At the Paths screen, click Next.

19. At the Review Options screen, click Next.

20. At the Prerequisites Check screen, click Install.

21. The server will restart automatically when the installation completes. When it does, log into Windows with the domain administrator credentials.

ABOUT PRINCIPLED TECHNOLOGIES

Principled Technologies, Inc.
1007 Slater Road, Suite 300
Durham, NC, 27703
www.principledtechnologies.com

We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

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Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.