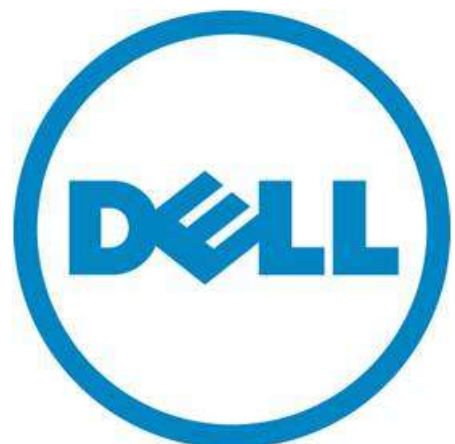

vStart 100 and 200 VMware® vSphere™ Reference Architecture

Release 1.3 for 12th Generation Servers

Dell Virtualization Solutions Engineering

Revision: A00

March 2012



THIS WHITE PAPER IS FOR INFORMATIONAL PURPOSES ONLY, AND MAY CONTAIN TYPOGRAPHICAL ERRORS AND TECHNICAL INACCURACIES. THE CONTENT IS PROVIDED AS IS, WITHOUT EXPRESS OR IMPLIED WARRANTIES OF ANY KIND.

© 2012 Dell Inc. All rights reserved. Reproduction of this material in any manner whatsoever without the express written permission of Dell Inc. is strictly forbidden. For more information, contact Dell.

Dell, the *DELL* logo, *PowerConnect*, *PowerEdge*, *EqualLogic*, and *OpenManage* are trademarks of Dell Inc. *Microsoft*, *Windows Server*, and *SQL Server* are either trademarks or registered trademarks of Microsoft Corporation in the United States and/or other countries. *Intel* and *Xeon* are registered trademarks of Intel Corporation. *VMware*, *ESXi*, *vSphere*, and *vCenter* are registered trademarks or trademarks (the "Marks") of VMware, Inc. in the United States and/or other jurisdictions. Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. Dell Inc. disclaims any proprietary interest in trademarks and trade names other than its own.

March 2012

Table of Contents

1	Introduction.....	4
2	Audience.....	4
3	Solution Overview	4
3.1	Product Overview	7
4	Design Principles and Solution Capabilities	9
4.1	No Single Point of Failure.....	9
4.2	Physical Separation of LAN and iSCSI SAN Traffic	10
4.3	Logical Separation of multiple LAN traffic types	10
4.4	Requirements for Integration into an Existing Data Center	10
4.5	VMware vSphere Features	11
4.6	Leverage EqualLogic Storage Integration with VMware	11
4.7	Thin Provisioning	11
4.8	Storage Tiering	11
5	Architecture	11
5.1	Network Architecture Overview	11
5.2	LAN Architecture	13
5.3	SAN Architecture	14
5.4	Management Architecture	17
6	Scalability	20
7	References	21

1 Introduction

The vStart solution is a virtualization infrastructure solution that has been designed and validated by Dell Engineering. It is delivered racked, cabled, and ready to be integrated into your datacenter. The vStart VMware vSphere™ is offered as two configurations: vStart 100 and 200. The vStart 100 and 200 configurations include Dell™ PowerEdge™ R720 servers running VMware® ESXi™, Dell EqualLogic™ PS6100 iSCSI storage, Dell PowerConnect™ switches, and a Dell PowerEdge R620 server that manages the solution by hosting VMware vCenter™ Server. VMware ESXi versions 4.1 Update 2 and 5.0 are both supported. The solution can either be configured with PowerConnect 6248 or PowerConnect 7048 switches.

The configurations also include Dell Management and Dell EqualLogic Host Integration Tools for VMware Edition (HIT/VE) Plug-ins for VMware vCenter. The two vStart configurations discussed in this paper vary based upon the number of R720 servers and EqualLogic PS6100 storage arrays required to meet the customer's resource needs.

The following documents are available to describe the various aspects of the solution. Customers can contact their Dell Sales teams to get the latest version of these documents

- *vStart 100 and 200 VMware vSphere Reference Architecture* (This document) - Provides a solution overview and reference architecture for the solution.
- *vStart 100 and 200 VMware vSphere Solution Overview* - Provides a solution overview, including various components, and how the solution is delivered.
- *vStart 100 and 200 VMware vSphere Solution Specification* - Provides a detailed specification of various components included in the solution.
- *vStart 100 and 200 VMware vSphere Solution Design Guide* - Provides a detailed architectural solution design.

2 Audience

This document provides an overview of the vStart solution. Customers, including CTOs and IT managers, can use this document to understand the overview and scope of the solution. IT administrators and managers can use this document to understand the solution architecture.

3 Solution Overview

The solution discussed in this whitepaper is powered by Dell PowerEdge servers, Dell EqualLogic iSCSI storage, Dell PowerConnect networking, and VMware vSphere. The solution implements Dell and VMware best practices and utilizes the latest Dell-developed vSphere integration offerings that provide management enhancements. Dell Management Plug-in for VMware vCenter and Dell EqualLogic HIT/VE Plug-in for vCenter are included in the solution, which provides integration of Dell hardware management and storage configuration with vCenter. EqualLogic SAN HeadQuarters (SAN HQ) is included in the solution for storage array management and monitoring. The solution also includes the rack, power distribution units (PDU), and an optional uninterruptible power supply (UPS), KMM (Keyboard, Monitor, Mouse), and management server.

The solution is offered in two main configurations: vStart 100 and 200. The variations between the two configurations are the number of PowerEdge R720 servers in the ESXi cluster and the number of EqualLogic arrays. vStart 100 includes three PowerEdge R720 servers and one EqualLogic array. vStart

200 includes six PowerEdge R720 servers and two EqualLogic arrays. Storage expansion modules are offered in this release, for which more details are provided in the section below. Figure 1 and Figure 2 below provide a high-level overview of the components utilized in each of the configurations.

Figure 1. vStart 100 Configuration Overview

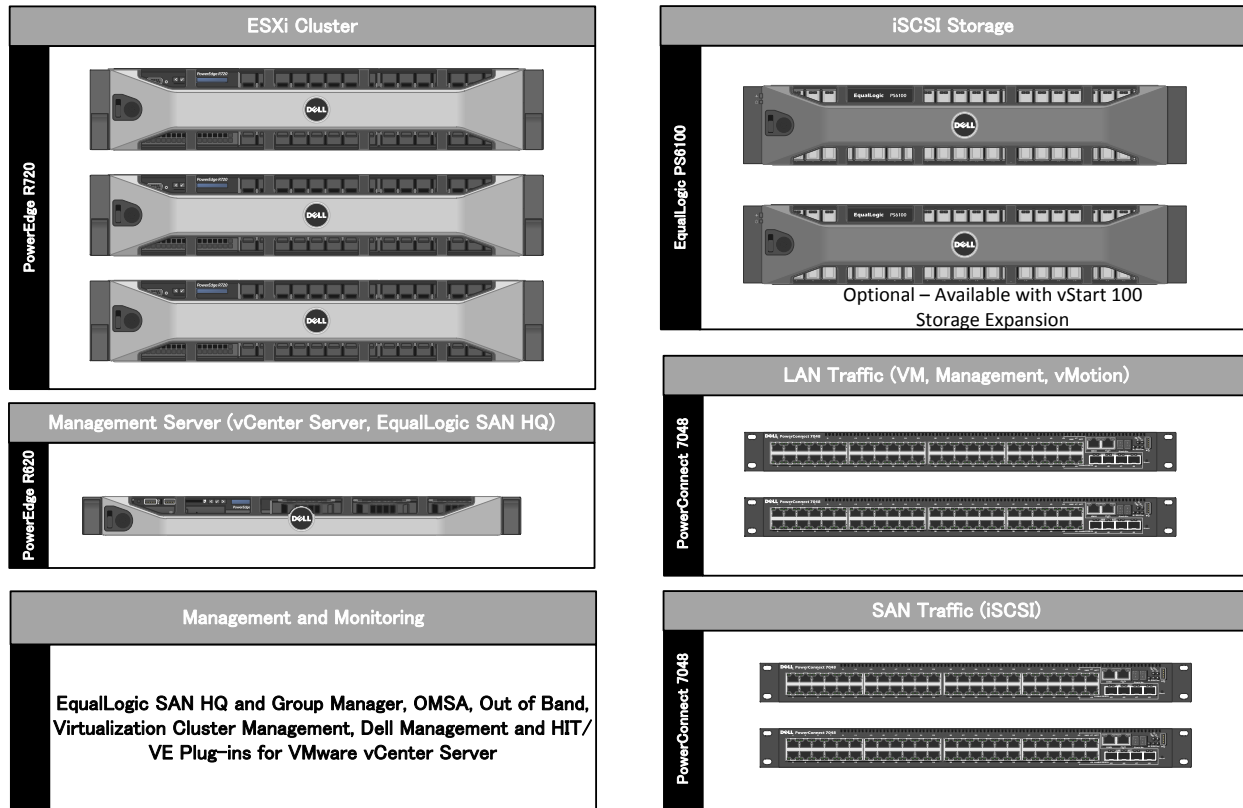


Figure 2. vStart 200 Configuration Overview

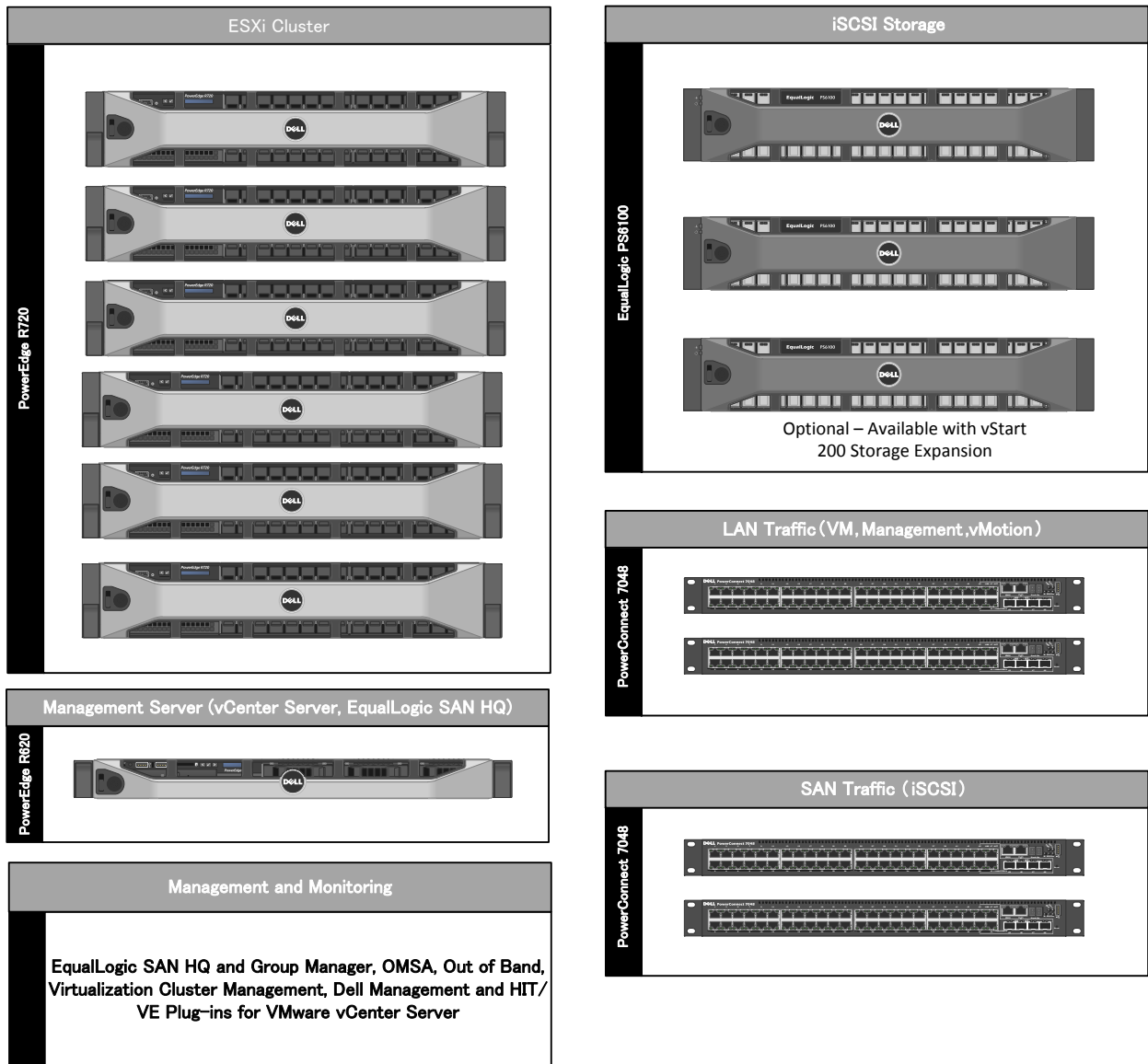


Table 1 below describes the solution components:

Table 1. Component Logical Groups

Component	Description	Role
ESXi Cluster	PowerEdge R720 servers running VMware ESXi Embedded	Host virtual machines (VMs)
iSCSI Storage	EqualLogic PS6100X with 24 x 600 GB 10K RPM 2.5" SAS Drives	Provide shared storage for the ESXi cluster to host the VMs
Management Server	PowerEdge R620 server running Microsoft® Windows Server® 2008 R2 SP1 Standard Edition	Host VMware vCenter Server and EqualLogic SAN HQ
LAN Traffic Switches	PowerConnect 7048 or 6248 switches	Support VM, vMotion, Management, and Out-of-Band Management traffic
SAN Traffic Switches	PowerConnect 7048 or 6248 switches	Support iSCSI data and iSCSI management traffic
Dell Management Plug-in for VMware vCenter	Dell virtual appliance hosted on the ESXi Cluster	Enables hardware monitoring, inventory, firmware updates, bare metal deployment of hypervisors, and warranty retrieval, all integrated into the vCenter Server user interface
Dell EqualLogic HIT/VE Plug-in for VMware vCenter	Dell virtual appliance hosted on the ESXi Cluster	Enables Auto Snapshots and storage volume management, all integrated into the vCenter Server user interface

3.1 Product Overview

This section provides an overview of the components in the solution.

3.1.1 PowerEdge R720 for ESXi 4 Cluster

The Dell PowerEdge R720 uses Intel® Xeon® E5 2600 series processors and Intel chipset architecture in a 1U rack mount form factor. The R720 supports up to sixteen 2.5" drives. There is also an option for an LCD on the front of the server for system health monitoring, alerting, and basic management configuration. The server features two CPU sockets and 24 memory DIMM slots supporting 2, 4, 8, 16 or 32GB DIMMs to meet the memory demands of a virtualized infrastructure.

3.1.2 EqualLogic PS6100 for iSCSI Storage

The Dell EqualLogic PS6100 is a virtualized iSCSI SAN that combines intelligence and automation with fault tolerance to provide simplified administration, rapid deployment, enterprise performance and reliability, and seamless scalability. The storage architecture delivers a self-optimizing SAN that is simple to manage and has an all-inclusive software suite to help reduce Total Cost of Ownership (TCO). In the vStart 100 and 200, the PS6100X uses 10,000 RPM Serial Attached SCSI (SAS) 2.5" form factor disk drives to provide capacity and performance for a range of applications.

With a 24 drive chassis full of 600GB SAS drives, the PS6100X array delivers 14.4 Terabyte (TB) of iSCSI-based storage built on fully-redundant, hot-swappable enterprise hardware. Scale out capacity and performance is provided by adding additional arrays. Built-in software functionality includes automated load balancing, snapshots and replication, multi-path I/O (MPIO), and consistency sets. SAN HQ is also available for Multi-SAN historical performance monitoring.

Advanced data protection features such as Auto Replication and Auto-Snapshot Manager (ASM) also come standard. The ASM integrates with VMware vCenter and VMware's native snapshot technology to provide intelligent and consistent snapshots.

EqualLogic also provides a Multipath Extension Module (MEM) for VMware vSphere to enable MPIO for the iSCSI storage. EqualLogic MEM offers:

- Ease of installation and iSCSI configuration in ESXi servers
- Increased bandwidth
- Reduced network latency
- Automatic load balancing across multiple active paths
- Automatic connection management
- Automatic failure detection and failover
- Multiple connections to a single iSCSI target

3.1.3 PowerEdge R620 management server

The Dell PowerEdge R620 uses Intel® Xeon® E5 2600 series processors and Intel chipset architecture in a 1U rack mount form factor. The R620 supports up to ten 2.5" drives. There is also an option for an LCD on the front of the server for system health monitoring, alerting, and basic management configuration. The server features two CPU sockets and 24 memory DIMM slots supporting 2, 4, 8, 16 or 32GB DIMMs to meet the memory demands of a virtualized infrastructure.

3.1.4 PowerConnect 7048 or 6248 for LAN and SAN Traffic

At the heart of the solutions network configuration are four Dell PowerConnect 7048 and 6248 switches. This managed Layer 3 Gigabit Ethernet switch offers the enterprise-class level of performance required for this configuration. The LAN switches use a stacked configuration that enables connection redundancy and added bandwidth where required. Additionally, its 10Gb uplink enables design and implementation flexibility needed by advanced users. LAN and SAN switches are physically and logically separated per best practices to support security and network traffic segmentation. VLANs are implemented to support solution management, security, and network traffic segmentation, and routing is leveraged to provide flexible connectivity.

3.1.5 Dell Hardware and Storage Management integrated into vCenter

Dell Management Plug-in for VMware vCenter is included in the solution. This enables customers to:

- Get deep-level detail from Dell servers for inventory, monitoring, and alerting – all from within vCenter
- Apply BIOS and Firmware updates to Dell servers from within vCenter
- Automatically perform Dell-recommended vCenter actions based on Dell hardware alerts
- Access Dell hardware warranty information online
- Rapidly deploy new bare metal hosts using Profile features

EqualLogic HIT/VE Plug-in for vCenter is also included in the solution. HIT/VE enables customers to:

- Create and manage Smart Copies and Smart Clones of VI objects
- Schedule creation of Smart Copies and Smart Clones
- Provision new datastores and expand existing datastores
- Create and deploy Virtual Desktops (This is outside the scope of this solution, and requires additional software.)

For more information on Dell Management Plug-in for VMware vCenter see [the Dell Management Plug-in for VMware vCenter web page](#). For more information about the Dell EqualLogic HIT/VE Plug-in for VMware vCenter see Dell EqualLogic Host Integration Toolkit VMware Edition (HIT/VE) Auto-Snapshot Manager 3.0 at:

<http://www.dellstorage.com/WorkArea/DownloadAsset.aspx?id=1616&terms=HIT%2fVE>

4 Design Principles and Solution Capabilities

This section lists the design principles, requirements, and solution capabilities behind the vStart solution architecture.

4.1 No Single Point of Failure

The solution is designed so that there is no single point of failure and redundancy is incorporated into all mission critical components of the solution. Management applications are not architected with this level of redundancy because the mission critical workloads will continue to operate in the event of a management application failure.

Network redundancy for the mission critical components is achieved with redundant network interface controllers (NICs) and redundant switches. VMware vSwitches provide failover and NIC teaming functionality across the redundant network interfaces. Similarly, for iSCSI storage, redundancy is achieved with redundant NICs, switches, and storage controllers. For both network and iSCSI traffic, the redundant NICs are selected in such a way that they are mapped across the LAN On Motherboards (LOMs) and add-in controllers to avoid any single point of failure. VMware High Availability (HA) provides HA for VMs by restarting the VMs on other ESXi servers when an ESXi server failure is detected. The solution also includes redundant power supplies connected to separate PDUs.

4.2 Physical Separation of LAN and iSCSI SAN Traffic

Dedicated NICs and switches are provided for iSCSI storage traffic to isolate the storage traffic from LAN traffic. This ensures minimal latency for storage I/O operations.

4.3 Logical Separation of multiple LAN traffic types

Virtual Local Area Networks (VLANs) are used to provide security and logical separation of various traffic types required for virtualization.

4.4 Requirements for Integration into an Existing Data Center

A database, domain name services (DNS), network time protocol (NTP), and routing between VLANs are requirements for the vStart solution. The architectures assume that a network core and routing are in place, and that a database is configured for VMware vCenter Server. DNS and NTP support must also be configured and running in the customer's environment prior to deploying a vStart solution. A site survey may be needed to gather additional information and confirm customer requirements. Table 2 below provides more details about the requirements. For more information about the site survey, please contact your Dell Sales and Services representatives.

Table 2. Customer Infrastructure and vStart Solution

Infrastructure Requirement	Function	vStart Solution Requirements
Database	vCenter Server requires a database to store details about vCenter Server hosts, VMs, and related attributes	Existing database that can be reached by the vCenter Server to be installed in vStart or existing vCenter Server and database
DNS	Provides name resolution for IP address to hostnames	ESXi hosts, iDRAC, and the Management Server require access to DNS for name resolution
NTP	Provides time synchronization services for components in the solution	ESXi hosts, PowerConnect Switches, and EqualLogic Storage Arrays require time synchronization
Network Routing	Provides a network path in/out of the vStart LAN switches to the customer's network	Existing network routing must be in place before the vStart solution can communicate with database, DNS, NTP and other services in the customers environment

For details about the databases supported by vCenter Server, refer to the [VMware Product Interoperability Matrix](#). DNS provides name resolution services for various solution components, while an NTP server is required to synchronize time across various components in the solution and to enable VMware HA functionality.

4.5 VMware vSphere Features

The solution is designed to enable key features of VMware vSphere:

- Support for VMware HA to enable High Availability for VMs.
- VMware vMotion is supported for manual load balancing and zero downtime maintenance.
- VMware Distributed Resource Scheduler (DRS), Dynamic Power Management (DPM), and Storage vMotion are also supported.
- 60 day trial versions of VMware vCenter Server and vSphere ESXi are included. Additional OS licenses needed. See your Dell Sales and Services representatives for more information.

4.6 Leverage EqualLogic Storage Integration with VMware

As mentioned earlier in the document, EqualLogic is tightly integrated with VMware to provide better performance and manageability. Integration is achieved through various features like EqualLogic MEM for storage network connection multipathing, VAAI integration for better performance, and ASM/VE for snapshot capabilities. These features are available as a part of the solution.

4.7 Thin Provisioning

The solution enables support for thin provisioning of storage both at the EqualLogic and the ESX level. Thin provisioning avoids the inefficiencies of over allocation by limiting the actual physical storage resource allocation to what is utilized now, and enables the automatic addition of storage resources as the requirements grow.

4.8 Storage Tiering

EqualLogic PS arrays provide IT organizations numerous techniques for storage tiering as a standard part of their all-inclusive feature set. These techniques extend the automation at the core of the PS Series design philosophy, while allowing broad customization of storage tiers to suit a wide range of business and organizational requirements.¹

5 Architecture

The architecture for the vStart 100 and 200 is identical with the exception of the smaller number of servers and storage arrays in the vStart 100. As such, the architecture discussed in this section will focus on the vStart 200. For those targeting to purchase or have currently deployed the vStart 100, the three additional servers and one additional iSCSI array can be ignored.

5.1 Network Architecture Overview

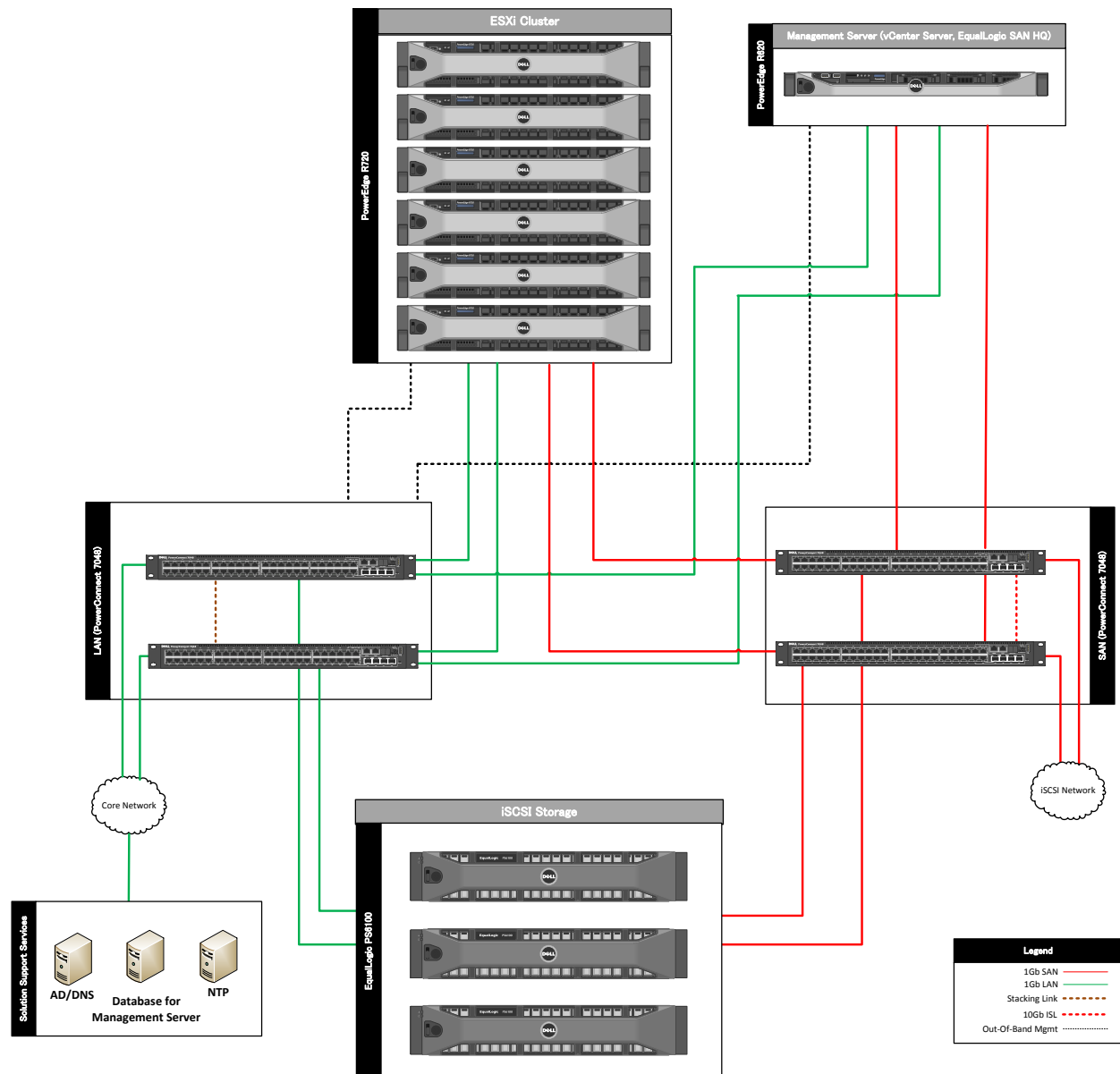
vSphere network traffic in this solution is comprised of four distinct types: Virtual Machine (VM), Management, vMotion, and iSCSI. In addition, support for out-of-band management is included. Two separate networks are created to support different traffic types:

¹ <http://www.equallogic.com/solutions/default.aspx?id=9687>

- **LAN** - This network supports management, VM, vMotion, and out-of-band management. In addition, uplinks to core infrastructure provide connectivity to the solution support services (DNS, NTP, and Database for vCenter Server).
- **SAN** - This network supports iSCSI data and SAN switch management traffic. Uplinks are supported to connect into an existing iSCSI network; however, these uplinks are not required for full solution functionality.

Figure 3 below depicts the logical LAN and SAN network architecture. Detailed diagrams are available throughout the remainder of the document.

Figure 3. Network Topology (Logical View)



The table below summarizes the use of each traffic type.

Table 3. Traffic Type Summary

Traffic Type	Use
Management	Supports virtualization management traffic and communication between the ESXi servers in the cluster, and configuration and monitoring of the storage arrays and LAN switches.
vMotion	Supports migration of VMs between ESXi servers in the cluster.
VM	Supports communication between the VMs hosted on the ESXi cluster and external systems.
Out-of-Band Management	Supports configuration and monitoring of the servers through the iDRAC management interface.
iSCSI Data	Supports iSCSI traffic between the servers and storage array(s). In addition, the SAN switches can be managed on this network.

5.2 LAN Architecture

The LAN includes two PowerConnect 7048 or 6248 switches which support VM, management, vMotion, and out-of-band management (OOB) traffic. These traffic types are logically separated through the use of VLANs. The two switches are stacked together which forms a single logical switch and provides a 48Gb stack bandwidth between the two PC6224 switches, or 64Gb stack bandwidth between the two PC7024 switches. The solution provides four 1Gb uplinks from each switch to link into an existing core network infrastructure. If the core network infrastructure supports 10Gb Ethernet, then 10Gb uplink modules may be added to each switch.

The traffic on the LAN is separated into four VLANs: one VLAN each for management, vMotion, VM, and OOB management traffic. VLAN tagging for the OOB management traffic is performed by the PowerConnect switches. For the other traffic types, the tagging is performed in the virtual switch by the ESXi hypervisor. The PowerConnect switches can be configured to provide the routing function. Additional VLANs can be implemented for VM traffic, if required.

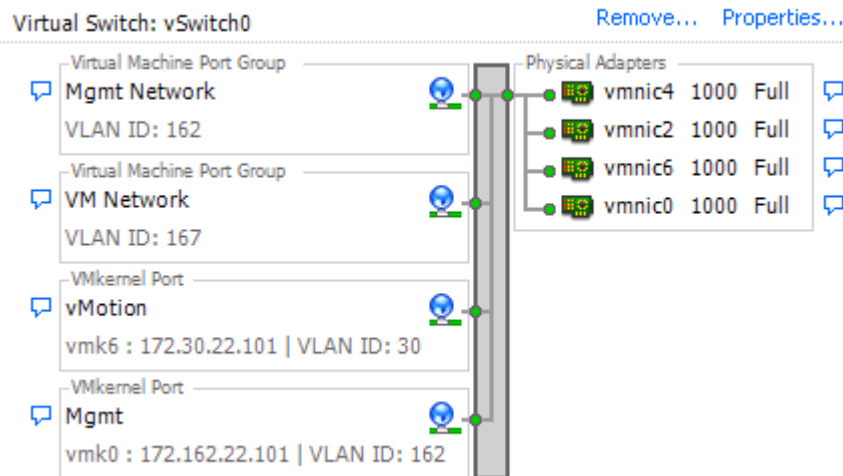
Table 4 provides an overview of the port configurations in the two PowerConnect LAN switches. Trunk mode is used to allow multiple VLANs on a port, and access mode is used when the switch performs the VLAN tagging function.

Each PowerEdge R720 has eight 1Gb ports, of which four are dedicated for LAN traffic. In addition, the iDRAC OOB management interface is connected to the LAN switches. A single ESXi virtual switch is created to support all LAN traffic. Route based on the originating virtual switch port ID is recommended for the vSwitch load balancing. Unique port groups are then created for management and VM traffic. In addition, VMkernel interfaces are defined for management and vMotion traffic. Each port group and VMkernel interface is configured to tag with the appropriate VLAN. The Management port group is utilized by the Dell Management Plug-in and the EqualLogic HIT/VE Plug-in for VMware vCenter.

Figure 4 is a screenshot taken in vCenter Server of the LAN virtual switch on Server 1. “Mgmt Network” is a Virtual Machine Port Group, which allows VMs to communicate on the management network, and

“Mgmt” is a VMkernel port, which allows the ESXi kernel to communicate with the management network.

Figure 4. LAN vSwitch configuration



5.3 SAN Architecture

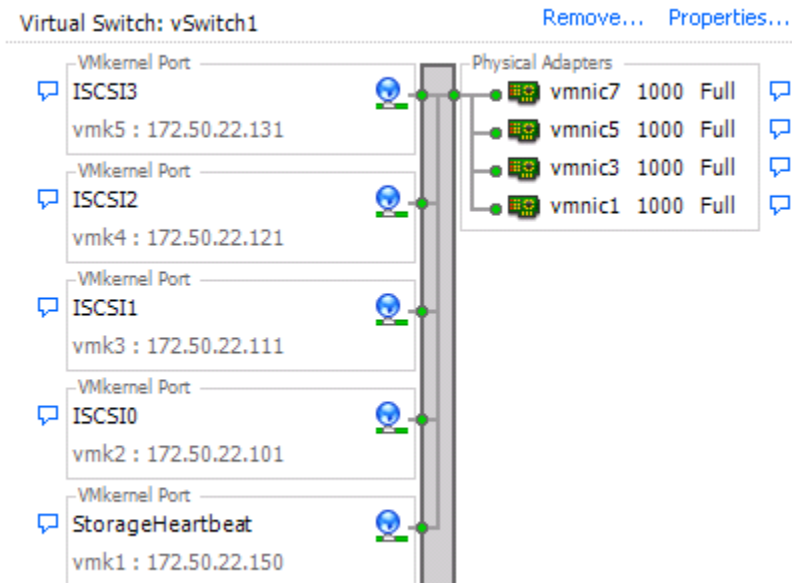
The SAN includes two PowerConnect 7048 or 6248 switches, which support iSCSI data traffic. The two switches are connected together with stacking modules on each switch. In addition, the solution supports up to eight 1Gb uplinks from each switch to link into an existing core iSCSI network infrastructure. If required, 10Gb uplink modules may be added to each switch.

The two switches are connected using two 10Gb Inter switch links (ISLs). The two 10Gb Link Aggregation Groups (LAGs) provide a path for communication across the switches. In addition, the LAGs support traffic between EqualLogic arrays if more than one array is present in the configuration.

The traffic for the SAN is also segregated into its own VLAN. This facilitates isolation from the default VLAN and gives a separation between SAN traffic and any other traffic that it may come across if the SAN is uplinked to a LAN or extended to another SAN for replication.

For each PowerEdge R720, a single virtual switch is created to support all SAN traffic. Four 1Gb physical networks that are dedicated for iSCSI traffic are connected to this virtual switch (as shown in Figure 5). Four VMkernel (vmk) interfaces are created and each VMkernel interface is associated with only one physical network port.

Figure 5. SAN vSwitch Configuration

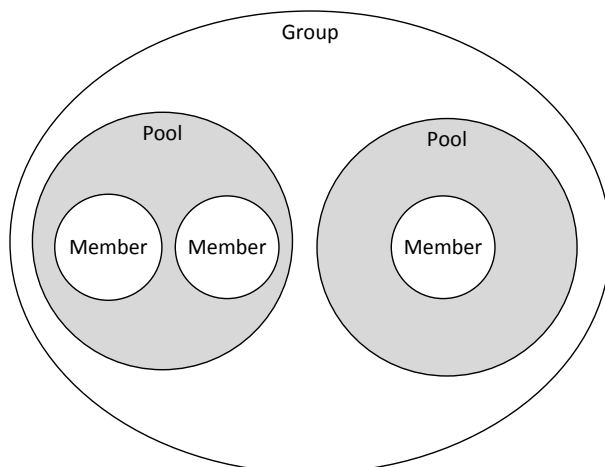


An additional VMkernel port is created on the iSCSI subnet serving as the default vmkernel port for storage heartbeat traffic with the EqualLogic storage. This heartbeat sits outside of the iSCSI software initiator and does not consume any additional iSCSI storage connections. It is simply used as the lowest vmkernel port for vmkping and other iSCSI network functions. This heartbeat has to be the lowest VMkernel port on the vSwitch and is not bound to the software initiator.

5.3.1 EqualLogic Group and Pool Configuration

Each EqualLogic array (or member) is assigned to a particular group. Groups help in simplifying management by enabling management of all members in a group from a single interface. Each group contains one or more storage pools. Each pool must contain one or more members and each member is associated with only one storage pool. Figure 6 shows an example of a group with three members distributed across two pools.

Figure 6. EqualLogic Organizational Concepts



The iSCSI volumes are created at the pool level. In the case where multiple members are placed in a single pool, the data is distributed amongst the members of the pool. With data being distributed over a larger number of disks, the potential performance of iSCSI volumes within the pool is increased with each member added.

5.3.2 Storage Array RAID Configuration

The storage array RAID configuration is highly dependent on the workload in your virtual environment. The EqualLogic PS series storage arrays support four RAID types: RAID 5, RAID 6, RAID 10, and RAID 50. The RAID configuration will depend on workloads and customer requirements. In general, RAID 10 provides the best performance at the expense of storage capacity.

RAID 10 generally provides better performance in random I/O situations, and requires additional overhead in the case of a drive failure scenario. RAID 50 generally provides more usable storage, but has less performance than RAID 10. RAID 5 provides the most storage capacity at the expense of lower performance and availability than RAID 10. RAID 6 provides better data protection than RAID 5 or 50.

For more information on configuring RAID in EqualLogic, refer to the white paper, *How to Select the Correct RAID for an EqualLogic SAN*, available at <http://www.EqualLogic.com/resourcecenter/assetview.aspx?id=8071>.

5.3.3 Volume Size Considerations

Volumes are created in the storage pools. Volume sizes depend on the customer environment and the type of workloads. Volumes must be sized to accommodate not only the VM virtual hard drive, but also the size of the virtual memory of the VM and additional capacity for any snapshots of the VM. Depending on the environment, you may decide to create multiple ~500 GB volumes with multiple VMs.

It is important to include space for the guest operating system memory cache, snapshots, and VMware configuration files when sizing these volumes. Additionally, you can configure thin-provisioned volumes to grow on demand only when additional storage is needed for those volumes. Thin provisioning can increase the efficiency of storage utilization.

With each volume created and presented to the servers, additional iSCSI sessions are initiated. When planning the solution, it is important to understand that group and pool limits exist for the number of

simultaneous iSCSI sessions. For more information, refer to the current EqualLogic Firmware (FW) Release Notes available at the [EqualLogic Support site](#).

5.4 Management Architecture

The management architecture of the vStart configurations includes hardware and software components that will manage all components of the vStart architecture. They can be found on the R620 server or on VMs running on the R620.

5.4.1 Management on the LAN

The management of the devices on the LAN includes the following items:

- Out-of-band server management
- Server management through Dell OpenManage™ Server Administrator
- Server management through Dell Management Plug-in for VMware vCenter
- ESXi cluster management through VMware vCenter
- LAN switch management through CLI or web browser
- EqualLogic array management and monitoring

Server Out-of-Band Management: The PowerEdge R720 servers and the PowerEdge R620 can be managed directly by connecting to the iDRAC7 web interface. In addition, the iDRAC7 supports remote KVM through a virtual console.

Dell OpenManage Server Administrator (OMSA): OMSA should be installed on the PowerEdge R720 servers and the PowerEdge R620. For the PowerEdge R720 servers, OMSA is available to download as *OpenManage Offline Bundle and VIB for ESXi* from support.dell.com. OMSA can be installed on each ESXi server either using vSphere Command Line Interface (vSphere CLI) or VMware vSphere Management Assistant (vMA). For more information refer to the white paper, *Dell Systems Management for VMware ESX and ESXi*, available at <http://support.dell.com/support/edocs/software/eslvmwre/sysman/sysman.htm>.

For the PowerEdge R620, the Dell OpenManage Installation DVD is available for download from support.dell.com. The OpenManage Web Service option allows the PowerEdge R620 to serve out the OpenManage web pages for the ESXi servers. The OMSA option provides hardware management for the local system.

Dell Management Plug-in for VMware vCenter: The plug-in provides server details for all PowerEdge R720 servers in the solution at the datacenter, cluster, and host level within vCenter Server. Inventory, monitoring, alerting, BIOS and firmware updates, and access to online warranty information are available within vCenter Server. In addition, the plug-in provides the ability to directly launch the iDRAC or OMSA web interfaces for each server.

ESXi Cluster Management: Management of the ESXi cluster will typically be performed directly with vCenter Server, but can also be performed by connecting to each server through the VMware Virtual Infrastructure Client (VI Client). In addition, for troubleshooting purposes, KVM or virtual console through iDRAC connectivity to an ESXi server may be required to utilize the Direct Console User Interface (DCUI).

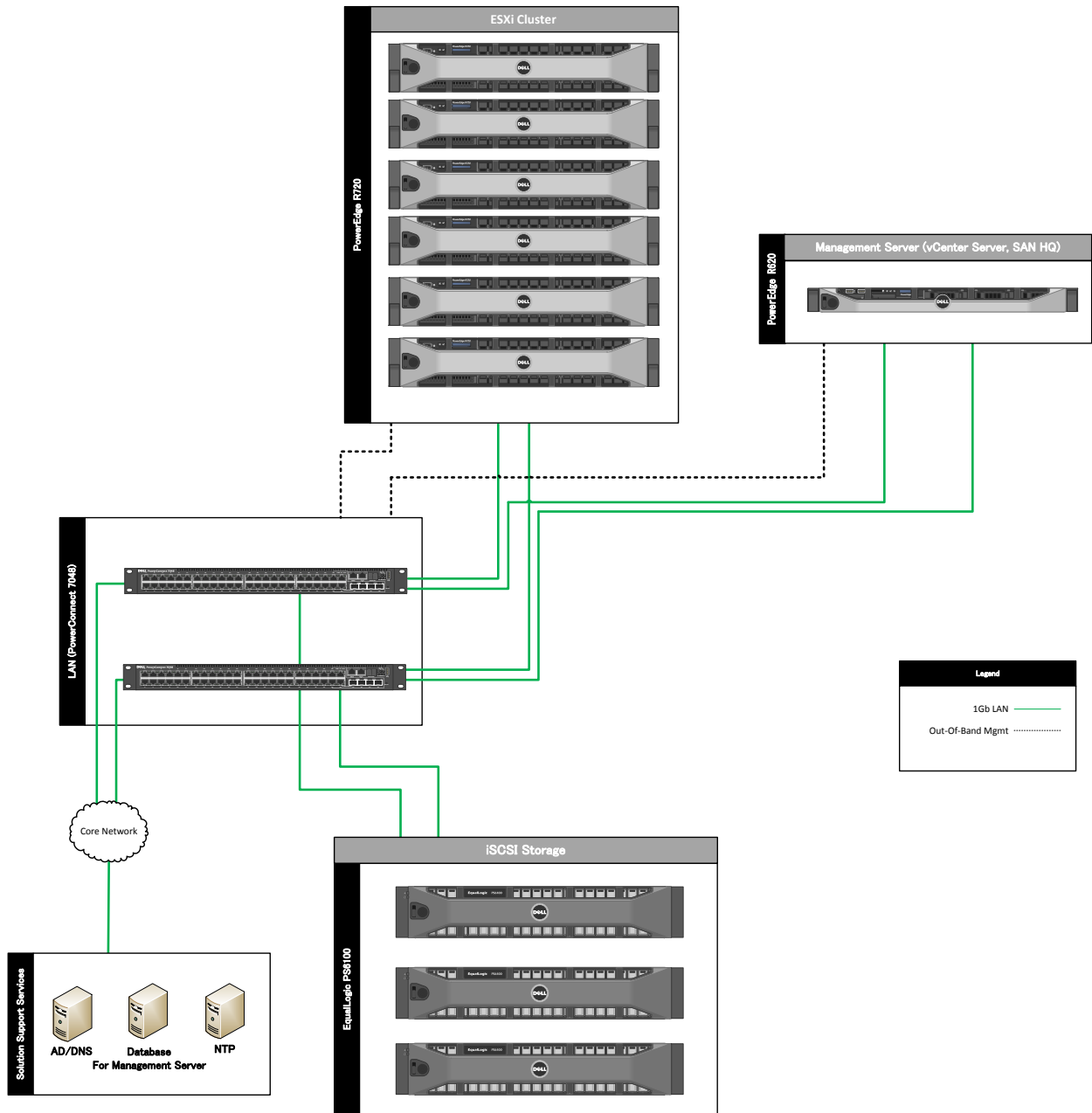
LAN Switch Management: Management of the LAN switches can be performed through a web browser, serial cable, or telnet.

EqualLogic Array Management: The EqualLogic arrays are managed through the EqualLogic Group Manager web interface which can be accessed from the management server. Administrator primary tasks within Group Manager include configuration and troubleshooting of the arrays. The HIT/VE Plug-in for VMware vCenter can also be used to manage the storage arrays from within vCenter Server.

EqualLogic Array Monitoring: SAN HQ is installed on the management server to provide current performance monitoring and historical statistics. Group Manager can also be used for array monitoring.

A logical overview of the LAN management architecture is shown in Figure 7. Notice that the PS6100 arrays are managed via the dedicated management ports that are connected to the LAN switches.

Figure 7. Management Overview (LAN)



6 Scalability

When adding additional servers or storage to the rack, power, weight, and cooling requirements must be taken into account. The power limits of PDUs and UPS must be understood prior to installing a new system.

Switch ports on both the LAN and SAN switches are available for expansion. Those ports must be enabled and configured to support the new servers and/or storage arrays.

Adding new servers to the ESXi Cluster: If additional VMs will be deployed that will exceed current resource capabilities, or the ESXi cluster has reached its acceptable maximum (CPU and memory) resource utilization, then additional servers can be added to the cluster.

Previously created iSCSI volumes on the EqualLogic array may require modifications to the access controls to grant access to the newly added servers.

When adding servers to an ESXi cluster, it is recommended that the configuration be identical to the other systems in the cluster. If this is not achievable, then there may be restrictions on certain actions such as vMotion between the differing systems. To understand vMotion compatibility requirements, refer to the Dell whitepaper, *VMware vMotion and 64-Bit Virtual Machine Support for Dell PowerEdge Systems Compatibility Matrix*, available at <http://support.dell.com/support/edocs/software/eslvmwre/VS/index.htm>.

For quick addition of a new server and for the ESXi cluster to be uniform, host profiles can be used. A host profile is created from an existing server on the same ESXi cluster. It will capture the networking, storage and security settings from the validated configuration. A new server with the basic vSphere installation can be added to the cluster and the host profile can then be applied to setup the networking, storage, and security configuration. Note that host profiles require vSphere Enterprise Plus license edition.

Adding new storage to the EqualLogic group: New EqualLogic arrays can be added to the existing EqualLogic group. As each new array is added to the storage group, the storage capacity and performance, in terms of both bandwidth and IOPS, are increased. This increased capacity can be utilized without downtime. When a new array is added to an existing pool, the existing data will automatically be distributed to the newly added array.

If EqualLogic thin provisioning was utilized and virtual capacity allocated is nearing the limit of physical capacity, then adding an additional storage array to the constrained pool will address this issue.

7 References

VMware references:

- VMware vSphere Edition Comparisons
https://www.vmware.com/products/vsphere/buy/editions_comparison.html
- VMware vSphere Compatibility Matrixes
http://www.vmware.com/pdf/vsphere4/r40/vsp_compatibility_matrix.pdf
- VMware High Availability (HA): Deployment Best Practices
<http://www.vmware.com/resources/techresources/10166>

EqualLogic references:

- Dell EqualLogic PS Series Architecture Whitepaper
http://www.dell.com/downloads/global/products/pvaul/en/dell_EqualLogic_architecture.pdf
- Configuring iSCSI Connectivity with VMware vSphere 5 and Dell EqualLogic PS Series Storage
<http://www.equallogic.com/WorkArea/DownloadAsset.aspx?id=10799>
- Host Integration Tools for VMware
<http://www.dell.com/downloads/global/products/pvaul/en/EqualLogic-host-software.pdf>
<http://www.delltechcenter.com/page/EqualLogic+HIT-VE+new+features#fbid=xzSL8xnCju5>
- How to Select the Correct RAID for an EqualLogic SAN
<http://www.EqualLogic.com/resourcecenter/assetview.aspx?id=8071>
- Using Tiered Storage in a PS Series SAN
<http://www.EqualLogic.com/resourcecenter/assetview.aspx?id=5239>
- Monitoring your PS Series SAN with SAN HQ
<http://www.EqualLogic.com/resourcecenter/assetview.aspx?id=8749>

Dell Management:

- Dell Management Plug-In for VMware vCenter references - Solution Brief
<http://content.dell.com/us/en/enterprise/d/business-solutions-virtualization-en/Documents-dell-management-plug-in-vmware-vcenter-solution-brief.pdf.aspx>