

Dell™ 3-2-1 Reference Configurations: Configuration, management, and upgrade guide



Simple yet powerful high availability Microsoft® Windows® virtualization



A Principled Technologies configuration guide commissioned by Dell Inc.

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INTRODUCTION

Choosing the right combination of hardware and software for your data center can be a daunting task. You need powerful servers to run your applications in virtual machines, reliable storage to safely store your data, and flexible software to help you manage your growing infrastructure. Because your applications must run with little to no downtime, your infrastructure requires several components, some redundant, to maintain high availability: at least two virtual machine host servers, a management server, storage, and switches to put the pieces together. Is there a simple and foolproof way to ensure you get the best hardware and software that all works together for your data center?

Dell™ 3-2-1 Reference Configurations take the guesswork out of designing, ordering, and deploying your virtualized infrastructure in your data center. Dell has designed proven, tested architecture to help you deploy a solution that meets your needs. Additionally, Dell provides scalability within these configurations to fit your hardware needs as your business grows. In this guide, we discuss the different pieces that comprise a Dell 3-2-1 Reference Configuration, the benefits they bring to your organization, how to deploy and manage your new solution using best practice recommendations and guidelines from Dell, and how to add servers and storage to your configuration as your business grows.

For the results of our performance tests for this solution, which show that it could support up to 1,500 users depending on the configuration, with room for future growth, see our companion

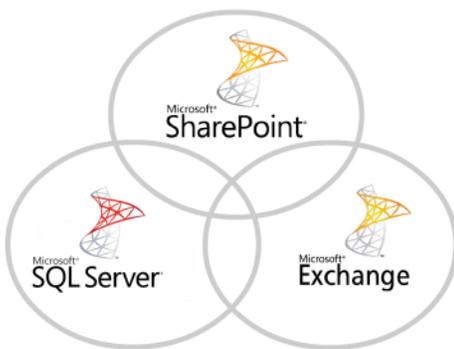
report at

http://www.pricedtechnologies.com/clients/reports/Dell/R720_321_upgrade_performance.pdf

Why 3-2-1?

Dell 3-2-1 Reference Configurations consist of three servers, two switches, and one storage array, and can be upgraded with additional servers and storage as your business grows. This type of configuration allows you to keep your infrastructure up and running, even in the face of hardware failure, so you have very little downtime and can keep your business running smoothly.

In this guide, we focus on a 3-2-1 Reference Configuration built on the latest Dell PowerEdge™ R720 servers, powered by new Intel® Xeon® processors E5-2680. Two or three of these servers can host your Microsoft® Windows Server® Hyper-V™ virtual machines (VMs) and run all of your critical business applications, while giving you failover protection. Our servers hosted VMs running three common business-critical applications from Microsoft: SQL Server® 2012, Exchange Server® 2010 SP2, and SharePoint Server® 2010 SP1. To learn more about the Dell PowerEdge R720 and the benefits it brings to your business, please see the Features of the new Dell PowerEdge R720 section below. The Dell PowerEdge R620 in this configuration ran as a management server.



Two Dell Force10™ S4810P switches allow stacking to provide interconnectivity and ample bandwidth for any network traffic and maintain high availability in the event of a switch failure.

The Dell EqualLogic™ PS6110XV storage array rounds out the 3-2-1 Reference Configuration, with excellent I/O performance,

optimized scalability, and flexible management options to meet all your storage and performance needs.

The importance of high availability

For business to keep moving, it's crucial to minimize the downtime of your IT infrastructure. A failover cluster, running on Hyper-V host servers and connected to shared storage, minimizes downtime in that a VM can quickly move from one host server to another if that host server malfunctions or goes offline. Additionally, failover clustering allows an IT administrator to make planned moves of a VM or group of VMs from one server host to another without having to take the VM offline.

With centralized management tools, managing your failover cluster is easy. Microsoft System Center 2012 Operations Manager (SCOM 2012) and System Center 2012 Virtual Machine Manager (SCVMM 2012) built on Windows Server 2012 Hyper-V and Failover Cluster Manager to help you manage your high availability environment. They allow you to discover, configure, and manage your Dell PowerEdge R720 host servers, failover clusters, and virtual machines from a single location. With these management tools, IT administrators can move VMs without bringing them offline and can monitor health status, hardware, and performance information for the entire configuration.

Two clustering options for high availability

There are two options for high availability clusters: creating a cluster either at the application level or at the host level. Clustering at the host level by using Hyper-V, which we did, works with any

application running in a VM within a failover cluster that connects multiple Hyper-V host servers. In a failover using this setup, the failover cluster connects to and reboots any VMs that were running on an off-lined server on an active server in the cluster. This configuration streamlines the setup, management, and upgrade of your solution while still maintaining a small amount of downtime in the event of a failover.

Clustering at the application level is application-dependent, where applications allow installation on multiple servers and act as failovers for each other. Some applications, such as Microsoft SQL Server, Exchange Server, and SharePoint Server have built-in features that allow for application clustering. In a failover using this setup, each application would detect the loss of a member of the application cluster and would reconnect any databases or restart any roles that went offline on the other member in the cluster. If the absolute smallest possible downtime is your primary goal, then clustering at the application level may be a better option.

Features of the new Dell PowerEdge R720



Figure 1: The new Dell PowerEdge R720 server, powered by the Intel Xeon processor E5-2680.

The new Intel Xeon processor E5-2680-powered Dell PowerEdge R720 2U rack server incorporates many improvements and features designed to improve performance, lower power consumption, and ease maintenance. Some of these features include the following:

Performance. Dell engineered the PowerEdge R720 to handle complex workloads, with I/O and internal data management technologies (i.e., NSC, NPAR, CacheCade) to allow faster access to information and GPU accelerators for faster than ever computational performance.

Processors. The Dell PowerEdge R720 is powered by two Intel Xeon processors E5-2680, which incorporate the very latest in technology from Intel. The powerful processors provide exceptional performance and make the PowerEdge R720 a solid virtualization platform.

Power efficiency. Dell PowerEdge R720 servers implement leading industry power efficiency standards, and are designed to optimize performance while maintaining low power consumption. Automated tracking and regulation of thermal activity, intelligent design of right-sized power options, and high efficiency fans and airflow management work to save power, saving you money in the process.

Management. The Dell PowerEdge R720, 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.

Storage. With impressive storage capacity for small business servers, the Dell PowerEdge R720 is available in both an 8-bay and 16-bay chassis.

Memory. The Dell PowerEdge R720 holds up to 768 GB of RAM, many times the RAM capacity of older small business servers, allowing for powerful flexibility with virtualized database solutions.

About the Intel Xeon processor E5 family

The 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, including the Intel Xeon processor E5-2680, visit <http://www.intel.com>.

Features of the Dell EqualLogic PS6110XV

The Dell EqualLogic PS6110XV 10GbE iSCSI array provides high-performance, cutting-edge rack storage, capable of supplying both the I/O and storage needed to run a high-end SMB virtualized data center environment. Its benefits include the following:

- **Reliability.** Hot-swap, incremental expansion options, dual power and network controllers, and port sharing for failover scenarios all ensure increased uptime.
- **Connectivity.** Connect via 10GbE SFP+ module or cost-effective 10GBASE-T copper.
- **Capacity.** Each array supports up to 24 hot-swappable 2.5" 15K SAS drives, for up to a maximum of 7.2 TB of storage.
- **Performance.** A 6G SAS backplane provides top-of-the-line disk I/O, while 10GbE technology maximizes throughput to and from the array.
- **Management.** EqualLogic Host Software and Host Integration Tools ease configuration and enhance communications between array and host.

Features of the Dell Force10 S4810P top-of-rack switch

The Dell Force10 S4810P High-Performance 10/40 GbE Switch enables high-bandwidth, low-latency communications for the demanding conditions of a modern performance-driven server environment. Its benefits include the following:

- **Performance.** Capable of 1.28Tbps, full-duplex, L2 and L3 forwarding through a full-duplex, non-blocking, cut-through switching architecture, the S4810 is able to deliver sub-700ns latency and 960 Mpps in a full-load scenario.
- **Capacity.** Occupying only a single rack unit, the S4810 provides 48 dual-speed 1/10GbE (SFP+) ports and 4 x 40GbE

(QSFP+) uplink ports. Breakout cables enable the uplink ports to deliver 64 x 10GbE ports.

- **Reliability.** Dell's modular Force10 operating system is custom-engineered for stability, advanced monitoring, and serviceability, while redundant power supplies and fans mitigate risk for single-point-of-failure issues on the hardware.
- **Open Automation Framework Support.** Enhanced virtualization and automation through the Open Automation Framework enables the switch to become VM-traffic-aware, reducing management overhead during the configuring and provisioning of virtual networks.

About Microsoft Windows Server 2012

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 improvements in its features that allow for better-than-ever 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.

About Microsoft SQL Server 2012

SQL Server 2012 is the latest release of Microsoft's database management platform. Microsoft has added new features to enhance performance, security, and management. SQL Server 2012 introduces Data Quality Services (DQS) to improve the usability of collected data, both locally and from cloud-based data service providers. In addition, SQL Server 2012 is more tightly-integrated with both Microsoft Office client applications and with SharePoint Server, providing greater ease-of-use to users.

About Microsoft Exchange Server 2010 SP2

Microsoft Exchange Server 2010 SP2 equips you with a robust communications platform that can also give your users anywhere access, increasing their mobility. Some other key features of Exchange Server 2010 SP2 include Unified Mailbox Resiliency, archiving, and access to the improved Outlook Web Application.

About Microsoft SharePoint Server 2010 SP1

Microsoft SharePoint Server 2010 SP1 is the latest version of this very popular and flexible software. It allows users to create collaborative Web sites and to create and manage their own workspaces. Some of its key features include SharePoint 2010 Communities, which lets users share ideas and information from a single platform; the SharePoint Search feature, which lets users find other people and information quickly; and SharePoint 2010 Insights, which gives users an improved ability to access databases, reports, and business applications.

About Microsoft System Center 2012

Microsoft System Center 2012 is a fully-featured platform for the management of physical, virtualized, and cloud infrastructure.

New in Microsoft System Center 2012 is the ability to manage public, private, and hybrid cloud infrastructures, reducing the overhead cost through centralized management.

System Center 2012 Virtual Machine Manager (SCVMM 2012) features the ability to discover, configure, and manage Hyper-V host servers, failover clusters, and virtual machines. Additionally, SCVMM 2012 is enhanced with greater flexibility in its live migration, dynamic optimization, Server Application Virtualization (Server App-V), and power management capabilities over its predecessor.

Microsoft System Center 2012 Operations Manager (SCOM 2012) enables IT administrators to monitor the health status, hardware, and performance information for many servers from a single management application. Additionally, SCOM 2012 features alerting capabilities for the tasks it monitors, including health status, performance, and hardware state information. In conjunction with the Dell Server PRO Management Pack, SCOM 2012 functions alongside SCVMM 2012 to help simplify IT administration and server management.

WE SHOW YOU HOW – SETTING UP, MANAGING, AND UPGRADING YOUR DELL 3-2-1 REFERENCE CONFIGURATION

For this guide, we assume that you have an existing infrastructure server running Active Directory Domain Services (AD DS) and Domain Name Services (DNS).

Figure 2 shows the hardware that comprises the Dell 3-2-1 Reference Configuration we tested, along with the function of each piece.

Quantity	Name	Function
2	Dell PowerEdge R720	Host servers
1	Dell PowerEdge R620	Management server
2	Dell Force10 S4810P	Switches
1	Dell EqualLogic PS6110XV	Storage array

Figure 2: The hardware that comes with the Dell 3-2-1 Reference Configuration we tested.

Please note that in this guide, we also demonstrate how to upgrade this configuration with an additional Dell PowerEdge R720 host server, as well as another Dell EqualLogic PS6110XV storage array.

Our Dell 3-2-1 Reference Configuration had the following software requirements:

- Microsoft Windows Server 2012 Datacenter Edition Release Candidate (RC)
- Microsoft Windows Server 2008 R2 SP1 Enterprise Edition
- Dell EqualLogic Host Integration Tools (HIT)
- Microsoft System Center 2012 Virtual Machine Manager
- Microsoft System Center 2012 Operations Manager
- Microsoft Exchange Server 2010 SP2
- Microsoft SQL Server 2012
- Microsoft SharePoint Server 2010 SP1

Cabling

For our high-availability setup, we configured the network cabling of the hardware as shown in Figure 3. You will need to configure the cabling in a similar fashion before proceeding with this guide. However, do not connect the stacking connections until you have completed switch configuration in the next section.

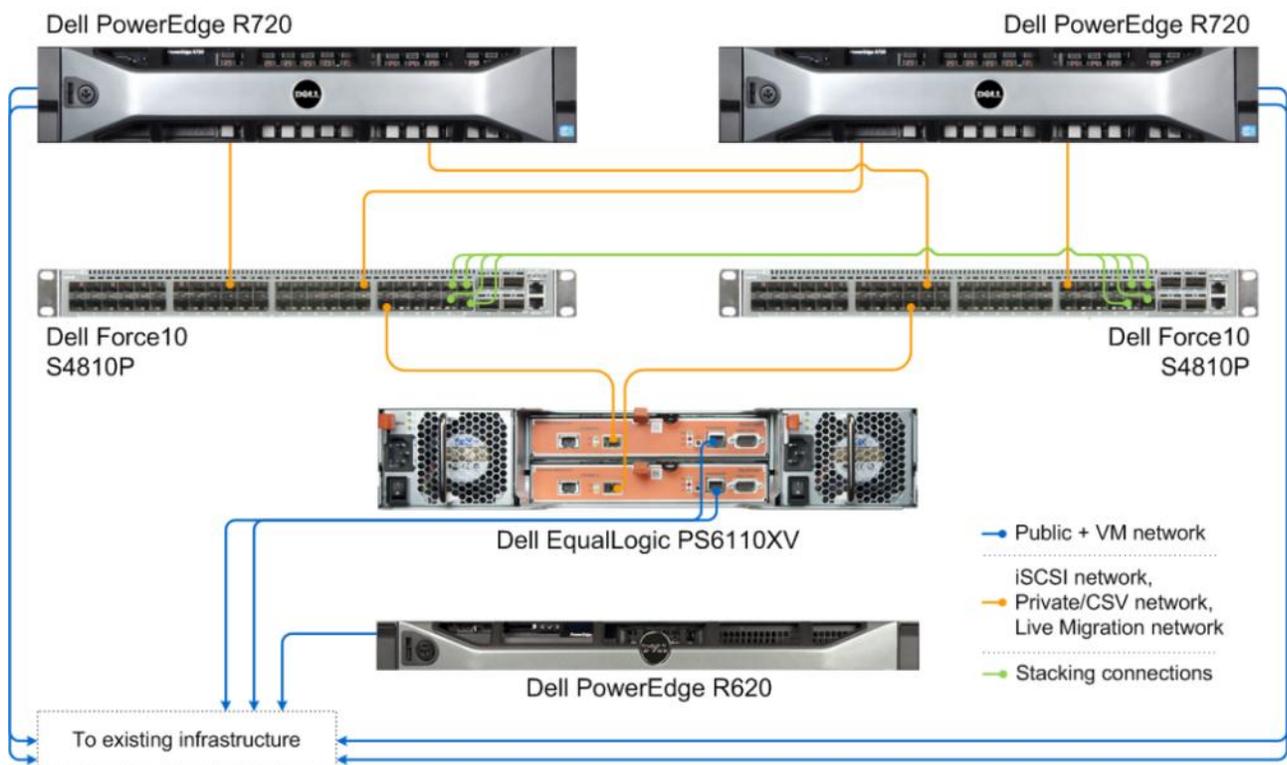


Figure 3: Networking cabling for our Dell 3-2-1 Reference Configuration.

The iSCSI network, Private/Cluster Shared Volumes (CSV) network, and Live Migration network are divided into VLANs using 10Gb connections. The 10Gb technology allows for ample bandwidth while simplifying cabling. Stacking connections for the two switches consist of four 10Gb SFP+ cables. The stacking feature allows you to

easily manage the two switches from a single management console and enables connectivity between the switches.

Figure 4 shows how we configured the network cables across the NICs for each Dell PowerEdge R720.

NIC	Port number	Traffic type
Integrated on-board 1G NIC	1	Public/VM #1
	2	Public/VM #2
Intel X520-DA Dual Port 10G NIC	1	iSCSI #1, Private/CSV #1, Live Migration #1
	2	iSCSI #2, Private/CSV #2, Live Migration #2

Figure 4: NIC port configurations for each Dell PowerEdge R720.

After we connected all of the network cables except for the stacking connections (which we connected after initial switch configuration), we attached all power cables. At this point, it was safe to power on all of the hardware.

Setting up the switches

We used a serial connection to access and configure the switches using the following checklist:

1. Verify that both switches have up-to-date firmware and are both running the same firmware version. For our testing, we used firmware version 8.2.10.3. Do not connect the switches with each other yet.
2. Connect to the first switch using a serial connection and terminal utility, and configure it to be the primary unit in the stack. For our testing, we configured it as unit 0, with priority 2, and used stack group 11.
3. Copy the running configuration to the startup configuration.

4. Connect to the second switch using a serial connection and terminal utility, and configure it to be the secondary unit in the stack. For our testing, we configured it as unit 1, with priority 1, and used stack group 11.
5. Copy the running configuration to the startup configuration for the second switch.
6. Take four SFP+ cables and connect ports 44-47 on the first switch with the corresponding ports on the second switch (e.g., port 44 on the first switch should be connected to port 44 on the second switch, and so on).
7. Using the serial connection and terminal utility, reboot the first switch using the `reload` command and allow it to finish rebooting. Then, connect to and reboot the second switch. To confirm that the stacking connections are working, ensure the LED labeled MASTER is a steady green on the first switch, and a blinking green on the second switch.
8. Enable and configure the out-of-band management port by setting the management IP address. For our testing, we set it to `192.168.1.1` with subnet mask `255.255.255.0`.
9. Set the admin password for the switches.
10. For the remaining ports (0-43) on each switch, set the following settings on each switch:
 - a. MTU to 9216.
 - b. Port mode to hybrid.
 - c. Ports set to Layer 2 switching.
 - d. Enable spanning tree RSTP edge port.
 - e. Flow control RX/TX to on.
11. Set your buffer profile to `global 1Q`.
12. Copy the running configuration to the startup configuration, and reboot the switches using the `reload` command.

For step-by-step instructions on the switch configuration steps above, see [Appendix A](#). For more information on configuring the many features of the Dell Force10 S4810P, visit

https://www.force10networks.com/CSPortal20/KnowledgeBase/DOCUMENTATION/CLIConfig/FTOS/S4810_CONFIG_8.3.10.3_5-Jun-2012.pdf

Setting up the shared storage and networking

In this section, we discuss setting up the Dell PowerEdge R720s with the Dell EqualLogic PS6110XV storage array and isolating the various types of traffic using VLANs on the Intel X520-DA dual-port 10G NICs. For more details, see [Appendix A](#).

Perform these steps on the first Dell PowerEdge R720, which will become the first Hyper-V host:

1. Restart the server, access the BIOS, and complete the following steps:
 - a. Verify that virtualization technology is enabled in the BIOS.
 - b. Configure the IP settings for iDRAC.
2. Using Server Manager, install the Hyper-V role, Failover Cluster feature, and Multipath I/O feature. Then, restart the server.

NOTE

During our installation of this role on both Hyper-V host servers, we did not create a virtual switch. We created virtual switches later in the setup process.

3. Install the Dell EqualLogic Host Integration Tools (HIT) software provided with the PS6110XV.

4. Open the Dell EqualLogic Remote Setup Wizard provided with the HIT software to initialize the PS6110XV, set the basic storage group IP address, and create an administrator username and password.
5. Go into the Network and Sharing Center, and create three VLANs on each of the Intel X520-DA 10G NICs as follows:

VLAN ID	Traffic type	Sample IP subnet
Untagged	iSCSI	192.10.1.0
20	Private/ CSV	192.20.1.0
30	Live Migration	192.30.1.0

Figure 5: Sample VLAN configuration.

NOTE

In order to create an untagged VLAN on the NIC, you must first create a tagged VLAN. Additionally, you need to assign two IP addresses for each VLAN (one for each adapter). For step-by-step instructions on creating a VLAN on the Intel X520 adapters, see [Appendix A](#).

6. Use the Windows Server 2012 NIC teaming feature to create a team using two of the integrated 1G NICs and designate this for the Public/VM network. The two Public/VM network NICs no longer have individual IP addresses and instead are accessed using the single teamed NIC IP address, which we set as 192.168.1.21 for our testing. For step-by-step instructions on creating a NIC team in Windows Server 2012, see [Appendix A](#).
7. Open the Dell EqualLogic Remote Setup Wizard to modify the MPIO settings, and limit iSCSI traffic to the iSCSI IP subnet you selected.
8. Change the name of your server to an appropriate name and join the domain. In our case, we selected R720-1 for the server name and testdomainpt for our domain. Joining

the domain modifies the iSCSI Qualified Name (IQN) of your Hyper-V host server. We performed this step to avoid having to change the iSCSI access settings of the Dell EqualLogic PS6110XV storage later. After completing this step, reboot the server and log into the domain.

NOTE

If you are unable to establish contact with the domain controller, you may need to modify the Windows Firewall settings on the Hyper-V host servers.

9. Open a Web browser window and enter the IP address of the storage group. If prompted, install Java™. Once you have provided the credentials you set in step 2, complete the following steps in the console:
 - a. Enable the port and apply the IP address to the management port.
 - b. Create 11 volumes, one for each type of data that will be hosted on the servers, virtual machine operating systems, as well as a disk witness volume for the failover cluster, allocating an adequate size to meet your needs. Figure 6 shows the volume sizes that we selected during this setup process. For the VM operating system and disk witness volumes, restrict access based on the iSCSI initiator name and enter the IQN of the first Hyper-V host server. Leave the default selection for no access to the remaining volumes created. Be sure to allow multiple simultaneous connections for all volumes. Later in setup, when the virtual machines are running, we will add access to the Exchange and SQL Server volumes to match their respective virtual machine IQNs.

Volume name	Volume size (GB)
VirtualMachine1	70
VirtualMachine2	70
VirtualMachine3	70
VirtualMachine4 (SharePoint)	570
Exchange	1,000
ExchangeLog	100
SQLData	150
SQLLog	25
SQLData 2	150
SQLLog 2	25
DiskWitness	10

Figure 6: The volumes we created on the Dell EqualLogic PS6110XV.

NOTE

After you have completed basic setup on the second Hyper-V host, you will need to return to this console to grant access to the virtual machine operating system and disk witness volumes by adding the iSCSI initiator name of the second host. We will remind you to do this later.

10. Open iSCSI Initiator in Administrative Tools, add the IP address of the storage under Discovery, and establish connections to each of the VM operating system and disk witness volumes. Ensure that the target is added to the favorite targets and that multi-path is enabled so that the Hyper-V host automatically establishes connections with the storage.
11. Open Disk Management and bring each of the volumes online. Perform a quick format and assign drive letters.

Now that the first Hyper-V host is configured, complete these steps on the other Dell PowerEdge R720, which will become the second Hyper-V host server:

1. Restart the server, access the BIOS, and complete the following steps:
 - a. Verify that virtualization technology is enabled in the BIOS.
 - b. Configure the IP settings for iDRAC.
2. Using Server Manager, install the Hyper-V role, Failover Cluster feature, and Multipath I/O feature, and restart the server.
3. Install the Dell EqualLogic Host Integration Tools software provided with the PS6110XV.
4. Navigate to the Network and Sharing Center, and create the same VLANs as outlined in step 5 and Figure 5 above, and assign IP addresses to the virtual NICs using the same subnet.
5. Use the Windows Server 2012 NIC teaming feature to create a team using two of the integrated 1G NICs and designate this for the Public/VM network. For our testing, we set this IP to 192.168.1.22.
6. Open the Dell EqualLogic Remote Setup Wizard to modify the MPIO settings, and limit iSCSI traffic to the iSCSI IP subnet you selected.
7. Change the name of your server to an appropriate name and join the domain. In our case, we selected R720-2 for the server name. After completing this step, reboot the server, and log into the domain.
8. Open a Web browser window and enter the IP address of the Dell EqualLogic PS6110XV storage group. If prompted, install Java. Provide the credentials, and modify the access settings for each of the virtual machine and disk witness volumes by adding the iSCSI initiator name of this secondary Hyper-V host. This allows the host to connect to the Dell EqualLogic PS6110XV storage in iSCSI Initiator.

9. In Administrative Tools, open iSCSI Initiator, add the IP address of the storage under Discovery, and establish connections to each of the target volumes. Ensure that the target is added to the favorite targets and that multi-path is enabled so that the Hyper-V host automatically establishes connections with the storage.
10. Open Disk Management and verify that the volumes are visible in Windows and online.

Creating the failover cluster and setting up the management server

Next, we will set up the management server (in our case, the Dell PowerEdge R620), prepare the Hyper-V hosts, and create the cluster. For our testing purposes, we created the cluster and virtual machines using the Failover Cluster Manager and Hyper-V Manager features in Windows Server 2012. Alternatively, you can use SCVMM 2012 to create the failover cluster and VMs. For step-by-step instructions related to these tasks, see [Appendix B](#).

Perform the following steps on each Hyper-V host:

1. Open Hyper-V Manager, and go to the Virtual Switch Manager.
2. Create three virtual switches, two for iSCSI traffic, and one for Public-VM traffic, and append them to their corresponding NICs.

If you notice connectivity issues, go into the Network Connection settings, and verify that the IP address of the hosting adapter was automatically carried over to the new vEthernet Hyper-V adapter. If not, re-assign this IP address to the vEthernet adapter to restore connectivity.

NOTE

Next, perform the following steps on the management server:

1. Reboot the server, access the BIOS, and configure the IP settings for iDRAC.
2. In the Network and Sharing Center, apply an IP address to the management server. For our testing, we set this IP address to 192.168.1.10.
3. Change the name of your server to an appropriate name and join the domain. For the name, we selected `Mgmt-Server`. Reboot the server, and log into the domain.
4. Install the Failover Cluster Manager feature and Hyper-V Management Tools under the Remote Server Administration Tools from Server Manager.
5. Open the Failover Cluster Manager and complete the Validate a Configuration Wizard using the two Hyper-V host servers.
6. After all validation tests have passed, create the cluster using the Create Cluster Wizard.
7. Verify that the cluster-shared volumes, disk witness volumes, and networking settings are all set correctly.
8. Set the Live Migration networks to preferentially use the designated network, and disable it from using the iSCSI or Public-VM networks.

Installing and configuring management tools

In this section, we show you the steps needed to install and configure System Center 2012 Virtual Machine Manager and Operations Manager for managing your Hyper-V host servers, cluster, and VMs. Please note that the steps below are an overview, and if needed, each of the steps below has a detailed step-by-step corresponding section in [Appendix C](#).

1. Install a supported edition of SQL Server (Standard, Enterprise, or Datacenter). For our testing, we used SQL Server 2012 Enterprise Edition.
2. Download and install Windows Assessment and Deployment Kit for Windows 8 Release Preview.
3. Download and install Microsoft SQL Server 2012 Command Line Utilities.
4. Download and install Microsoft Report Viewer 2010 Redistributable Package.
5. Install SCVMM 2012.
6. Launch SCVMM 2012, and add the failover cluster and Hyper-V host servers.
7. Install SCOM 2012. You may use the same instance of SQL Server during this installation as the one you used for SCVMM 2012.
8. Launch SCOM 2012 and complete discovery for servers in the domain.
9. Download and import the latest available Dell Server PRO Management Pack for Microsoft System Center Virtual Machine Manager.
10. Import the Windows Server 2008 Internet Information Services 7 management pack from the online catalog, and add any necessary dependencies for this management pack.
11. Launch SCVMM 2012, and integrate SCOM with SCVMM under the settings workspace.

Creating and configuring the virtual machines

Creating virtual machines (VMs) in Windows Server 2012 is a straightforward process. Use the steps below on the management server to create the four VMs you will need for your virtualized environment. For more details, see [Appendix D](#).

1. Launch Failover Cluster Manager and begin the New Virtual Machine wizard.
2. Select the node you wish to create the cluster on while evenly distributing the VM workload on the two Hyper-V hosts.
3. When selecting the location for the VM, be sure to modify the default path to store the OS on one of the cluster shared volumes.
4. Set the desired hardware configuration, and connect the first NIC with the Public-VM virtual switch.
5. Edit the VM settings, increasing the number of processors to four, and adding two NICs, each attached to an iSCSI virtual switch. Note that you do not have to add processors at this step to have a functional configuration, but having additional processing power in each VM will help prevent CPU bottlenecks during heavy application utilization.
6. Insert the installation media for the OS for the VM into the appropriate Hyper-V host and capture the DVD drive into the VM. Then, boot the VM.

NOTE

Verify that you do not have the host DVD/CD drive attached to more than one virtual machine, or you may experience errors when attempting to start your VMs.

7. Install the operating system. For our testing, we installed Windows Server 2012 on the VMs hosting SQL Server 2012, and Windows Server 2008 R2 for the VMs hosting Exchange Server 2010 SP2 and SharePoint Server 2010 SP1.
8. If applicable, Install Hyper-V Integration Services onto the VM.
9. Boot the VMs and assign IP addresses to the newly-created virtual network adapters using your iSCSI network IP scheme.

10. Join each VM to the domain.

Adding storage volumes to the virtual machines

Follow the steps below to attach the storage volumes you created on the Dell EqualLogic PS6110XV earlier to each of the virtual machines.

1. Install the Dell EqualLogic Host Integration Tools software in the VM. Use the Remote Setup Wizard to exclude the Public-VM subnet from MPIO. For our testing, we excluded the 192.168.1.0 subnet.
2. Open a Web browser window, and enter the IP address of the storage group. After you have provided the appropriate credentials, modify the access settings for the appropriate volumes by adding the iSCSI initiator name of the VM. For example, for VM #1, which will serve as the first SQL Server VM, you will modify the SQLData and SQLLog volumes' access settings by adding the iSCSI initiator name of VM #1 and so on.
3. Open iSCSI Initiator, add the IP address of the storage under Discovery, and establish connections to the appropriate target volumes. Ensure that the target is added to the favorite targets and that multi-path is enabled so that the VM automatically establishes connections with the storage.
4. Open Disk Management and bring each of the volumes online. Perform a quick format and assign drive letters.

Customizing your virtual machines

In this section, we discuss installing SQL Server 2012, Exchange Server 2010 SP2, and SharePoint Server 2010 SP1 on the VMs. For step-by-step instructions, see [Appendix E](#).

Installing SQL Server 2012 on VMs #1 and #2

After you create your virtual machines, install SQL Server 2012 on VMs #1 and #2. Although not required, when possible, deploy SQL Server 2012 to machines that are joined to an Active Directory® domain. When deploying SQL Server in a domain, do not make the SQL Server service domain accounts members of the Domain Administrators group; grant only the necessary rights on the local server to the SQL Server service account as part of your pre-installation planning. The SQL Server installation software creates the local groups it needs for security purposes.

This section provides an overview of the SQL Server 2012 installation process. [Appendix E](#) provides detailed installation instructions.

1. Insert the SQL Server 2012 DVD into the host machine DVD drive, mount it to the virtual machine, and log into the VM. If prompted to enable the .NET Framework Core role, click OK.
2. On the SQL Server Installation Center screen, choose Installation in the left pane, and click the link for New SQL Server stand-alone installation or add features to an existing installation in the right pane (see Figure 7).



Figure 7: SQL Server 2012 Installation Center options.

3. Proceed through the first several installation steps, entering license information and installing prerequisites with default options specified. On the Setup Role screen, choose SQL Server Feature Installation.
4. On the Feature Selection screen, select only what you need for your particular configuration (see Figure 8). We chose the Database Engine Services, Full-Text and Semantic Extractions for Search, Client Tools Connectivity, Client Tools Backwards Compatibility, Management Tools – Basic, and Management Tools – Complete.

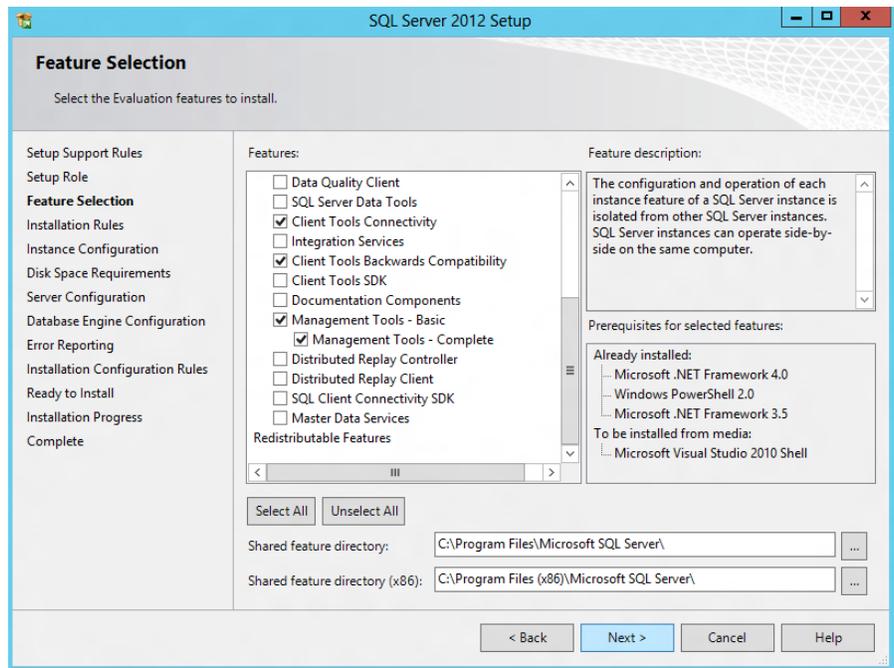


Figure 8: Choosing features for installation.

5. On the first installation, choose to install the default instance. If you perform subsequent installations on the same server, choose Named Instance and provide a name for the instance.
6. Configure the credentials of the SQL Server service account and SQL Server Agent accounts.
7. Specify SQL Server administrators and a password for the system administrator account, and specify the authentication mode for your configuration. For our configuration, we selected Mixed Mode authentication.
8. Complete the installation.

Installing Microsoft Exchange Server 2010 SP2 on VM #3

We performed a basic installation of Exchange Server 2010 SP2. For complete details on the installation of Exchange Server 2010 SP2, see [Appendix E](#).

1. Install the Web Server (IIS) role and necessary role services, .NET Framework, and the latest available Microsoft Filter Pack. Also, set the Net.TCP Port Sharing Service to start automatically, and install the Remote Server Administration Tools pack. Reboot the server.
2. Insert the Exchange Server 2010 SP2 installation DVD, and attach the DVD drive to the virtual machine. When the Autoplay window appears, click Run Setup.EXE.
3. The installer should consider steps 1, 2, and 3 to be complete (they will appear grayed out). Click the link to Step 4: Install Microsoft Exchange (see Figure 9).



Figure 9: The main installation menu for Exchange Server 2010.

4. On the introduction screen, click Next, and accept the license agreement.
5. Click Next, select No on the Error Reporting screen, and click Next.

6. Select Typical Exchange Server Installation, and click Next (see Figure 10).

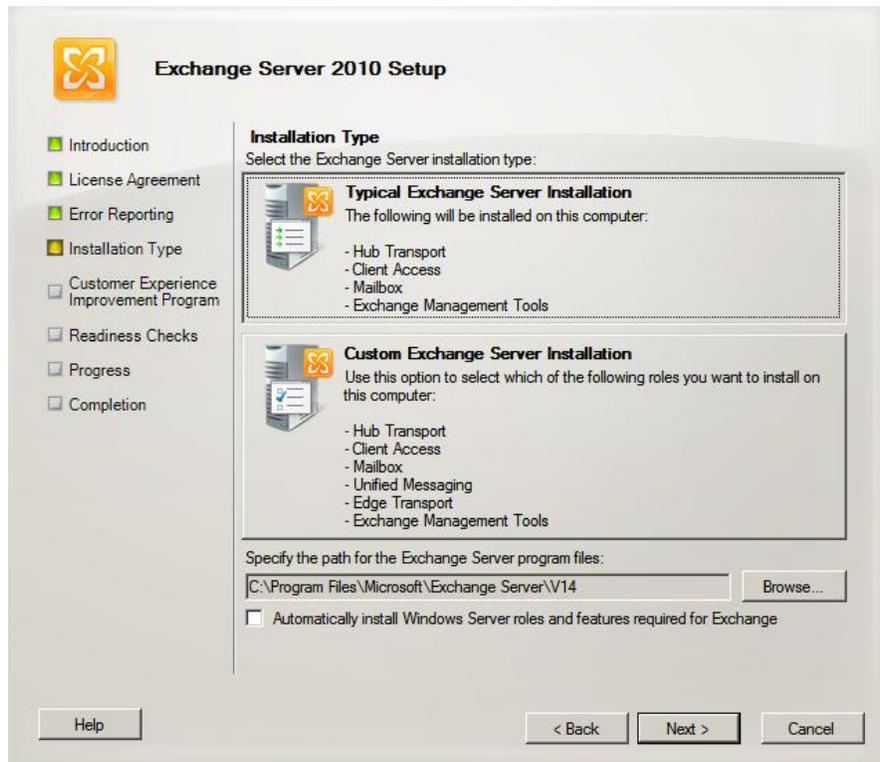


Figure 10: Exchange Server 2010 Installation type selection screen.

7. Leave the Organization Name at default (First Organization), and click Next.
8. To enable compatibility with previous Outlook 2003 clients, at the question about client computers running Outlook 2003 or Entourage, select Yes, and click Next.
9. Click Next to accept defaults for Configure Client Access Server External Domain, and select your preference for the Customer Experience Improvement Program. Click Next.

10. The installation performs a readiness check. If a warning about a lack of SMTP appears after the check finishes, ignore it. To start the installation process, click Install (see Figure 11).

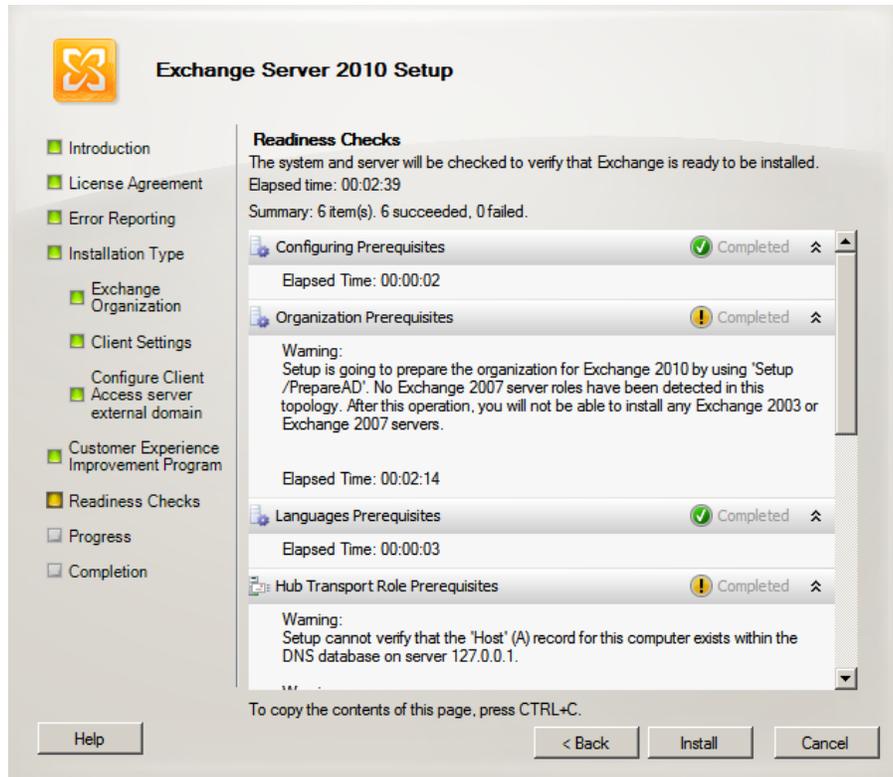


Figure 11: Readiness Checks status and install screen.

11. Once the installation has completed, check the Finalize this installation using the Exchange Management Console box, and click Finish. Exchange will automatically open the Exchange Management Console (see Figure 12).

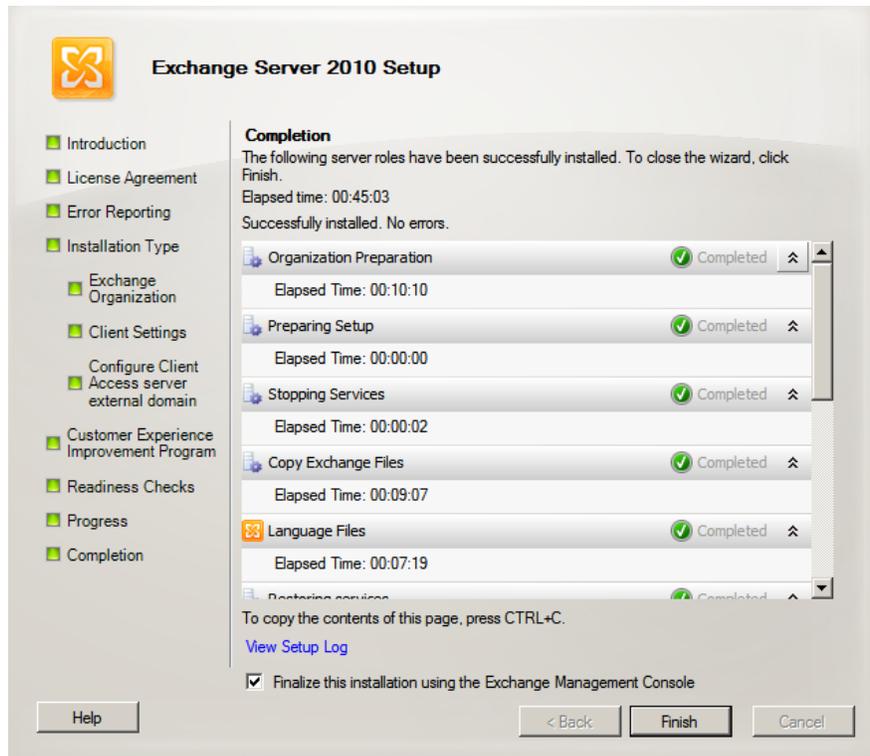


Figure 12: Installation complete screen.

NOTE

In order to receive external email, you will need to contact your Internet Service Provider (ISP) to register your MX record associated with your email server's external IP address. You must also establish routes in your firewall to direct all SMTP traffic to your Exchange Server 2010 IP address.

Installing Microsoft SharePoint Server 2010 SP1 on VM #4

When we installed SharePoint Server 2010, we followed the stand-alone installation procedure. For complete details on the installation of SharePoint Server 2010, see [Appendix E](#).

1. Insert the installation DVD, and attach the DVD drive in the VM session. Launch setup.exe, and click Install software prerequisites (see Figure 13).



Figure 13: The main installation menu for SharePoint Server 2010.

2. When the prerequisites finish installing, click Install SharePoint Server on the main SharePoint installation menu.
3. Choose the Stand-alone server type, and click Install (see Figure 14).

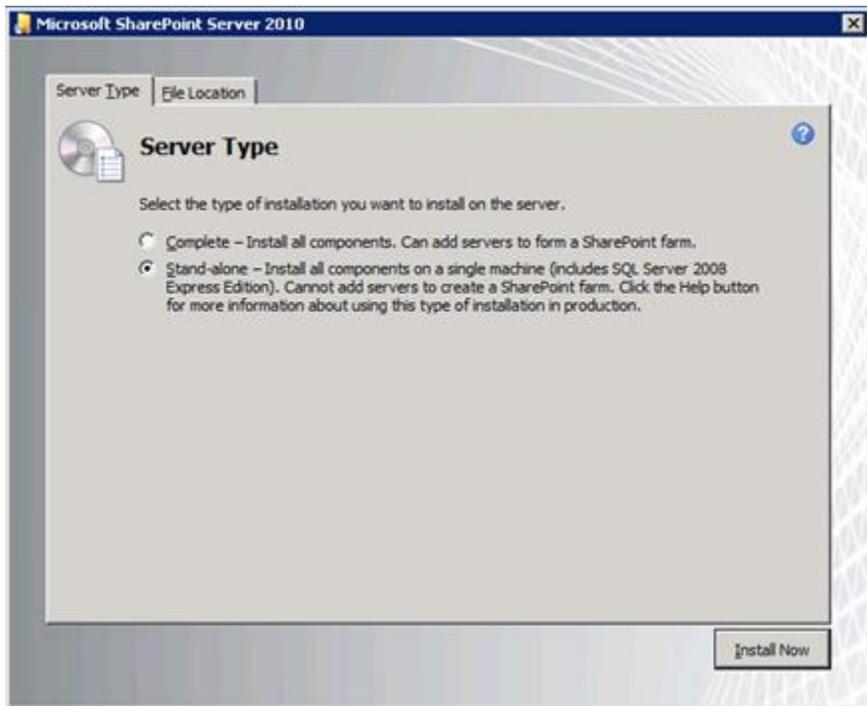


Figure 14: Selecting the server type.

4. When the installation finishes, check the Run the SharePoint Products Configuration Wizard now box, and click Close.
5. When the configuration completes successfully, click Finish.

Upgrading your Dell 3-2-1 Reference Configuration

What happens as your business grows and you need more servers and storage to support your business needs? Adding servers and storage into your existing 3-2-1 Reference Configuration is a straightforward process that lets your configuration grow with you. In this final section, we discuss adding an additional Dell PowerEdge R720 Hyper-V host server to your failover cluster, and adding an additional EqualLogic PS6110XV storage array.

Adding a Dell PowerEdge R720 Hyper-V host server

When adding a new node to your Hyper-V cluster, shut down any VMs running on your cluster and bring the cluster disks offline, as these may cause the validation tests to fail when you run them on the new Hyper-V host server. Complete the following steps on the new Hyper-V host server:

1. Connect power and networking cables to the new host server as with the previous two Hyper-V Hosts.
2. Power the server, verify that virtualization technology is enabled, and set the iDRAC IP address.
3. After booting into Windows Server 2012, set an appropriate name for the server (e.g., R720-3). Reboot the server if prompted.
4. Team two of the 1G NICs for the Public-VM traffic and assign an IP address to the NIC team. For our testing, we used 192.168.1.23.
5. Create three VLANs as before on each port of the 10Gb dual port NICs and assign an IP address to each using the same IP scheme as before for each network traffic type.
6. Join the server to the domain.

7. Install the Hyper-V role, Failover Cluster feature, and Multipath I/O feature. Reboot the server if prompted.
8. Install the Dell EqualLogic Host Integration Toolkit.
9. Open the Dell EqualLogic Remote Setup Wizard and configure the MPIO settings to exclude all subnets except for the iSCSI subnet.
10. Open a Web browser and enter the group IP address of the Dell EqualLogic storage. If prompted, install Java. For our testing, we used 192.10.1.100 for the IP address.
11. Allow access by adding the IQN name of the new Hyper-V host to each of the virtual machine OS volumes and the disk witness volume.
12. Open iSCSI Initiator, and add the Dell EqualLogic group IP address as the target portal. Then, connect to each of the virtual machine OS volumes and disk witness volume, enabling multi-path for each.
13. Open Hyper-V Manager, create the three external virtual switches (one for Public-VM, and two for iSCSI), and assign each to the appropriate NIC.

Next, complete the following steps on the management server. For more details on the Add Node or Configure Cluster Quorum Settings wizards, see [Appendix F](#).

1. Open Failover Cluster Manager.
2. Expand Storage, click Disks, right-click on each, and select Take Offline. Click OK to confirm.
3. Complete the Add Node wizard to add the additional Hyper-V host server. It will then run a validation test.
4. At this point, you no longer need a disk witness for quorum and can remove it. To do this, run the Configure Cluster Quorum Settings wizard.

Adding an EqualLogic PS6110XV storage array

Adding a new Dell EqualLogic PS6110XV storage array to your cluster is relatively simple – it takes only a small number of steps. To configure and add the new storage, complete the following steps. For more details, see [Appendix F](#).

1. Connect to the storage array using serial port and terminal utility.
2. Complete the initial setup on the array, assigning a member name and IP information.
3. For group name, enter the name of the existing group you created when you configured the first PS6110XV storage array. For our testing, this was `grpmanager`. Verify that the remaining settings are correct, and provide the administrator password.
4. Open a Web browser on one of the Hyper-V hosts and enter the group IP address. Select the unconfigured member and configure it. For our testing purposes, we assigned a RAID policy of RAID 10.

SUMMING IT ALL UP

High availability infrastructures are an essential part of any business. To keep your data going and your company moving along, you need a system that not only handles your business in an effective, structured manner, but one that won't fail.

Dell 3-2-1 Reference Configurations, which include the latest Dell PowerEdge servers and EqualLogic storage, provide you and your business with the tools to design and deploy a virtualization infrastructure with no hassles and continued support.

As we have shown in this Guide, a Dell 3-2-1 Reference Configuration takes the guesswork out of the typically complicated task of designing, setting up, and configuring a virtual infrastructure, and instead makes the process simple and straightforward. And, as your business grows, Dell 3-2-1 Reference Configurations are easy to upgrade so your infrastructure can grow as your business needs do.

APPENDIX A – SETTING UP THE SHARED STORAGE AND NETWORKING

Dell Force10 S4810P switch configuration

Before beginning, make sure both switches are running the latest and same version of firmware available. For our testing, we used version 8.3.10.3. Connect to each switch with a serial cable and terminal utility, but do not connect the switches with each other, and complete the steps below:

Setting up the stack configuration

1. Once connected through the terminal to the first switch, which will become the master, type `enable` and press Enter.
2. Type `delete startup-config` and press Enter. When asked to confirm, type `yes` and press Enter.
3. Type `reload` and press Enter, and if asked to save the system configuration, type `no` and press Enter.
4. When asked to proceed with the reload, type `yes` and press Enter.
5. When the switch finishes rebooting, type `enable` and press Enter.
6. Type `config` and press Enter.
7. Type `stack-unit 0 priority 2` and press Enter.
8. Type `exit` and press Enter.
9. Type `stack-unit 0 stack-group 11` and press Enter.
10. Type `copy run start` and press Enter.
11. Connect to the second switch in the terminal.
12. Type `enable` and press Enter.
13. Type `delete startup-config` and press Enter. When asked to confirm, type `yes` and press Enter.

14. Type `reload` and press Enter, and if asked to save the system configuration, type `no` and press Enter.
15. When asked to proceed with the reload, type `yes` and press Enter.
16. When the switch finishes rebooting, type `enable` and press Enter.
17. Type `stack-unit 0 renumber 1` and press Enter.
18. Type `config` and press Enter.
19. Type `stack-unit 1 priority 1` and press Enter.
20. Type `exit` and press Enter.
21. Type `stack-unit 1 stack-group 11` and press Enter.
22. Type `copy run start` and press Enter.
23. Connect the switches with SFP cables, from ports 44-47 in the first switch to the respective ports in the second switch (port 44 in the first switch to port 44 in the second, etc.).
24. Connect to the first switch through the terminal, type `reload` and press Enter. Type `yes` and press Enter when asked to proceed with the reload.
25. Wait for the first switch to finish rebooting.
26. Connect to the second switch through the terminal.
27. Type `reload` and press Enter. Type `yes` and press Enter when asked to proceed with the reload.
28. Wait for the second switch to finish rebooting.
29. Connect to the first switch through the terminal.
30. To ensure that the stack has been set up, type `show redundancy` and press Enter.

31. If configuration was successful, the LED labeled MASTER will have a steady green light for the master switch (the first switch, here) and will show blinking green light for the standby switch (the second switch, here).

Configuring the out-of-band management port

1. In the first switch's terminal, type `enable` and press Enter.
2. Type `config` and press Enter.
3. Type `interface ManagementEthernet 0/0` and press Enter.
4. Type `no shut` and press Enter.
5. Type `ip address 192.168.1.1 255.255.255.0` and press Enter.
6. Type `no shut` and press Enter.
7. Type `exit` and press Enter.

Configuring login credentials

1. Type `username admin privilege 15 password 0 password` and press Enter, where *password* is the password you wish to set.
2. Type `enable password level 15 0 password` and press Enter.

Configuring the remaining ports

1. Type `interface range tengigabitethernet 0/0 - 43` and press Enter.
2. Type `mtu 9216` and press Enter.
3. Type `portmode hybrid` and press Enter.
4. Type `switchport` and press Enter.
5. Type `spanning-tree rstp edge-port` and press Enter.
6. Type `flowcontrol rx on tx on` and press Enter.

7. Type `no shut` and press Enter.
8. Type `exit` and press Enter.
9. Type `interface range tengigabitethernet 1/0 - 43` and press Enter.
10. Type `mtu 9216` and press Enter.
11. Type `portmode hybrid` and press Enter
12. Type `switchport` and press Enter.
13. Type `spanning-tree rstp edge-port` and press Enter.
14. Type `flowcontrol rx on tx on` and press Enter.
15. Type `no shut` and press Enter.
16. Type `exit` and press Enter.
17. Create the VLANs on the switch and assign the ports to be able to route the traffic:
 - a. Type `interface vlan 20`
 - b. Type `name livemigration`
 - c. Type `tagged tengigabitethernet 0/0-43`
 - d. Type `tagged tengigabitethernet 1/0-43`
 - e. Type `no shut` and press Enter.
 - f. Type `exit` and press Enter.
 - g. Repeat steps a through e for VLAN 30, naming it `privatecsv`
18. Type `buffer-profile global 1Q` and press Enter.
19. Type `exit` and press Enter.
20. To save these settings, type `copy run start` and press Enter.
21. To apply these settings, type `reload` and press Enter. When asked if you want to proceed with the reload, type `yes` and

press Enter. After the switches reboot, the settings will have all taken effect.

Adding the Hyper-V role, Failover Cluster feature, and MPIO feature

1. In Server Manager, click Manage→Add Roles and Features.
2. At the Before you begin screen, click Next.
3. At the Select installation type, leave the default selection of Role-based or feature-based installation, and click Next.
4. At the Select destination server screen, leave the default selection, and click Next.
5. At the Select server roles screen, check the box for Hyper-V, and click Next.
6. When the Add Roles and Features Wizard window pops up, click Add Features.
7. Click Next.
8. At the Select features screen, check the box for Failover Clustering and Multipath I/O, clicking Add Features when prompted for each, and click Next.
9. At the Hyper-V screen, click Next.
10. At the Create Virtual Switches screen, leave the NICs unselected, and click Next.
11. At the Virtual Machine Migration screen, leave the checkbox unselected, and click Next.
12. At the Default Stores screen, leave the default locations, and click Next.
13. At the Confirm installation selections screen, click Install.
14. When the installation completes, click Close.

Installing Dell EqualLogic Host Integration Tools

1. Insert the disk and click Setup.exe.
2. At the Welcome screen, click Next.

3. At the License Agreement screen, review and accept the terms of the license agreement, and click Next.
4. At the Destination Folder screen, click Next.
5. At the Select Type screen, select Custom, and click Next.
6. At the Custom Setup screen, disable the Auto-Snapshot Manager/Microsoft Edition feature, and click Next.
7. At the Ready to Install the Program screen, click Install.
8. At the Installation Complete screen, click Finish.
9. In the pop-up window that follows to restart the system, click Yes.

Running the Remote Setup Wizard for the Dell EqualLogic PS6110XV

1. Press the Windows key and open Remote Setup Wizard.
2. At the Welcome screen, leave the radio button on Initialize a PS Series array, and click Next. The Remote Setup Wizard will search for uninitialized PS Series arrays (see Figure 15).

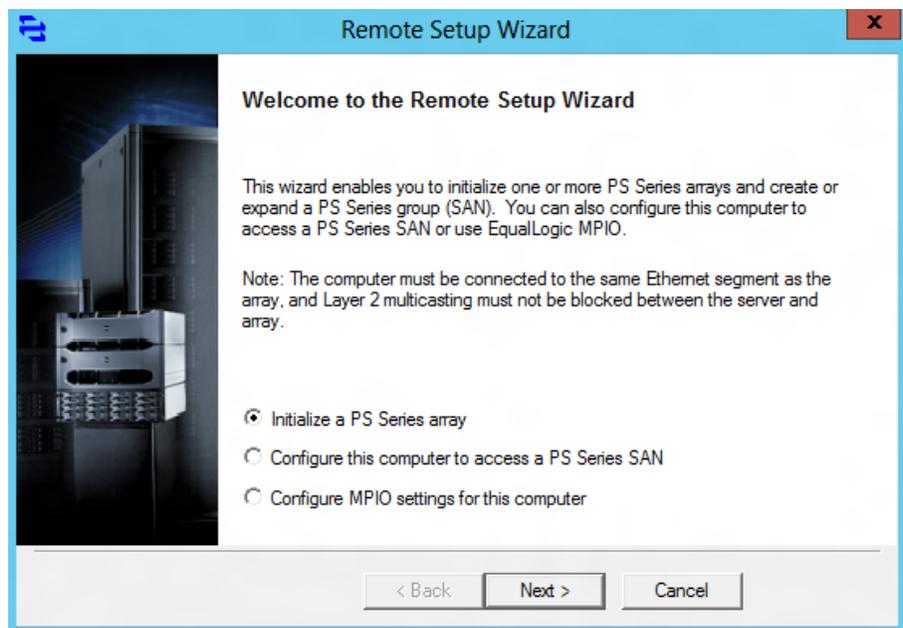


Figure 15: Remote Setup Wizard Welcome Screen.

3. At the All PS Series arrays have been initialized screen, select the storage array, and click Next.
4. At the Initialize Array screen, enter the appropriate information, and click Next. For our testing, we used PS6110XVstorage for Member Name, 192.10.1.101 for IP Address, 255.255.255.0 for Subnet Mask, and 192.10.1.1 for Default Gateway.
5. Under Group Information, leave the Create a new group radio button selected, and click Next.
6. At the Create a New Group screen, enter the appropriate information. For our testing, we used grpmanager for the Group Name, and 192.10.1.100 for the Group IP Address (see Figure 16).

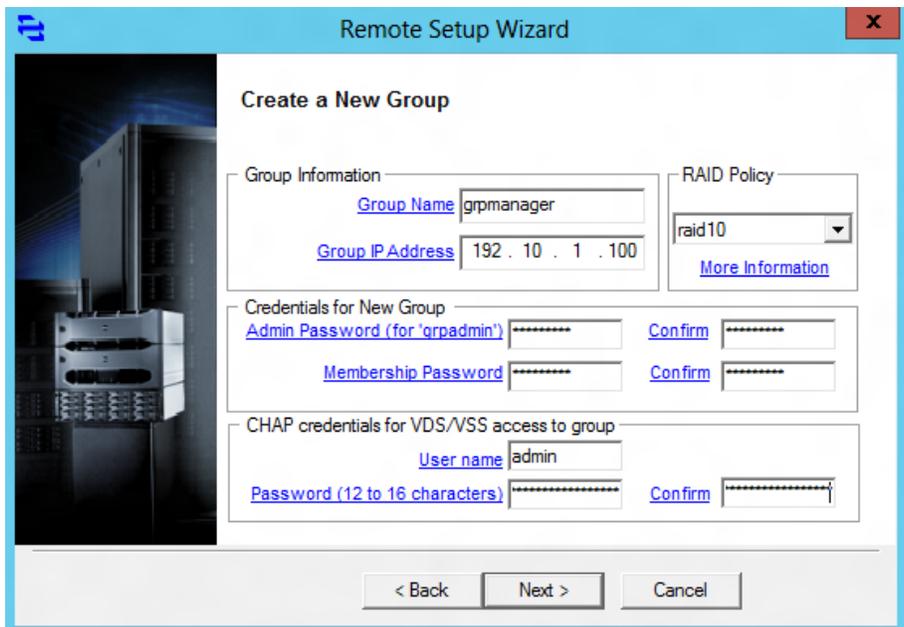


Figure 16: The Create a New Group screen.

7. Select the desired RAID level. We selected RAID 10 for the RAID Policy.
8. Under Credentials for New Group, enter the passwords.

9. Under CHAP credentials for VDS/VSS access to group, enter a user name and password, and click Next.
10. On the Initialization Successful pop-up, click OK.
11. Click Finish.

Creating VLANs on the Intel X520-DA adapters

1. Go to the Network and Sharing Center, right-click the first Intel Ethernet Server Adapter X520-2 port, and select Properties.
2. Click Configure.
3. Click the VLANs tab.
4. Click New.
5. Use 20 for the VLAN ID, and click OK.
6. Repeat steps 4-5 with the VLAN ID 30, and then repeat once more but instead of entering a VLAN ID, check the Untagged checkbox.
7. Click OK.
8. Right-click the first newly-created Ethernet port, and click Properties.
9. Select Internet Protocol Version 4 (TCP/IPv4) and click Properties.
10. Provide the appropriate IP addresses for each type of traffic, iSCSI, Live Migration, and Private-CSV.
11. Click OK.
12. Repeat steps 1-11 for the second Intel Ethernet Server Adapter X520-2 port, using the appropriate IP addresses.

Configuring a NIC team with the Public-VM NICs

1. In Server Manager, click Local Server in the left pane.
2. In the Properties frame, next to NIC Teaming, click Disabled.

3. In the TEAMS section of the NIC Teaming window that pops up, click the Tasks menu, and click New Team.
4. Assign a name to the team, and check the boxes for the two appropriate 1G adapters to add them to the team. For our testing, we named this the Public-VM team.
5. When finished, click OK.

Configuring MPIO settings

1. Press the Windows key, and open Remote Setup Wizard.
2. At the Welcome to the Remote Setup Wizard screen, select Configure MPIO settings for this computer, and click Next.
3. Under Subnets included for MPIO, select the subnets you wish to exclude from MPIO (see Figure 17).

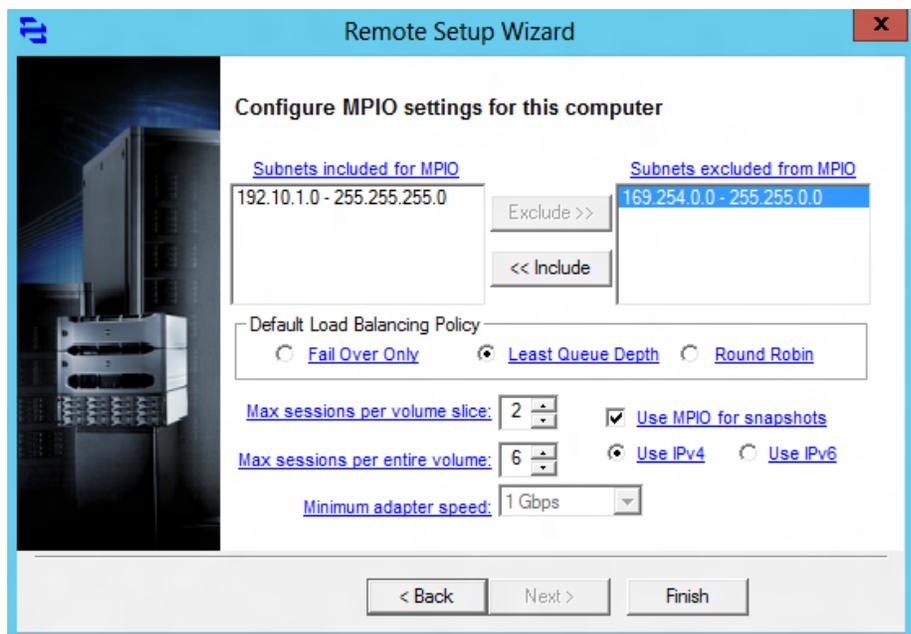


Figure 17: Select excluded subnets.

4. Click Exclude.
5. Click Finish.

Configuring the Dell EqualLogic PS6110XV storage

1. Press the Windows key, click Internet Explorer, and enter the IP address of the Dell EqualLogic PS Series Group Manager. For our testing, we used 192.10.1.100.
2. Log into Group Manager using the credentials you created during the Remote Setup Wizard.
3. Expand Members, click the member PS6110XVStorage, and in the right pane, select the Network tab.
4. Right-click the management port, and select Enable interface.
5. Click Yes in the Enable network interface popup that appears.
6. Click OK in the Warning popup that appears.
7. Right-click, and select Modify IP settings.
8. Enter the desired IP address for the management port and click OK. For our testing we used 192 . 20 . 1 . 200 for the IP address and 255 . 255 . 255 . 0 for the Subnet mask.
9. Create the volumes:
 - a. In the left pane, click Volumes, and, in the adjacent pane, click Create volume.
 - b. Name the volume `VirtualMachine1` and click Next (see Figure 18).

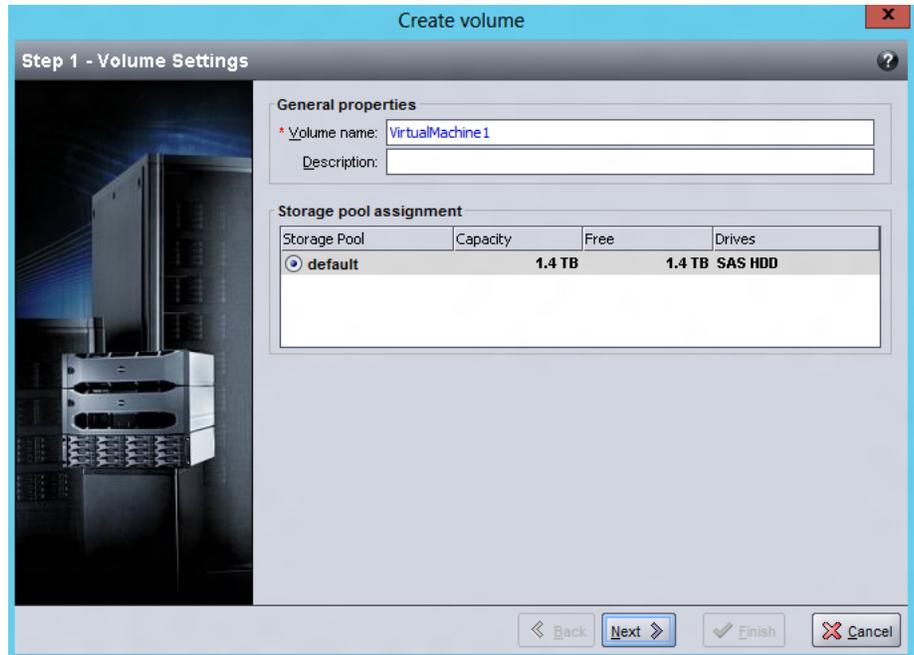


Figure 18: Name the volume.

- c. Type 70 for the Volume size, and click Next. For our testing purposes we did not create a snapshot reserve with the volume.
- d. On the Step 3 – iSCSI Access screen (see Figure 19), click the Allow simultaneous connections from initiators with different IQN names checkbox, and perform the following, depending on the volume you are creating:
 - i. For the VirtualMachine1-4 and DiskWitness volumes, check the Limit access to iSCSI initiator name box, and enter the appropriate iSCSI initiator name. For our testing, this was `iqn.1991-05.com.microsoft:R720-1.testdomainpt`

- ii. For the Exchange and SQL Server volumes, leave the No access radio button selected since you will enter the IQN name of the appropriate VM later.

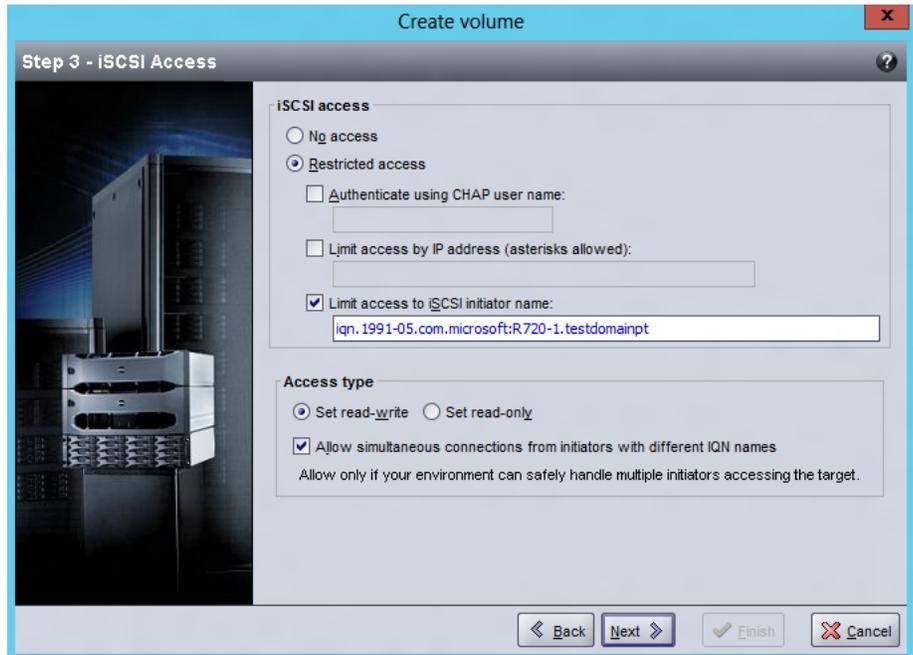


Figure 19: Adjust access parameters.

- e. Click Finish.
10. Repeat step 6 eleven times for the remaining volumes, using the following names and volume sizes:
- VirtualMachine2 – 70GB
 - VirtualMachine3 – 70GB
 - VirtualMachine4 – 570GB (SharePoint)
 - Exchange – 1000GB
 - ExchangeLog – 100GB
 - SQLData – 150GB
 - SQLLog – 25GB

- SQLData2 – 150GB
- SQLLog2 – 25GB
- DiskWitness – 10 GB

Connecting to the volumes with Microsoft iSCSI Initiator

1. To launch iSCSI Initiator, select Tools from the Server Manager menu, and click iSCSI Initiator.
2. Select the Discovery Tab, and click Discover Portal.
3. Enter the IP Address for the Dell EqualLogic Storage Group, and click OK.
4. Select the Targets tab, and click Refresh.
5. Select the first Inactive Target listed, and click Connect.
6. Ensure that Add this connection to the list of Favorite Targets is selected, check the Enable multi-path check box, and click OK (see Figure 20).



Figure 20: Connecting to a Target.

7. Repeat steps 5 and 6 three times, until you've connected to all four volumes, and click OK.

Configuring the Dell EqualLogic PS6110XV for access from the second Hyper-V host

1. Click Start→Internet Explorer, and enter the IP address of the Dell EqualLogic PS Series Group Manager. For our testing, we used 192.10.1.100.
2. Log into the group manager using the credentials you created during the Remote Setup Wizard.
3. Click the volume `VirtualMachine1`, click the Access tab, and click Add.
4. Check the Limit access to iSCSI initiator name checkbox and enter the iSCSI initiator name of the second Hyper-V host server, and click OK. For our testing, this was `iqn.1991-05.com.microsoft:R720-2.testdomainpt`.
5. Repeat steps 3 and 4 four times for the remaining volumes:
 - `VirtualMachine2`
 - `VirtualMachine3`
 - `VirtualMachine4`
 - `DiskWitness`

APPENDIX B –CREATING THE FAILOVER CLUSTER AND SETTING UP THE MANAGEMENT SERVER

Creating the virtual switches on each Hyper-V host

Complete the following steps on each host server, ensuring that you use the same name for the virtual network on each host.

1. Open Server Manager and click Tools→Hyper-V Manager.
2. In the right pane, click Virtual Switch Manager.
3. Leave External highlighted under type of virtual switch, and click Create Virtual Switch.
4. Enter a name, in our case Public-VM, and select the Microsoft Network Adapter Multiplexor Driver from the drop-down menu under External Network to select the teamed NIC. Check the Allow management operating system to share this network adapter, and click Apply.
5. When the warning pops up, click Yes.
6. Click OK.
7. Repeat steps 1 through 6 twice, once for each of the iSCSI NICs on each Hyper-V Host. You will use these to attach the additional volumes to each VM later in the setup process.

Creating and configuring the cluster

Next, use the management server to create the cluster. Before creating the cluster, add the Failover Cluster Manager feature and Hyper-V Management Tools from the Remote Server Administration Tools feature from Server Manager on your management server.

Then, complete the following steps.

Running the Validate a Configuration Wizard and creating the cluster in Failover Cluster Manager

1. Open Server Manager.

2. Click Tools→Failover Cluster Manager.
3. Click Validate Configuration...
4. On the Before You Begin page, check the Do not show this page again box, and click Next.
5. At the Select Servers page, type the name of each Hyper-V host server, and click Add. After adding both servers, click Next.
6. On the Testing Options page, select Run all tests (recommended), and click Next.
7. On the Confirmation page, click Next to begin running the validation tests.
8. Once the validation tests complete successfully, click Finish.
9. Next, the Create Cluster Wizard pops up. (If it does not, click Create Cluster... in Failover Cluster Manager.) At the Before You Begin screen, click Next.
10. At the Access Point for Administering the Cluster, enter a name and appropriate IP address. For our testing, we used `TestCluster` as the name and `192.168.1.50` as the IP address.
11. At the Confirmation screen, leave the default selections and click Next.
12. At the Summary Screen, click Finish.

Next, verify that the cluster shared volumes, disk witness, and networking settings are set correctly:

1. Select and expand the newly created cluster in Failover Cluster Manager.
2. Expand Storage, and click Disks. Verify that the cluster creation process added all four virtual machine disks, and that the 10GB volume has been appropriately assigned as the disk witness in quorum.

3. Next, expand Networks. Verify that the Public-VM network is set to external, the Private-CSV and Live Migration networks are set to internal, and that the iSCSI network is set to disabled. An easy way to do this is to click on each Cluster Network in the middle pane and identify each network based on the assigned subnet. For example, using our sample IP scheme, the subnet for our Cluster Network 4 is 192.10.1.0, identifying it as our iSCSI network.

NOTE

Notice which cluster network has the subnet that corresponds to the Live Migration network, as you will need this information to complete the next step. In our test setup, this subnet is 192.20.1.0 and was assigned as Cluster Network 3.

4. Click Live Migration Settings... in the right pane.
5. Uncheck the checkboxes for the Cluster Networks that correspond with iSCSI and Public-VM traffic, and move the dedicated Live Migration network to be the preferred network. Click Apply, and click OK.

APPENDIX C – INSTALLING AND CONFIGURING MANAGEMENT TOOLS

Installing prerequisites for System Center 2012 Virtual Machine Manager

Before installing SCVMM 2012, you will need to join the management server to the domain and deploy a supported edition (Standard, Enterprise, or Datacenter) of SQL Server. For our testing, we used SQL Server 2012 Enterprise Edition. Then, complete the following steps:

Installing Windows Assessment and Deployment Kit for Windows 8 Release Preview

1. Go to <http://www.microsoft.com/en-us/download/details.aspx?id=29929> and click the Download button to download the Windows Assessment and Deployment Kit for Windows 8 Release Preview.
2. Run adksetup.exe.
3. Select Install the Assessment and Deployment Kit to this computer, and designate an installation path. Click Next.
4. On the Join the Custom Experience Improvement Program (CEIP) screen, select No and click Next.
5. On the License Agreement screen, click Accept.
6. When asked to Select the features you want to install, check all of the boxes, and click Install.
7. When installation completes, click Close.

Installing Microsoft SQL Server 2012 Command Line Utilities

1. Go to <http://www.microsoft.com/en-us/download/details.aspx?id=29065> and scroll down the page until you see Microsoft SQL Server 2012 Command Line Utilities, and click the X64 Package link.
2. Launch SqlCmdLnUtils.exe once it finishes downloading.
3. At the welcome screen, click Next.

4. Accept the terms of the license agreement, and click Next.
5. Click Install.
6. When installation completes, click Finish.

Installing Microsoft Report Viewer 2010 Redistributable Package

1. Go to <http://www.microsoft.com/en-us/download/details.aspx?id=6442> and click the Download button.
2. Launch ReportViewer.exe after it finishes downloading.
3. At the welcome screen, click Next.
4. Accept the license terms, and click Install.
5. When installation completes, click Finish.

Installing System Center Virtual Machine Manager 2012

1. Insert the Microsoft System Center Virtual Machine Manager 2012 DVD, and run setup.exe.
2. At the welcome screen, check the Get the latest updates to Virtual machine Manager from Windows Update checkbox, and click Install.
3. At the Select features to add screen, check the VMM management server and VMM console boxes, and click Next.
4. At the Product registration information screen, enter the appropriate name, organization, and product key, and click Next.
5. Accept the license agreement terms, and click Next.
6. At the Customer Experience Improvement Program screen, select the radio button for No, I am not willing to participate, and click Next.
7. At the Microsoft Update screen, select On (recommended) and click Next.

8. At the Installation location screen, leave the default location, and click Next.
9. At the prerequisite warnings screen, complete any prerequisite requests, and click Next.
10. At the Database configuration screen, select the appropriate SQL Server instance name from the drop-down menu, and click Next.
11. On the Configure service account and distributed key management screen, select Domain account, enter the domain administrator's username and choose the password, and click Next.
12. On the Port configuration screen, click Next.
13. On the Library configuration screen, select Create a new library share, enter a Share name, and click Next.
14. On the Installation summary screen, click Install.
15. When setup completes, click Close.

Adding the failover cluster in SCVMM 2012

1. Launch the System Center 2012 Virtual Machine Manager Console.
2. Select Specify credentials, provide the credentials for the Active Directory administrator, and click Connect.
3. Select the Fabric workspace on the bottom left, click the Add Resources button in the Ribbon, and select Hyper-V Hosts and Clusters.
4. At the Resource location screen, select Windows Server computers in a trusted Active Directory domain, and click Next.
5. At the Credentials screen, select Manually enter the credentials, provide the credentials for the domain administrator account, and click Next.

6. At the Discovery scope screen, select Specify Windows Server computers by names, enter the names of the two Hyper-V hosts, and click Next.
7. At the Target resources screen, click the box next to the failover cluster name, and click Next.
8. At the Host settings screen, click Next.
9. On the Summary screen, click Finish.

NOTE

If a Jobs window pops up recommending that you reboot the Hyper-V hosts, you can close the window and use the Connect via RDP button at the Host banner to restart the Hyper-V hosts.

Installing System Center Operations Manager (SCOM) 2012

1. Insert the Microsoft System Center Operations Manager 2012 DVD, and run Setup.exe.
2. At the Welcome screen, click Install.
3. Check the features you wish to install, and click Next. For our testing purposes, we selected Management server and Operations console.
4. At the Select installation location screen, click Next.
5. At the Proceed with Setup screen, click Next.
6. At the Specify an installation option screen, select Create the first Management server in a new management group, give the Management group a name, and click Next.
7. Accept the terms of the license agreement, and click Next.
8. On the Configure the operational database screen, enter the appropriate SQL server same instance name, and click Next. For our testing purposes, we used the default SQL Server instance (R620.testdomainpt\MSSQLSERVER).

9. On the Configure the data warehouse database screen, enter the instance name used above, select Create a new data warehouse database, and click Next.
10. At the Configure Operations Manager accounts, leave the default radio buttons selected, enter the appropriate credentials for each service, and click Next. For security reasons, it is not recommended that you use a domain administrator account.
11. At the Customer Experience Improvement Program and Error Reporting screen, select No, I am not willing to participate for both radio button selections, and click Next.
12. On the Microsoft Update screen, select On (recommended) and click Next.
13. On the Installation Summary screen, click Install.
14. When the installation completes, select Launch Microsoft Update when the wizard closes and Start the Operations console when the wizard closes.
15. Click Close.

Configuring SCOM 2012

1. Launch the System Center Operations Console, and click Monitoring workspace on the bottom left of the screen.
2. Click the link for Required: Configure computers and devices to manage.
3. In the Computer and Device Management Wizard, select Windows computers, and click Next.
4. Select Automatic computer discovery, and click Next.
5. Select Use selected Management Server Action Account or enter appropriate credentials, and click Discover.

6. Check the box for the devices you wish to manage, and click Next. For our testing, we selected to manage the Hyper-V host servers and the Active Directory server in our testbed.
7. At the Summary screen, select local system or enter the appropriate credentials to allow the agents to execute, and click Finish.
8. When the task finishes, click Close.

Importing the Dell Server PRO Management Pack

1. Download the latest available Dell Server PRO Management Pack (for our testing, we used version 2.1) for Microsoft System Center Virtual Machine Manager.
2. Launch Dell_PROPack_v2.1.0_A00.exe, and click Unzip to the default location.
3. Click OK when the window pops up saying the files unzipped successfully.
4. Launch the System Center Operations Console, and click the Monitoring workspace on the bottom left of the screen.
5. Click the link for Required: Required: Import management packs.
6. On the Import Management Packs screen, click Add → Add from disk..., and when the Online Catalog Connection screen pops up, click Yes.
7. When the Select Management Packs to import screen pops up, navigate to the location where the files were unzipped in step 2 of this section. By default, this is C:\Dell Management Packs\Dell PROPack Management Pack\2.1.0
8. Select Dell.Connections.hyperv.PROPack.mp, and click Open.
9. The Import Management Packs wizard will say that the management pack depends on other packs that aren't yet imported, but are available in the online catalog. Click the Resolve link under the Status column.

10. In the Dependency Warning screen that pops up, click Resolve.
11. Click Install, and click Yes to continue.
12. When the management pack import is complete, click Close.

Integrating SCVMM 2012 with SCOM 2012

1. Launch the System Center Operations Console, and click the Monitoring workspace on the bottom left of the screen.
2. Click the link for Required: Required: Import management packs.
3. On the Import Management Packs screen, click Add → Add from catalog...
4. Search for Windows Server 2008 Internet Information Services 7, and expand the search results to locate it in the catalog (under Microsoft Corporation → Windows Server → IIS 2008). Highlight it, and click Add.
5. Click Resolve to also download and install the necessary dependencies. At the Dependency Warning, click Resolve.
6. When the Windows Server 2008 Operating System (Discovery) management pack appears, click Resolve. At the Dependency Warning, click Resolve.
7. Click Install.
8. Click Close when the management packs have been imported.
9. Launch the SCVMM 2012 console and log in using the appropriate credentials.
10. In the bottom left pane, click Settings, click System Center Settings, and double-click Operations Manager Server.
11. At the Introduction screen, click Next.
12. Enter the server name for the management server, specify the credentials you wish to log in with, and click Next.

13. At the Connection to VMM screen, enter the appropriate domain user credentials, and click Next.

14. At the Summary screen, click Finish.

APPENDIX D – CREATING AND CONFIGURING THE VIRTUAL MACHINES

Creating the virtual machines

NOTE

1. In Failover Cluster Manager, click Roles, and click Virtual Machines...→New Virtual Machine...
2. At the New Virtual Machine screen, select the cluster node you wish to install the VM on.

Try to evenly disperse your VMs across the hosts in the cluster. For our testing purposes, we hosted a SQL Server VM and the Exchange VM on one server, and the other SQL Server VM and the SharePoint VM on the other server.

3. At the Before You Begin screen, click Next.
4. Enter a name for the virtual machine, check the Store the virtual machine in a different location checkbox, click Browse..., and navigate to the cluster shared volume. By default, this is on C:\ClusterStorage on each Hyper-V host. Click Next.
5. Enter 4096 for the startup memory, and click Next.
6. At the Configure Networking screen, select Public-VM (or the appropriate name for the Public-VM virtual switch you created) from the drop-down menu, and click Next.
7. At the Connect Virtual Hard Disk screen, enter 70GB for the size (or 570GB for the SharePoint VM), and click Next.
8. At the Installation Options screen, click Install an operating system later, and click Next. We will install the operating systems after creating all of the VMs.
9. Click Finish to begin VM creation.
10. At the Summary screen, view any notifications following VM creation, and click Finish.

11. Right-click on the newly created VM and click Settings...
12. Under Processor, change the number of virtual processors to 4, and click Apply.
13. Select Add Hardware, select Network Adapter, and click Add.
14. Under Virtual switch, select the first iSCSI virtual switch, and click Apply.
15. Repeat steps 13 and 14 for the second iSCSI virtual switch, and click OK.
16. Repeat steps 1 through 15 for the three remaining VMs. Please note that you will not need to add additional network adapters (steps 13-15 for the SharePoint VM).

Now, install an operating system on each virtual machine. To do this, complete the following steps:

1. Insert the installation DVD into the assigned Hyper-V host for the VM
2. Right-click on the virtual machine in Failover Cluster Manager, and click Connect...
3. Click Media→DVD Drive→Capture G: (or the drive letter of the DVD Drive).
4. To boot the VM, click the Start button on the panel.
5. Allow the operating system files to load off the installation media, and install the OS in the same way as you would on a physical server.
6. After installing and configuring the OS, click Action→Insert Integration Services Setup Disk. Run the installation, and reboot when prompted.

Configuring the virtual machines

Before proceeding with this section, ensure that you have assigned an appropriate name and IP address to each virtual machine,

and that they have been joined to the existing domain. Additionally, you must install the Dell EqualLogic Host Integration Tools and exclude the Public-VM subnet from MPIO using the Remote Setup Wizard. You will need to perform these steps on both SQL Server VMs and the Exchange VM, but not the SharePoint VM.

1. Connect to the first VM, open a Web browser, and log into the EqualLogic PS Series Group Manager with the appropriate credentials. If prompted, install Java.
2. Expand the volumes, and select the appropriate volume.
3. In the right pane, click the Access tab, and click Add.
4. At the Create access control record screen, click Limit access to iSCSI initiator name, enter the name of the appropriate VM, and click OK.
5. Repeat steps 2 through 4 for any additional volumes to which you need to enable access for that VM. For example, for VM #1 you will need to enable access to both the SQLData and SQLLog volumes. When you are finished, close the browser window.
6. In Server Manager, click Tools→iSCSI Initiator.
7. Select the Discovery Tab, and click Discover Portal.
8. Enter the IP Address for the Dell EqualLogic Storage Group, and click OK.
9. Select the Targets tab, and click Refresh.
10. Select the first Inactive Target listed, and click Connect.
11. Ensure that the Add this connection to the list of Favorite Targets is selected, check the Enable multi-path check box, and click OK.
12. Repeat steps 10 and 11 if needed for additional volumes, and click OK.

13. Bring the volumes online using Disk Management under Computer Management.

14. Repeat steps 1 through 13 for the other two VMs.

APPENDIX E – CUSTOMIZING YOUR VIRTUAL MACHINES

Installing SQL Server 2012 on VMs #1 and #2

Install an instance of Microsoft SQL Server 2012 by following these steps. This installation walkthrough covers only the installation of the Database Engine and Management Components. For other components outside the scope of this guide, such as Reporting Services, Integration Services, or Analysis Services, see Microsoft documentation at <http://msdn.microsoft.com/en-us/library/bb500395.aspx>.

1. Connect and log into the virtual machine.
2. Insert the installation DVD for SQL Server 2012 into the appropriate Hyper-V host server's DVD drive and attach it to the virtual machine.
3. Click Run SETUP.EXE. If Autoplay does not begin the installation, navigate to the SQL Server 2012 DVD, and double-click it.
4. If the installer prompts you with a .NET installation prompt, click Yes to enable the .NET Framework Core role.
5. In the left pane, click Installation.
6. Click New SQL Server stand-alone installation or add features to an existing installation.
7. At the Setup Support Rules screen, wait for the rule check to complete. If there are no failures or relevant warnings, click OK.
8. Enter your product key, and click Next.
9. Click the checkbox to accept the license terms, and click Next.
10. If no failures are displayed after the setup support files are installed, click Next.

- 11.** At the Setup Role screen, choose SQL Server Feature Installation.
- 12.** At the Feature Selection screen, select the features that your organization requires. We chose the following features for this guide: Database Engine Services, Full-Text and Semantic Extractions for Search, Client Tools Connectivity, Client Tools Backwards Compatibility, Management Tools – Basic, and Management Tools – Complete. Click Next.
- 13.** At the Installation Rules screen, click Next after the check completes.
- 14.** At the Instance configuration screen, enter the appropriate details for your configuration. For a default instance, leave the defaults selected. For a named instance, enter a new instance name and adjust the file paths as necessary. Click Next.
- 15.** At the Disk Space Requirements screen, click Next.
- 16.** At the Server Configuration screen, choose the service account, preferably an Active Directory domain account, fill in a password if necessary, and click Next.
- 17.** At the Database Engine Configuration screen, choose an authentication mode. If your legacy servers use SQL Server logins at all, select Mixed Mode. If you exclusively use Active Directory domain accounts in your SQL Server environment, choose Windows Authentication.
- 18.** If you choose to use Mixed Mode authentication, enter a password for the system administrator (SA) account, and click Add Current User.
- 19.** Click the Data Directories tab, and enter the appropriate drive and folder to which you eventually deploy the SharePoint databases.
- 20.** Click Next.
- 21.** At the Error reporting screen, click Next.

22. At the Installation Configuration Rules screen, check that there are no failures or relevant warnings, and click Next.
23. At the Ready to Install screen, click Install.
24. After installation completes, click Close.
25. Close the installation window.
26. After the SQL Server 2012 installation process completes, check Microsoft's Web site for the latest SQL Server service pack and install it. At the time we wrote this guide, there were no service packs available.

Installing Exchange Server 2010 SP2 on VM #3

1. Select Start→Administrative Tools→Server Manager.
2. Click Add Roles.
3. At the Before You Begin screen, click Next.
4. At the Select Server Roles screen, click Web Server (IIS).
5. If prompted by an Add features required for Web Server (IIS) pop-up window, click Add Required Features.
6. Click Next.
7. At the Web Server (IIS) screen, click Next.
8. At the Select Role Services screen, select the Static Content, Default Document, Directory Browsing, HTTP Errors, HTTP Redirection, ASP .NET, .NET Extensibility, ISAPI Extensions, ISAPI Filters, HTTP Logging, Request Monitor, Tracing, Basic Authentication, Windows Authentication, Digest Authentication, Client Certificate Mapping Authentication, Request Filtering, Static Content Compression, Dynamic Content Compression, IIS 6 Metabase Compatibility, IIS 6 WMI Compatibility, and IIS 6 Management Console checkboxes, and click Next.
9. At the Confirm Installation Selections screen, click Install.
10. At the Installation Results screen, click Close.

- 11.** Select Start→Administrative Tools→Server Manager.
- 12.** Click Features.
- 13.** Click Add Features.
- 14.** Select .NET Framework 3.5.1 Features.
- 15.** When the Add Features Wizard pop-up prompts you, click Add Required Role Services.
- 16.** Click Next.
- 17.** At the Introduction to Web Server (IIS) screen, click Next.
- 18.** At the Select Role Services screen, click Next.
- 19.** Click Install.
- 20.** At the Installation Results screen, click Close.
- 21.** Download the Microsoft Filter Pack 2.0.
(<http://www.microsoft.com/downloads/en/details.aspx?FamilyID=5cd4dcd7-d3e6-4970-875e-aba93459fbee>)
- 22.** Run FilterPack64bit.EXE.
- 23.** Click Next.
- 24.** Check the I accept the terms in the License Agreement box, and click Next.
- 25.** When the installation completes, click OK.
- 26.** Click Start→Administrative Tools→Services.
- 27.** Right-click the Net.TCP Port Sharing service, and click Properties.
- 28.** Change the Net.TCP Port Sharing startup type to Automatic, and click OK.
- 29.** Open a command prompt, type `ServerManagerCmd -i RSAT-ADDS`, and press Enter.
- 30.** Reboot the server.

- 31.** Insert the Exchange Server 2010 SP2 installation DVD, and capture the DVD drive in the VM session. When the Autoplay window appears, click Run Setup.EXE.
- 32.** The installer should consider steps 1, 2, and 3 to be complete (they appear grayed out). Click the link to Step 4: Install Microsoft Exchange.
- 33.** To go past the introduction screen, click Next.
- 34.** Accept the license agreement, and click Next.
- 35.** Select No for error reporting, and click Next.
- 36.** Select Typical Exchange Server Installation, and click Next.
- 37.** Leave the organization name at default (First Organization), and click Next.
- 38.** At the question about client computers running Outlook 2003 or Entourage, select Yes, and click Next.
- 39.** To accept defaults for Configure Client Access server external domain, click Next.
- 40.** At the Customer Experience Improvement Program screen, select I don't wish to join the program at this time, and click Next.
- 41.** If a warning about a lack of SMTP appears after the check finishes, ignore it for now. We address this issue in steps 42-52 below.
- 42.** Click Install to start the installation process.
- 43.** After the installation has completed, click Finish. Exchange should automatically open the Exchange Management Console.
- 44.** At the pop-up that warns about rebooting, click OK.
- 45.** If Exchange does not automatically open the Exchange Management Console, click Start → All Programs → Microsoft Exchange Server 2010 → Exchange Management Console.

46. In the left pane, expand Microsoft Exchange On-Premises, expand Organization Configuration, and select Hub Transport.
47. In the Actions pane on the far right, select New Send Connector.
48. Name the send connector SMTP, select the intended use as Internet, and click Next.
49. In the Address space window, click Add.
50. In the SMTP Address Space window, type * as the address, check the Include all subdomains checkbox, and click OK.
51. Click Next.
52. On the Network settings page, select Use domain name system (DNS) "MX" records to route mail automatically, and click Next.
53. In the Source Server window, accept the defaults, and click Next.
54. At the New Connector page, click New to create the connector.
55. Click Finish to close the New SMTP Send Connector wizard.

In order to receive external email, you will need to contact your Internet Service Provider (ISP) or DNS provider to register the MX record associated with your email server's external IP address. You will also need to establish routes in your Firewall to direct all SMTP traffic to your Exchange Server 2010 IP address.

Installing SharePoint Server 2010 on VM #4

1. Insert the installation DVD, and capture the DVD drive in the VM session.
2. Launch splash.hta, and click Install software prerequisites.

3. At the Welcome to the Microsoft SharePoint 2010 Products Preparation Tool screen, click Next.
4. Accept the EULA, and click Next.
5. When the prerequisites finish installing, click Finish.
6. On the main SharePoint installation menu, click Install SharePoint Server.
7. Enter your product license key, and click Continue.
8. Accept the EULA, and click Continue.
9. Choose the Stand-Alone server type, and click Install.
10. When the installation finishes, check the box for Run the SharePoint Products Configuration Wizard now, and click Close.
11. On the Welcome to SharePoint Products screen, click Next.
12. On the pop-up warning about services that will need to be restarted during the configuration, click Yes.
13. When the wizard has completed the configuration, click Finish.

APPENDIX F – UPGRADING YOUR DELL 3-2-1 REFERENCE CONFIGURATION

Complete the following sections on the management server unless directed otherwise.

Running the Add Node wizard

1. Launch Failover Cluster Manager.
2. Expand Storage, and click Disks. Right-click on each disk, and select and Take Offline. Click OK to confirm.
3. Click Nodes, and click Add Node...
4. At the Before You Begin screen, click Next.
5. Enter the name of the new Hyper-V host, and click Next.
6. At the Validation Warning screen, leave the default selection to run the validation tests and click Next.
7. At the Before You Begin screen for the validate a configuration wizard, click Next.
8. At the Testing Options screen, leave the default selection, and click Next.
9. At the Confirmation screen, click Next.
10. At the Summary screen, click Finish.
11. At the Confirmation screen for the Add Node Wizard, click next.
12. At the Summary screen, click Finish.

Running the Configure Cluster Quorum Settings wizard

1. Launch Failover Cluster Manager.
2. Select the failover cluster and select More Actions→Configure Cluster Quorum Settings...
3. At the Before You Begin screen, click Next.

4. At the Select Quorum Configuration Option, leave the default selection, and click Next.
5. At the confirmation screen, click Next.
6. At the Summary screen, click Finish.

Adding another Dell EqualLogic PS6110XV storage array

Connect to the storage array using serial port and terminal utility and complete the following steps:

1. Enter the login credentials. By default, the login/password is `grpadmin/grpadmin`
2. When prompted to configure the array, type `y`
3. When asked Do you want to proceed?, type `Yes`
4. Enter a member name and press Enter. For our testing we chose `PS6110XV-2`
5. Press Enter for the network interface.
6. Enter an IP address, and press Enter. For our testing, we chose `192.10.1.102`
7. Leave the default netmask, and press Enter.
8. Leave the default gateway, and press Enter.
9. For group name, enter the name of the existing group you created when you configured the first PS6110XV storage array. For our testing, this was `grpmanager`
10. Verify that the group IP address is correct, and press Enter.
11. Enter the password for the group manager, and press Enter.
12. When asked to add the array to the group, type `yes`
13. Open a web browser on one of the Hyper-V hosts and enter the group IP address.
14. Provide the appropriate login credentials when prompted.

15. Select the unconfigured member in the group, and click Yes to configure it.
16. At the General Settings screen, click Next.
17. Select the RAID policy, and click Next. For our testing, we selected RAID 10.
18. At the Summary screen, click Finish.

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