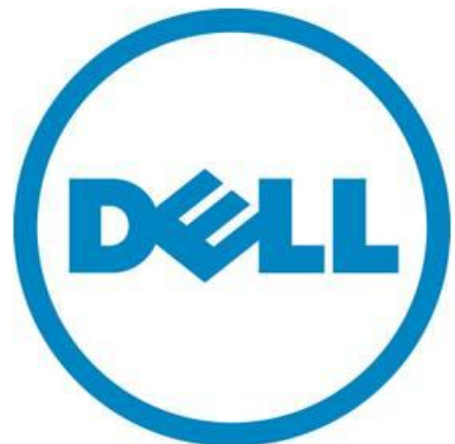


# Dell vStart 100v and vStart 200v Solution Overview

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A Dell Technical White Paper

Dell Virtualization Solutions Engineering



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February 2011

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# 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. vStart is offered as two configurations: vStart 100v and vStart 200v. The configurations include Dell™ PowerEdge™ R710 servers running VMware ESXi 4, Dell EqualLogic™ PS6000XV iSCSI storage, Dell PowerConnect™ 6248 switches, Dell PowerEdge R610 server that manages the solution by hosting VMware vCenter Server and Dell management tools, and Dell management plug-in for VMware vCenter. The two configurations vary in the number of R710 servers and EqualLogic PS6000XV storage to meet customer's resource needs.

The following documents are provided to describe the various aspects of the solution. Contact your Dell Sales or Services representative to get the latest revision of all the documents.

- vStart 100v and vStart 200v Solution Overview (this document) - Provides an overview of the solution, including various components, and how it is delivered.
- vStart 100v and vStart 200v Solution Specification - Provides a detailed specification of various components included in the solution.
- vStart 100v and vStart 200v Solution Design Guide - Provides a detailed architectural design of the solution.

## 2 Audience

The document provides an overview of the vStart solution. Customers, including CTOs and IT managers, who have purchased or plan to purchase a vStart solution can use this document to understand the overview and scope of the solution.

## 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 4.1. 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 vCenter is included in the solution which provides integration of Dell hardware management with vCenter. EqualLogic SAN HeadQuarters (SAN HQ) is included in the solution for storage array management. The solution also includes the rack, power distribution units (PDU), and uninterruptible power supplies (UPS).

The solution is offered in two configurations: vStart 100v and vStart 200v. The variations between the two configurations are the number of PowerEdge R710 servers in the ESXi cluster and the number of EqualLogic arrays. vStart 100v includes three PowerEdge R710 servers and one EqualLogic array. vStart 200v includes six PowerEdge R710 servers and two EqualLogic arrays. Figure 1 and Figure 2 below provide a high-level overview of the components utilized in each of the configurations.

vStart 100v and vStart 200v Solution Overview

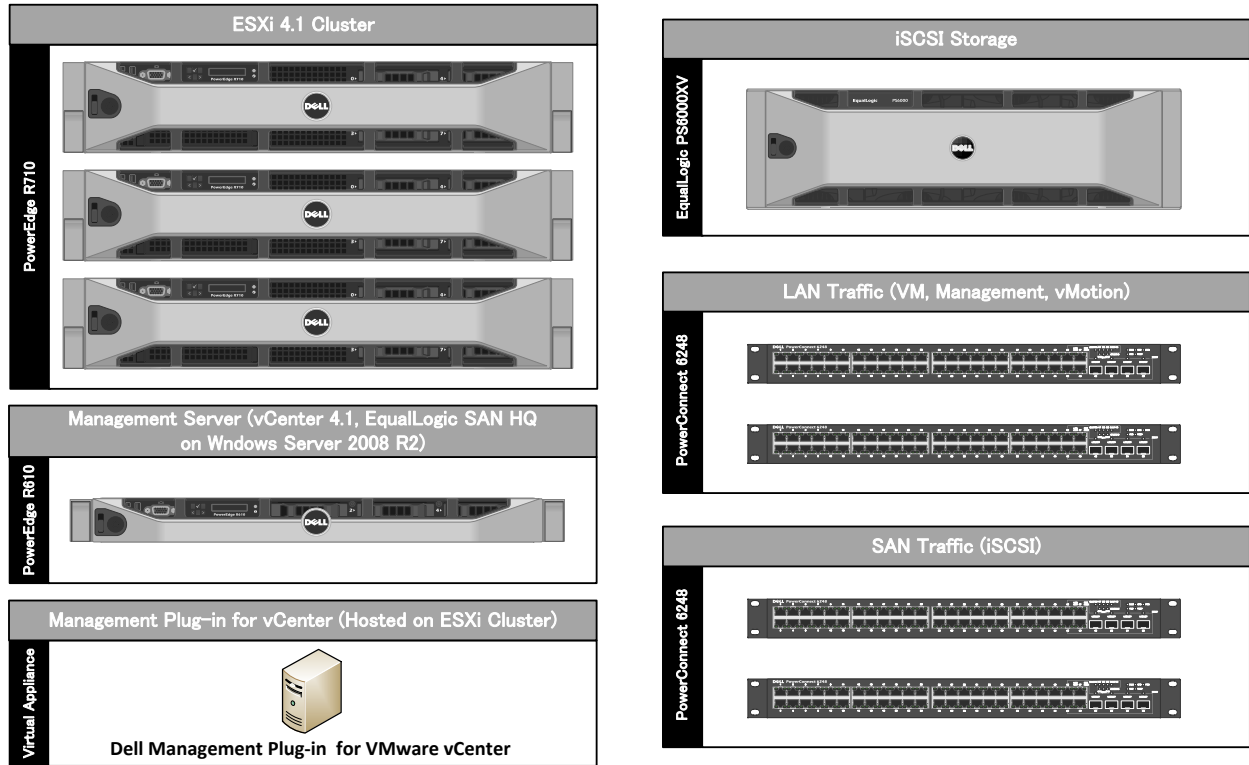


Figure 1: vStart 100v Configuration Overview

vStart 100v and vStart 200v Solution Overview

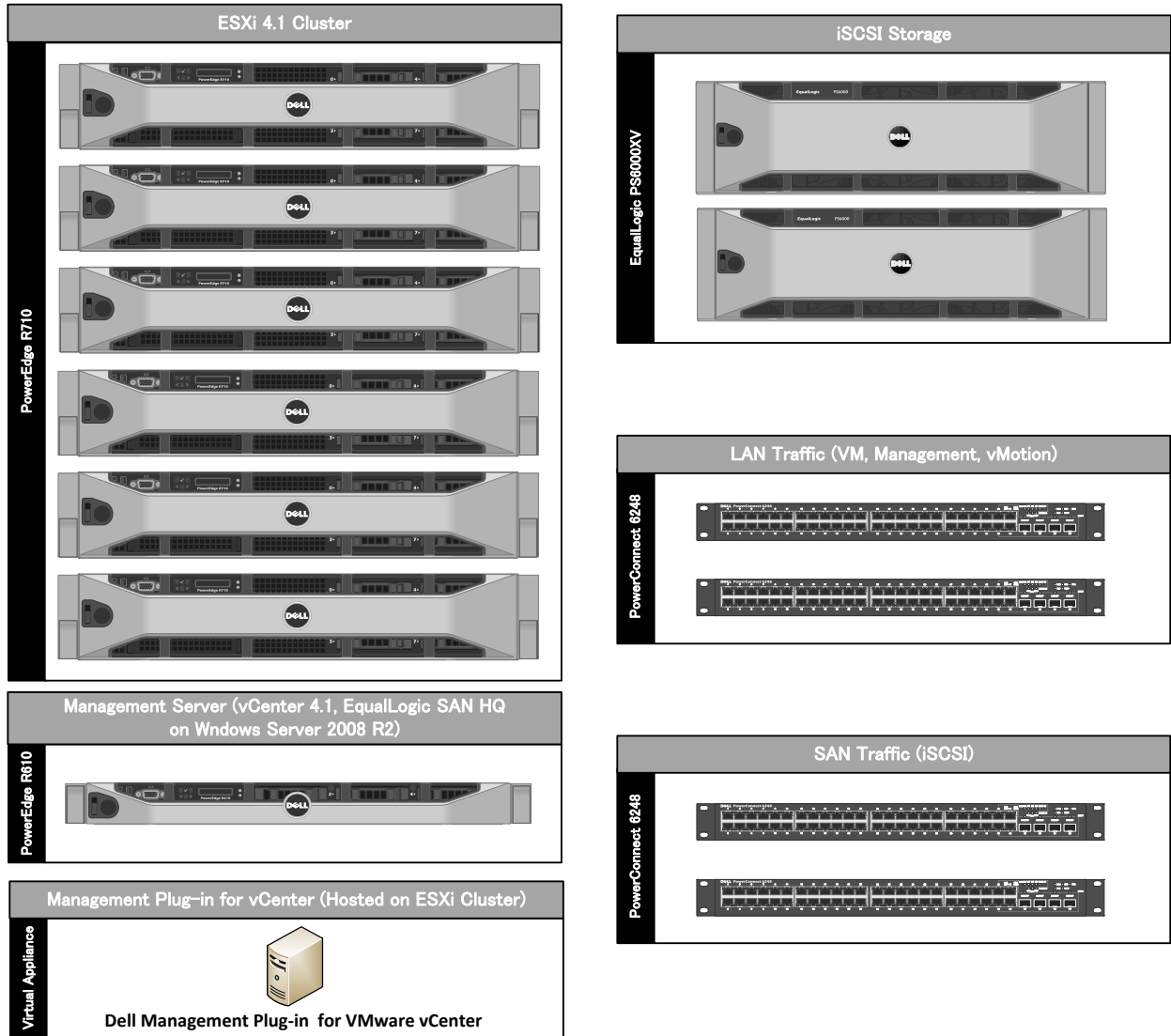


Figure 2: vStart 200v Configuration Overview

Below is the description of the solution components:

**Table 1. Component Logical Groups**

Component	Description	Role
ESXi 4.1 Cluster	PowerEdge R710 servers running VMware ESXi 4.1	Host virtual machines (VMs)
iSCSI Storage	EqualLogic PS6000XV with 16 x 600 Gigabyte (GB) 15,000 RPM SAS Drives	Provide shared storage for the ESXi cluster to host on the VMs
Management Server	PowerEdge R610 server running Windows Server® 2008 R2 Standard Edition	Host VMware vCenter Server 4.1 and EqualLogic SAN HQ
LAN Traffic Switches	PowerConnect 6248 switches	Support VM, vMotion, Management, and Out-of-Band Management traffic
SAN Traffic Switches	PowerConnect 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

## 4 Product Overview

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

### PowerEdge R710 for ESXi 4 Cluster

The Dell PowerEdge R710 uses Intel® 5600 series processors and Intel chipset architecture in a 2U rack mount form factor. These servers provide a graphical and interactive LCD located in the front of the server for system health monitoring, alerting, and control of basic management configuration. An AC power meter and ambient temperature thermometer are built into the server which can be monitored on this display without any software tools. The server features two CPU socket and 18 memory DIMM slots supporting 1, 2, 4, 8 or 16GB DIMMs, to meet the memory demands of a virtualized infrastructure.

Energy-efficient design features include power-supply units sized appropriately for system requirements, innovative system-level design efficiency, policy-driven power and thermal management, and highly efficient standards-based Energy Smart components. For more information, see [R710 technical guidebook](#) and [Dell PowerEdge Server Portfolio Guide](#).

## EqualLogic PS6000XV for iSCSI Storage

The Dell EqualLogic PS6000XV 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). The PS6000XV uses 15,000 RPM Serial Attached SCSI (SAS) disk drives to deliver high performance for databases and online transaction processing applications.

With a 16 drive chassis full of 600GB SAS drives, the PS6000XV array delivers 9.6 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, 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 also come standard. The Auto-Snapshot Manager 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 multipath I/O 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

For more information on EqualLogic MEM, refer to the technical report [Configuring and Installing the EqualLogic Multipathing Extension Module for VMware vSphere 4.1 and PS Series SANs](#).

EqualLogic supports VMware vStorage APIs for Array Integration (VAAI). VAAI provides performance improvements through various capabilities like Full Copy, Hardware Assisted Locking, and Block Zeroing. All of these features result in better performance for operations such as creating and cloning VMs, starting and stopping VMs, and snapshots. For more information, see the technical paper [What's New in VMware vSphere 4.1 - Storage](#).

## PowerEdge R610 for management server

Dell PowerEdge R610 is an Intel-based, 2-socket/1U server which has reduced power consumption with increased performance over previous generations<sup>1</sup> and Lifecycle Controller for advanced systems management. The PowerEdge R610 rack server uses Intel® 5600 series processors, which feature quad-core processing to maximize performance, for data center infrastructures such as management

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<sup>1</sup> <http://www.dell.com/us/business/p/poweredge-r610/pd>



applications. For more information, see [R610 technical guidebook](#) and [Dell PowerEdge Server Portfolio Guide](#).

### **PowerConnect 6248 for LAN and SAN Traffic**

At the heart of the solutions network configuration are two Dell PowerConnect 6248 switches. This managed Layer 3 Gigabit Ethernet switch offers the enterprise-class level of performance required for this configuration. The 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.

### **Dell Hardware 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

For more information on Dell Management Plug-in for VMware see [the Dell Management Plug-in web page](#).

## **5 Solution Capacity and Sizing**

The table below provides detailed hardware capacity information for each of the vStart configurations. This information is useful to help determine which configuration best fits your requirements.

With the capacity information and the sizing example shown in Table 8, the number of Virtual Machines (VMs) supported by a configuration can be determined according to the CPU, memory, and disk usage requirements for your respective workloads. It's important to note that the nature of the workloads running within the VMs will affect the performance and will ultimately determine the overall number of VMs that can be deployed within the ESXi cluster.

**Table 1. Solution Capacity and Example Sizing**

Component	vStart 100v Configuration	vStart 200v Configuration
Number of ESXi Servers	3	6
Compute Capacity (total number of processor cores)	36 cores	72 cores
Memory Capacity	288 GB	576 GB
Storage Capacity	9.6 Terabyte raw capacity	19.2 Terabyte raw capacity
Number of drives	16 15K SAS drives	32 15K SAS drives
Example VM Characteristics	Sample Sizing	Sample Sizing
3:1 vCPU to CPU Core Ratio	108 VMs	216 VMs
Memory Utilization: 2.5 GB per VM	270 GB	540 GB
Storage Utilization (RAID 50): 30GB per VM	3.24 TB	6.48 TB
Example Workload	Webserver Light IO Profile	Webserver Light IO Profile

With the available CPU and Memory resources, the vStart 100v and vStart 200v configurations are ideally suited for workloads that are CPU and Memory centric, or have a light to moderate IO profile. Accordingly, higher VM densities can be achieved with light-IO workloads such as web or application servers. Due to the nature of the random and heavier IO workload profiles typically associated with applications like database, mail, and file servers; the vStart 100v and 200v configurations will support lower VM densities when running VMs with heavy-IO centric workload profiles.

Additionally, factors such as future planned/unplanned growth of existing VMs, addition of new VMs, extra capacity for high availability or fault tolerance, quality of service (QoS) requirements and service level agreements (SLAs) for your end users and customers, and host or infrastructure maintenance should be considered; and may impact the number of VMs a given configuration can support.

For more information on virtualization and infrastructure sizing recommendations, please consult with your Dell Services representative, or refer to VMware and EqualLogic documentation.

## 6 Delivery Model

The solution will be racked, cabled, and delivered to the customer site, ready for deployment. Dell Services will deploy and configure the solution tailored to the business needs of the customer and based on the architecture developed and validated by Dell Engineering. The final turn-key virtualization infrastructure solution will be available for customer's use.

Figures 3 and 4 below show the two configurations racked in a Dell 42U rack (front side only) with all of the components.

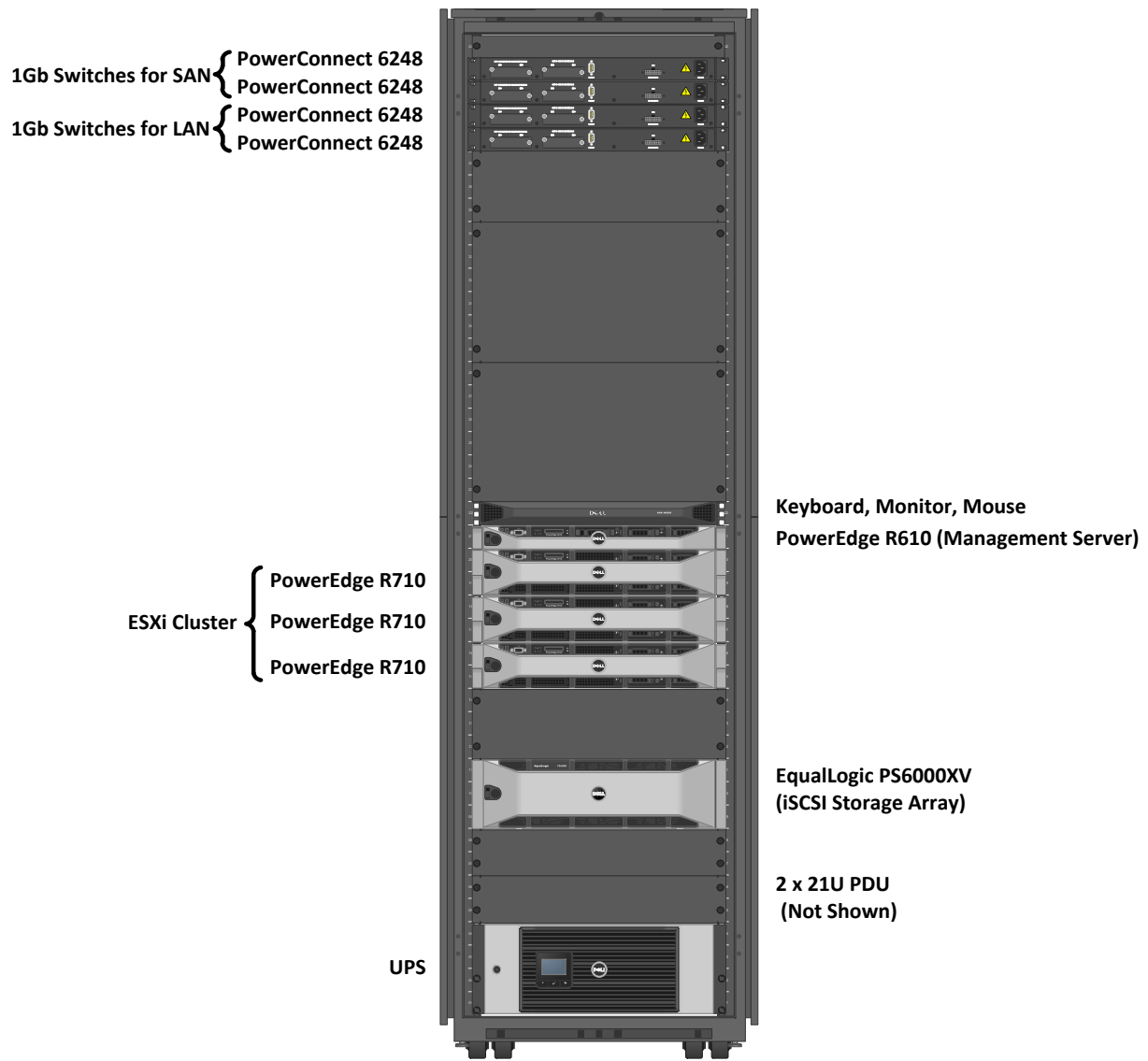


Figure 3: vStart 100v Racked Configuration

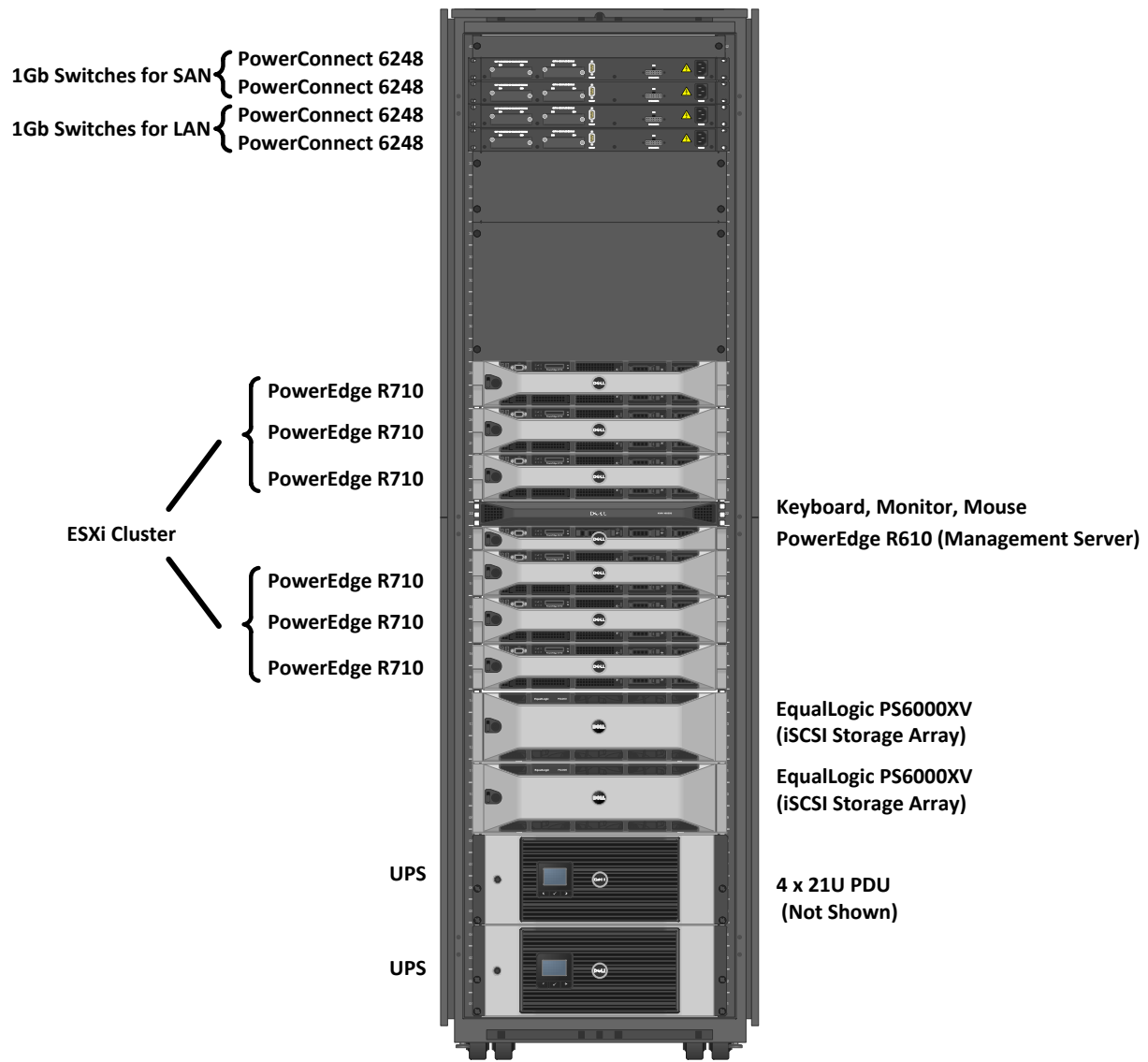


Figure 4: vStart 200v Racked Configuration

## 7 Design Principles and Solution Capabilities

This section lists the design principles and solution capabilities behind the architecture of the vStart solutions.

### 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 LOMs (LAN On Motherboards) 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 PDUs.

### **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.

### **Logical Separation of multiple traffic types of LAN**

VLANs are used to provide security and logical separation of various traffic types required for virtualization.

### **Integration into an Existing Data Center**

The architectures assume that there is a database configured for VMware vCenter Server, and DNS support is in place to support the solution. It is required to have a Network Time Protocol (NTP) server to synchronize time across various components in the solution and enable VMware HA functionality.

### **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), Storage vMotion are also supported

### **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 connections multipathing, VAAI integration for better performance and ASM/VE for snapshot capabilities. These features are available as a part of the solution.

### **Thin Provisioning**

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

## 8 Management Capabilities

This section provides an overview of various tasks that the administrator is required to perform on the virtualization infrastructure and the tools that are used to perform those tasks.

### Virtualization Management

VMware vCenter provides a single control and management center for VMware ESX/ESXi Servers. All of the day-to-day operations, such as the ability to manage ESXi Servers, manage VMs, utilize advanced features such as vMotion, HA, and DRS, and monitoring performance, can be done from VMware vCenter console.

### Health Monitoring

With the Dell Management Plug-in for VMware vCenter, hardware can now be monitored for health from vCenter. Once the plug-in is installed and configured, each server in the ESXi cluster has an additional tab named *Dell* in the vCenter. This tab provides health information for each server. Administrators can automatically perform Dell-recommended vCenter actions based on Dell hardware alerts, such as putting an ESXi server in maintenance mode when there is a hardware issue with the server. For more details, see [Dell Management Plug-in for VMware vCenter Documentation](#).

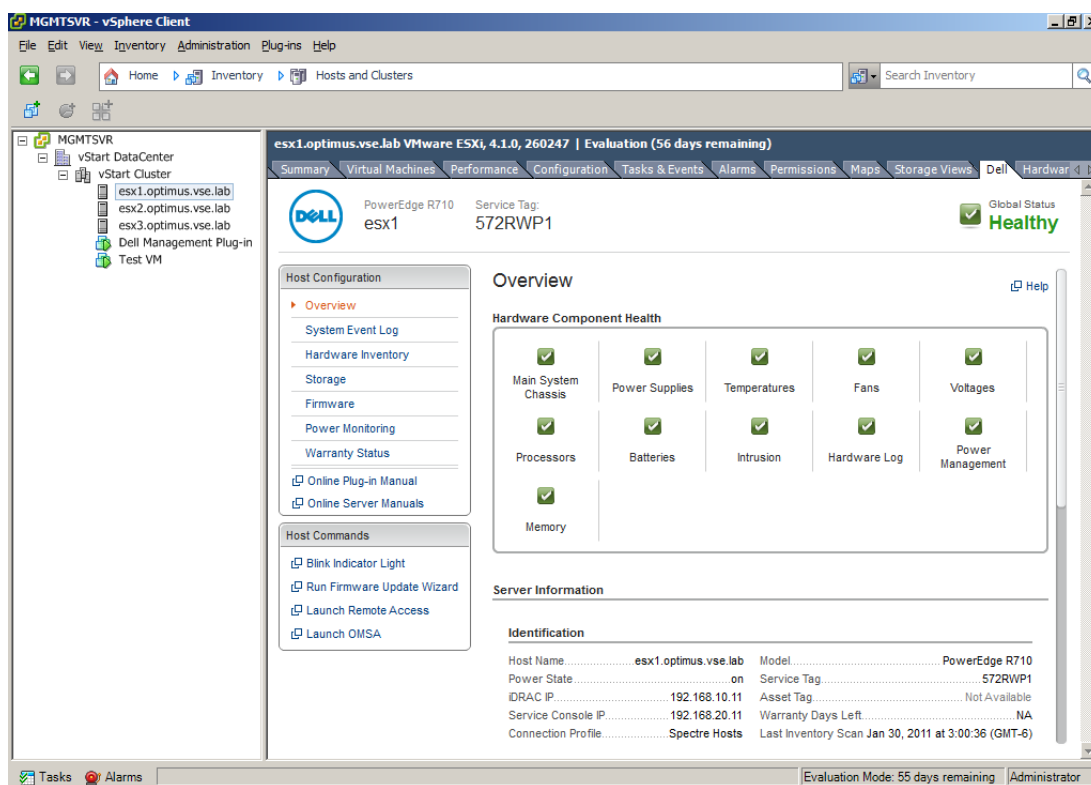


Figure 5: Screenshot of Dell Management Plug-in for vCenter

### System Inventory

In addition to providing health information, the Dell Management Plug-in for vCenter also provides a detailed inventory from Dell servers. Dell hardware warranty information can also be accessed online.

## Performance Monitoring

Performance monitoring and troubleshooting can often be difficult in a complex environment such as virtualized infrastructure. It is important to understand the tools used and the metrics measured to monitor the performance. VMware vCenter provides basic tools for performance monitoring and initial troubleshooting at the cluster and individual ESXi host level. Advanced tools such as *resxtop* can be used for a deeper level troubleshooting at the ESXi host level. The document “[Performance Troubleshooting for VMware vSphere 4](#)” provides a good overview of the tools and processes used to monitor and troubleshoot performance. For storage, SAN HQ provides an easy-to-use and intuitive tool for monitoring storage level performance. Refer to the document [Monitoring your PS Series SAN with SAN HQ](#), for more information on monitoring and troubleshooting EqualLogic PS performance.

## Storage Management

Storage management can be performed from the management server. EqualLogic Group Manager is a web based GUI that can be used to manage the EqualLogic storage arrays. Features include creating pools and volumes, configuring RAID options, and configuring access control. As discussed above, SAN HQ can be used to monitor storage performance.

## Hardware and Hypervisor Maintenance

Change Management can include updating the server hardware (BIOS and firmware), storage array and hypervisor. There are several ways to update the BIOS and firmware of the server. One of the easiest ways to update the BIOS and firmware is through the Dell Management Plug-in for vCenter. Updates can be applied using just a single console and with zero down time. The ESXi server is put in maintenance mode, which will migrate all the VMs from that server and the updates are then applied to the system.

Updates to the EqualLogic storage array can be applied from the Group Manager interface. For more information, see this short [video](#).

Updates to the hypervisor can also be applied from vCenter using VMware vCenter Update Manager. vCenter Update Manager scans the state of the ESXi hosts, as well as select guest operating systems, compares them with baselines set by the administrator and then automatically applies updates and patches. For more information, see [VMware vCenter Update Manager Documentation](#).

## Out-of-band management

Out-of-band management is available through iDRAC 6 in each server. iDRAC 6 features include:

- Remote systems management and monitoring
- Console redirection for remote system KVM (keyboard, video, mouse) functionality
- Virtual media that enables servers to access local media drives on a management station
- Access to system logs
- Platform events and alerts that warn of potential problems by e-mail or simple network management protocol (SNMP) trap
- Remote power management functionality
- Ability to launch iDRAC console from Dell Management Plug-in for vCenter

For more information, see [Embedded Server Management web site](#).