vStart 50 VMware vSphere Solution Overview

Release 1.5 for 12th Generation Servers

Dell Virtualization Solutions Engineering

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# Table of Contents

1. Introduction ........................................................................................................... 4  
2. Audience ............................................................................................................... 4  
3. Solution Overview .................................................................................................. 5  
   3.1 Storage Expansion Options ................................................................................ 6  
   3.2 Product Overview ............................................................................................. 7  
4. Delivery Model ....................................................................................................... 10  
5. Design Principles and Solution Capabilities ........................................................ 11  
   5.1 No Single Point of Failure .................................................................................. 11  
   5.2 Physical Separation of LAN and iSCSI SAN Traffic ....................................... 11  
   5.3 Logical Separation of multiple LAN traffic types ......................................... 11  
   5.4 Requirements for Integration into an Existing Data Center ........................... 11  
   5.5 VMware vSphere Features ............................................................................. 12  
   5.6 Leverage EqualLogic Storage Integration with VMware .............................. 13  
   5.7 Thin Provisioning ............................................................................................. 13  
   5.8 Storage Tiering ............................................................................................... 13  
6. Management Capabilities ....................................................................................... 13  
   6.1 Virtualization Management .............................................................................. 13  
   6.2 Health Monitoring ............................................................................................ 13  
   6.3 System Inventory ............................................................................................. 14  
   6.4 Performance Monitoring .................................................................................. 14  
   6.5 Storage Management ....................................................................................... 14  
   6.6 Hardware and Hypervisor Maintenance ........................................................... 15  
   6.7 Out-of-band management ............................................................................... 15  
7. Cooling, Power, and Weight Requirements ........................................................... 16
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 50 VMware vSphere™ configuration includes Dell™ PowerEdge™ R620 servers running VMware® ESXi™, Dell EqualLogic™ PS6100X iSCSI storage, Dell PowerConnect™ switches, and a Dell PowerEdge R420 server that manages the solution by hosting VMware vCenter™ Server and Dell management tools.

The configurations also include Dell Management and Dell EqualLogic Host Integration Tools for VMware Edition (HIT/VE) Plug-ins for VMware vCenter Server. VMware ESXi versions 4.1 Update 2 and 5.0 are both supported. The solution can either be configured with PowerConnect 7024 or PowerConnect 6224 switches.

The following documents are provided to describe the various aspects of the solution.

- **vStart 50 VMware vSphere Solution Overview** - (this document) Provides a solution overview, including various components, and how it is delivered.
- **vStart 50 VMware vSphere Solution Specification** - Provides a detailed specification of various components included in the solution.
- **vStart 50 VMware vSphere Solution Design Guide** - Provides a detailed architectural solution design.

For Dell Sales and Services teams, the latest versions of these documents are available at the [internal vStart Web portal](#). Customers can contact their Dell Sales teams to get the latest version.

2 Audience

This 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. 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 Host Integration Tools for VMware (HIT/VE) Plug-in for vCenter are included in the solution, which provide 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.

Figure 1 below provides a high-level overview of the components utilized in the vStart 50 configuration.

Figure 1. vStart 50 Configuration Overview
Below is the description of the solution components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESXi Cluster</td>
<td>PowerEdge R620 servers running VMware ESXi Embedded</td>
<td>Host virtual machines (VMs)</td>
</tr>
<tr>
<td>iSCSI Storage</td>
<td>EqualLogic PS6100X with 24 x 300 GB 10K RPM 2.5” SAS Drives</td>
<td>Provide shared storage for the ESXi cluster to host the VMs</td>
</tr>
<tr>
<td>Management Server</td>
<td>PowerEdge R420 server running Microsoft ® Windows Server ®2008 R2 SP1 Standard Edition</td>
<td>Host VMware vCenter Server and EqualLogic SAN HQ</td>
</tr>
<tr>
<td>LAN Traffic Switches</td>
<td>PowerConnect 7024 or 6224 switches</td>
<td>Support VM, vMotion, Management, and Out-of-Band Management traffic</td>
</tr>
<tr>
<td>SAN Traffic Switches</td>
<td>PowerConnect 7024 or 6224 switches</td>
<td>Support iSCSI data and iSCSI management traffic</td>
</tr>
<tr>
<td>Dell Management Plug-in for VMware vCenter</td>
<td>Dell virtual appliance hosted on the ESXi Cluster</td>
<td>Enables hardware monitoring, inventory, firmware updates, bare metal deployment of hypervisors, and warranty retrieval, all integrated into the vCenter Server user interface</td>
</tr>
<tr>
<td>Dell EqualLogic HIT/VE Plug-in for VMware vCenter</td>
<td>Dell virtual appliance hosted on the ESXi Cluster</td>
<td>Enables Auto Snapshots and storage volume management, all integrated into the vCenter Server user interface</td>
</tr>
</tbody>
</table>

3.1 Storage Expansion Options

This section provides an overview for the vStart 50 storage expansion options.

As previously shown in Figure 1 above, the vStart 50 comes with one PS6100X array. For customers whose VM profiles and workloads require additional storage capacity or IOPS, an additional PS6100 array can be added as an upgrade for existing vStart 50’s with one array (vStart 50+). For customers who are considering purchasing a vStart 50, the option for two PS arrays is available.

<table>
<thead>
<tr>
<th>vStart Model</th>
<th>vStart 50: Base vStart Storage Array Configuration</th>
<th>vStart 50+: With Storage Expansion Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>vStart 50</td>
<td>1 x PS6100X</td>
<td>2 x PS6100 Series Arrays</td>
</tr>
</tbody>
</table>

It’s important to note that adding an additional storage array will not require customers to purchase additional PowerConnect switches, management servers, or software since the vStart architecture was designed with storage and host expansion in mind.
3.2 Product Overview

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

3.2.1 PowerEdge R620 for ESXi Cluster

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 varying memory density demands of a virtualized infrastructure.

3.2.2 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 50, 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 300GB SAS drives, the PS6100X array delivers 7.2 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

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 and Configuring and Installing the EqualLogic Multipathing Extension Module for VMware vSphere 5 and PS Series SANs.
3.2.3 PowerEdge R420 for management server

The Dell PowerEdge R420 uses Intel® Xeon® E5 2400 series processors and Intel chipset architecture in a 1U rack mount form factor. The PowerEdge R420 supports up to eight 2.5” drives. The internal RAID controllers supported are PERC H310/H710/H710P. The server features two sockets and 12 memory DIMM slots supporting 2, 4, 8, 16 or 32GB DIMMs, up to a total of 192 GB of memory. This is sufficient to meet the demands of the management operating system and its software components. For more information on PowerEdge R420 management server, see the Dell PowerEdge R420 Technical Guide.

3.2.4 PowerConnect 7024 or 6224 for LAN and SAN Traffic

At the heart of the solutions network configuration are four Dell PowerConnect 7024 or 6224 switches. These managed Layer 3 Gigabit Ethernet switches offer 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, the 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.

3.2.5 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 web page. For more information about the Dell EqualLogic HIT/VE Plug-in for VMware vCenter see http://www.dellstorage.com/WorkArea/DownloadAsset.aspx?id=1616&terms=HIT%2fVE.
4 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 based upon the architecture developed and validated by Dell Engineering, while meeting the customer’s business and technical needs. The final turn-key virtualization infrastructure solution will be available for customer’s use. For more details or questions about the delivery model, consult with your Dell Sales representative. Figure 2 shows the configuration in a Dell 24U rack (front side only) with all of the components.

Figure 2. vStart 50 Racked Configuration

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1 In certain unique and limited circumstances Dell may not be able to deliver a pre-built vStart, and will have to assemble the vStart at the customer’s site. Please consult with your Dell Sales and Services team for more information.
5  Design Principles and Solution Capabilities
This section lists the design principles, requirements, and solution capabilities behind the vStart solution architecture.

5.1  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.

5.2  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.

5.3  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.

5.4  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 3 below provides more details about the requirements. For more information about the site survey, please contact your Dell Sales and Services representatives.
Table 3. Customer Infrastructure and vStart Solution

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

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.

5.5 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. Please see your Dell Sales and Services representatives for more information.
5.6 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.

5.7 Thin Provisioning

The solution enables support for thin provisioning of storage both at the EqualLogic and the ESXi 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.

5.8 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.

6 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.

6.1 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.

6.2 Health Monitoring

With the Dell Management Plug-in for VMware vCenter, hardware can now be monitored for health from vCenter. As shown in Figure 3 below, once the plug-in is installed and configured, each server in the ESXi cluster has an additional tab named Dell Server Management 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 the Dell Management Plug-in for VMware vCenter documentation.
6.3 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.

6.4 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 and ESX 4.0* 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 HeadQuarters* for more information on monitoring and troubleshooting EqualLogic PS SAN performance.

6.5 Storage Management

Storage management can be performed from the management server using EqualLogic Group Manager, or using the HIT/VE Plug-in for vCenter. Figure 4 shows EqualLogic Group Manager, which 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. For more information about the HIT/VE Plug-in, see [http://www.dellstorage.com/WorkArea/DownloadAsset.aspx?id=1616&terms=HIT%2fVE](http://www.dellstorage.com/WorkArea/DownloadAsset.aspx?id=1616&terms=HIT%2fVE).
6.6 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 server BIOS and firmware; one of the easiest ways 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.

6.7 Out-of-band management

Out-of-band management is available through the iDRAC7 in each server. iDRAC7 features include:

- Remote systems management and monitoring
- Console redirection for remote system KVM 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 the Embedded Server Management web site.

7 Cooling, Power, and Weight Requirements

This section provides power, cooling, and weight requirements for the solution. Power values provided in the table are estimated maximum power values for the solution based on Dell Labs measurements. Actual power, cooling, and weight will vary based on configuration, workload, and Data Center Environment. PDUs and UPS(s) utilized in this paper are specifically for the solution available in the USA. Consult with your Dell Sales and Services representatives for further details.

Table 4. vStart 50 Cooling, Power, and Weight Requirements

<table>
<thead>
<tr>
<th>Solutions</th>
<th>Power (max watts)</th>
<th>Cooling (BTU/hr)</th>
<th>Weight (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>vStart 50</td>
<td>no UPS</td>
<td>2414</td>
<td>8237</td>
</tr>
<tr>
<td></td>
<td>with R3750 UPS</td>
<td>2789</td>
<td>9516</td>
</tr>
<tr>
<td>vStart 50+</td>
<td>no UPS</td>
<td>3114</td>
<td>10625</td>
</tr>
<tr>
<td></td>
<td>with R3750 UPS</td>
<td>3489</td>
<td>11905</td>
</tr>
</tbody>
</table>