



Configuring and Installing the EqualLogic Multipathing Extension Module for VMware vSphere 5.0 and PS Series SANs

Abstract

This Technical Report will explain the benefits of the EqualLogic Multipathing Extension Module (MEM) for VMware® vSphere™ which provides multipath I/O for highly available access to the Dell™ EqualLogic™ PS Series SAN

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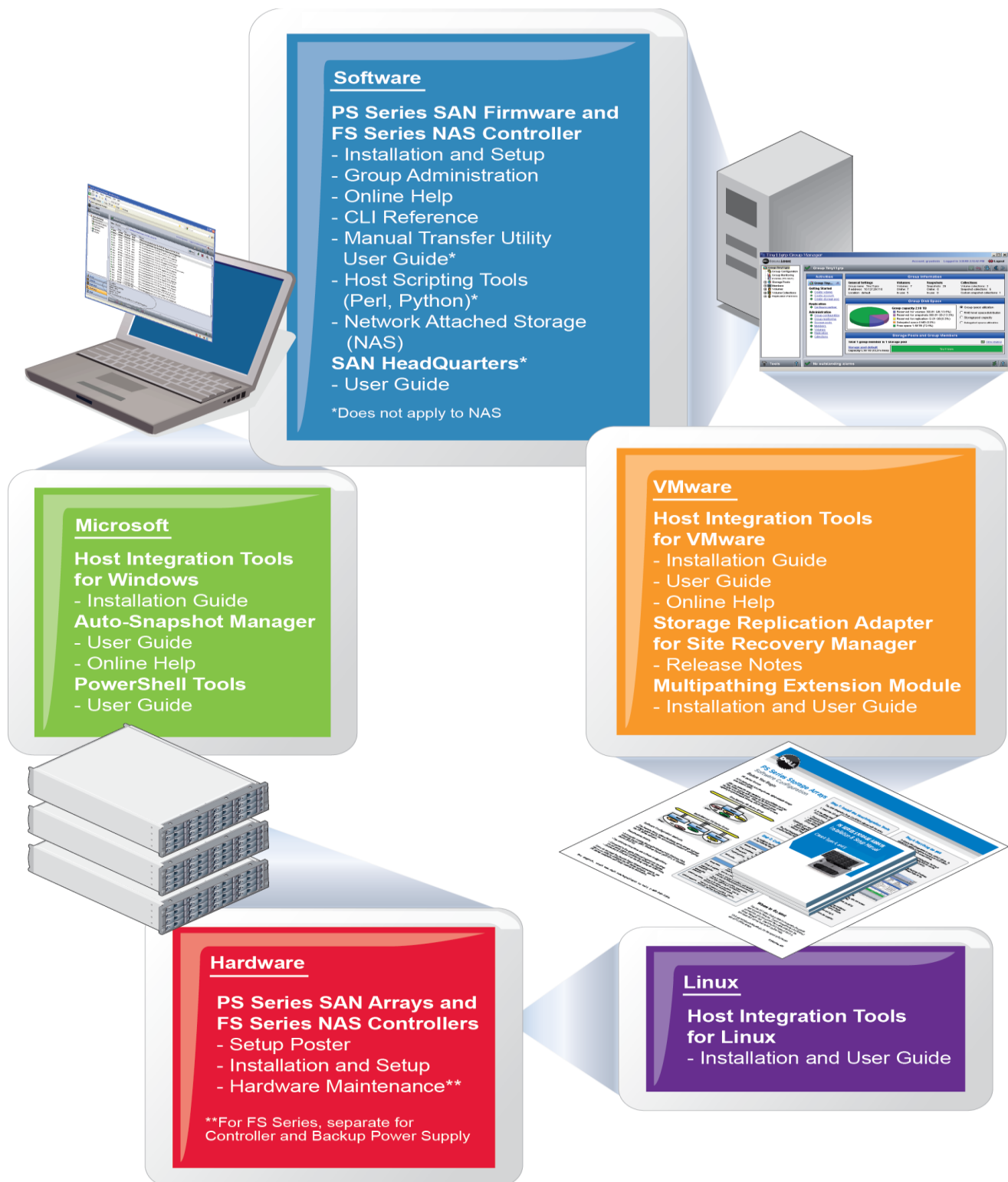
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[November 2011]



Current Customers Please Note: You may not be running the latest versions of the tools and software. If you are under valid warranty or support agreements for your PS Series array, you are entitled to obtain the latest updates and new releases as they become available.

To learn more about any of these products, contact your local sales representative or visit the Dell EqualLogic site at <http://www.EqualLogic.com>. To set up a Dell EqualLogic support account to download the latest available PS Series firmware and software kits visit: <https://www.EqualLogic.com/secure/login.aspx>

Preface

Thank you for your interest in Dell™ EqualLogic™ PS Series storage products. We hope you will find the PS Series products intuitive and simple to configure and manage.

PS Series arrays optimize resources by automating volume and network load balancing. Additionally, PS Series arrays offer all-inclusive array management software, host software, and firmware updates. The following value-add features and products integrate with PS Series arrays and are available at no additional cost:

- **PS Series Array Software**

- **Firmware** – Installed on each array, this software allows you to manage your storage environment and provides capabilities such as volume snapshots, clones, and replicas to ensure data hosted on the arrays can be protected in the event of an error or disaster.
 - **Group Manager GUI:** Provides a graphical user interface for managing your array
 - **Group Manager CLI:** Provides a command line interface for managing your array.
- **Manual Transfer Utility (MTU):** Runs on Windows® and Linux host systems and enables secure transfer of large amounts of data to a replication partner site when configuring disaster tolerance. You use portable media to eliminate network congestion, minimize downtime, and quick-start replication.
- **SAN HeadQuarters (SANHQ):** Provides centralized monitoring, historical performance trending, and event reporting for multiple PS Series groups.

- **Host Software for Linux**

- **Host Integration Tools Kit**
 - **Remote Setup Wizard Command Line Interface (RSWCLI):** Discovers and initializes PS Series arrays, configures and manages access to PS Series arrays, and configures and manages multipathing.
 - **Multipath device configuration components:** Provides the EqualLogic Connection Manager (ehcmd) daemon to manage multipath devices, a Device Mapper kernel module (dm-switch) to optimize routing of multipathing devices, and a command line interface (ehcmcli) that allows users to review the diagnostic state of EqualLogic multipathing.
 - **EqualLogic Host Performance and Tuning Tool Suite (eqltune):** A utility used to validate configurable parameters against Dell's recommended practices.

- **Host Software for Windows®**

- **Host Integration Tools Kit**
 - **Remote Setup Wizard (RSW):** Initializes new PS Series arrays, configures host connections to PS Series SANs, and configures and manages multipathing.
 - **Multipath I/O Device Specific Module (MPIO DSM):** Includes a connection awareness-module that understands PS Series network load balancing and facilitates host connections to PS Series volumes.
 - **VSS and VDS Provider Services:** Allows 3rd party backup software vendors to perform off-host backups.
 - **Auto-Snapshot Manager/Microsoft Edition (ASM/ME):** Provides point-in-time SAN protection of critical application data using PS Series snapshots, clones, and replicas of supported applications such as SQL Server®, Exchange Server®, Hyper-V™, and NTFS file shares.
 - **PowerShell Tools:** Provides a comprehensive set of PowerShell cmdlets for managing one or many PS Series groups.

- **Host Software for VMware®**
 - **Host Integration Tools Kit**
 - **Auto-Snapshot Manager/VMware Edition (ASM/VE):** Integrates with VMware vCenter and PS Series snapshots to allow administrators to enable Smart Copy protection of vCenter folders, datastores, and virtual machines.
 - **EqualLogic Datastore Manager:** Allows administrators to create and manage datastores on EqualLogic PS Series arrays from within vCenter.
 - **Virtual Desktop Deployment Utility:** Automates the deployment of virtual desktops in a VMware View environment.
 - **Storage Adapter for Site Recovery Manager (SRM):** Allows SRM to understand and recognize PS Series replication for full SRM integration.
 - **Multipathing Extension Module for VMware® vSphere:** Provides connection awareness enhancements to the existing VMware multipathing functionality that understands PS Series network load balancing and facilitates host connections to PS Series volumes.

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Revision Information

The following table describes the release history of this Technical Report.

Report	Date	Document Revision
1.0	November 2011	Initial Release

The following table shows the software and firmware used for the preparation of this Technical Report.

Vendor	Model	Software Revision
VMware®	vSphere 5.0 with Enterprise licensing	5.0
Dell	Dell™ EqualLogic™ PS Series SAN	4.3 or above
Dell	EqualLogic Multipathing Extension Module for VMware vSphere 5.0	1.1.0

The following table lists the documents referred to in this Technical Report. All PS Series Technical Reports are available on the Customer Support site at: support.dell.com

Vendor	Document Title
Dell	Dell EqualLogic PS Series Array Administration Guide
Dell	EqualLogic Multipathing Extension Module: Installation and User Guide
VMware	vSphere Storage Guide
VMware	vSphere Installation and Setup Guide
VMware	Installing and Administering VMware vSphere Update Manager
VMware	vSphere Command-Line Interface Concepts and Examples
VMware	vSphere Management Assistant Guide

Executive Summary

High availability is an important requirement of any system in the datacenter. This availability is even more critical if that system is a component in the virtual infrastructure upon which a virtualized datacenter is built. Redundant hardware and RAID technologies form a critical foundation. When using shared storage, the paths from the servers to the storage need to also be redundant and highly available.

This Technical Report details the benefits of Dell's EqualLogic Multipathing Extension Module, MEM, for VMware® vSphere™, as well the installation and configuration process to provide multipath I/O for highly available access to the Dell EqualLogic PS Series SAN. Also covered are a number of overall virtual environment iSCSI design considerations and best practices.

Introduction

VMware vSphere offers many enhancements to the software iSCSI initiator beyond basic iSCSI SAN connectivity. The most significant of these enhancements is the API support for third party multipathing plugins. This provides a framework that enables the EqualLogic MEM to intelligently route and efficiently load balance iSCSI traffic across multiple NICs.

The EqualLogic MEM provides the following benefits:

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

The EqualLogic MEM utilizes the same multipathing iSCSI vSwitch as VMware's Round Robin multipathing. As part of Dell's continuous efforts to help customers simplify their IT environments, the iSCSI MPIO vSwitch configuration process for the EqualLogic MEM has been reduced to either a single command with a few parameters or a guided question and answer process. The MEM installation process is equally straightforward, requiring that only a single command be executed, or can be installed using VMware's vSphere Update Manager.

Once installed, the EqualLogic MEM will automatically create iSCSI sessions to each member that a volume spans. As the storage environment changes, the MEM will respond by automatically adding or removing iSCSI sessions as needed.

As storage IO requests are generated on the ESXi hosts, the MEM will intelligently route these requests to the array member best suited to handle the request. This results in efficient load balancing of the iSCSI storage traffic, reduced network latency and increased bandwidth.

Deploying the EqualLogic MEM

Deploying the EqualLogic MEM consists of two steps:

- Configuring a vSwitch for iSCSI multipathing
- Installing the EqualLogic MEM

The entire process of creating the multipathing compatible vSwitch and installing the EqualLogic multipathing extension module can be quickly and efficiently completed in short period of time. Once deployed, it can provide both new and existing ESXi hosts with increased performance to EqualLogic storage resources.

Deployment Considerations: Requirements

The EqualLogic MEM has the following requirements:

- VMware vSphere ESXi 5.0 with Enterprise or Enterprise Plus licensing
- VMware CLI 5.0 or VMware vMA 5.0
- EqualLogic array firmware 4.3 or above

Prior to deploying the MEM the following steps should be completed:

1. The ESXi host(s) must be placed in maintenance mode.
2. Download and install either the VMware vSphere Management Assistant (vMA), or the VMware vSphere CLI. Refer to VMware's documentation for installation and configuration details of these tools.
3. Download the EqualLogic MEM 1.1 from the EqualLogic Support website.
4. Unpack the ZIP archive. If using the vMA, upload to the vMA the setup.pl file.
5. Do not unpack the embedded zip file, dell-eql-mpio-<version>.zip, this is a VIB offline bundle and is expected to be in this format. This zip file should be uploaded to the individual hosts' local datastore or preferable to a shared datastore, NFS share or web share.
6. Retain the included readme.txt and User_Guide.pdf for reference.

Deployment Considerations: Storage Heartbeat

In the current VMware virtual networking model, certain types of vmkernel network traffic are sent out on a default vmkernel port for each subnet. The iSCSI multipathing network configuration requires that the iSCSI vmkernel ports use a single physical NIC as an uplink. As a result, if the physical NIC that is being used as the uplink for the default vmkernel port goes down, network traffic that is using the default vmkernel port will fail. This includes vMotion traffic, SSH access, and ICMP ping replies.

Though iSCSI traffic isn't directly affected by this condition, a side effect of the suppressed ping replies is that the EqualLogic PS Series group will not be able to accurately determine connectivity during the login process, and therefore a suboptimal placement of iSCSI sessions will occur. In some scenarios, depending upon array, server and network load, logins may not be completed in a timely manner. To prevent this from occurring, Dell recommends that a highly available vmkernel port be created on the iSCSI subnet serving as the default vmkernel port for such outgoing traffic.

Deployment Considerations: iSCSI Connection Count

The Dell EqualLogic MEM provides for increased bandwidth and lower latency access to access to EqualLogic storage. This performance benefit is achieved through leveraging several behaviors that are unique to EqualLogic frameless SAN architecture. It is important to understand how the MEM achieves these performance gains, and the potential impact it can have if these considerations are not taken into account.

The MEM achieves its performance gains by creating multiple iSCSI connections to each member on which a datastore volume resides. Assuming the MEM's default settings are being used, and depending on the configuration of the environment, there will be up to six iSCSI connections to the volume. This is a significant increase, when compared with VMware's Fixed Path policy, which utilizes one iSCSI connection per volume. This increase must be planned for at deployment time and also while the vSphere and its supporting EqualLogic storage environment scales.

To calculate the number of iSCSI connections that the MEM will consume in a particular environment, utilize the following formula:

$$\text{Number of ESXi hosts} * 2 \text{ (default iSCSI sessions per volume portion)} * \text{Number of EqualLogic members in the pool (with a max value of 3)} * \text{Number of volumes}$$

For example: In a vSphere environment with eight ESXi hosts, and using a two member EqualLogic pool for hosting the ten volumes needed for virtual machines this would be:

$$8 * 2 * 2 * 10 = 320 \text{ iSCSI connections}$$

While this is within the 1024 iSCSI connection limit per pool of the firmware, it does not take into account other iSCSI connections to the EqualLogic storage pool from other servers in the datacenter. Consideration should also be given to how this virtual environment may grow in the future with respect to additional ESXi hosts, datastore volumes and additional EqualLogic members.

Depending on the overall environment, and future requirements, changes may need to be made to one or more of the following if there are concerns about the iSCSI connection count growing too large:

- The MEM parameters `membersessions`, `volumessessions` or `totalsessions`: see the Installation and User Guide for details.
- The number of volumes: By increasing the size of a given volume, more virtual machines can reside on it, thereby reducing the total number of volumes needed. With vSphere 5.0 datastore are no longer restricted to 2TB.
- The total number of ESXi hosts, or the number of ESXi hosts per cluster: By splitting large clusters into smaller clusters and assigning particular volumes to a particular cluster the total number of iSCSI connections can be reduced.
- The configuration of EqualLogic members: reducing the number of EqualLogic members per pool, and increasing the number of pools, will increase the number of available iSCSI connections.

Configuring an iSCSI vSwitch for Multipathing

As previously mentioned, the EqualLogic MEM utilizes the same multipathing vSwitch as VMware's Round Robin multipathing. Therefore if the ESXi hosts are configured for Round Robin this step can be omitted. If the ESXi hosts are configured for Fixed Path, the iSCSI the initiator and associated vSwitch should be un-configured and removed before continuing. Those who have previously configured Round Robin multipathing will appreciate the powerful functionality and the ease of use of the MEM's setup.pl script provides when compared to the manual process for configuring the iSCSI vSwitch for multipathing.

Note: The instructions provided here refer to using the vMA, however the syntax is the same whether the vMA or CLI is used. The optional parameters --username and --password have been excluded from the examples below for clarity. If not included and vi-fastpass is not configured, then the user will be prompted to provide the username and password.

1. Connect to the vMA and change directory to where the setup.pl was uploaded to.
2. The simplest method of creating a multipathing iSCSI vSwitch is to invoke the setup.pl in Interactive Mode.

```
setup.pl --configure --server="hostname"
```

In this configuration mode a series of questions are posed with defaults presented, as shown in the example below:

Interactive Mode Example

```
setup.pl --configure --server=10.124.6.223
Do you wish to use a standard vSwitch or a vNetwork Distributed Switch
(vSwitch/vDS) [vSwitch]:
Found existing switches vSwitch0.
vSwitch Name [vSwitchiSCSI]:
Which nics do you wish to use for iSCSI traffic? [vmnic1 vmnic2 vmnic3]:
vmnic2 vmnic3
IP address for vmknic using nic vmnic2: 192.168.0.215
IP address for vmknic using nic vmnic3: 192.168.0.216
What IP address would you like to use for the highly available heartbeat
vmknic (optional)? : 192.168.0.214
Netmask for all vmknics [255.255.255.0]:
What MTU do you wish to use for iSCSI vSwitches and vmknics? Before
increasing the MTU, verify the setting is supported by your NICs and
network switches. [1500]: 9000
What prefix should be used when creating VMKernel Portgroups? [iSCSI]:
The SW iSCSI initiator is not enabled, do you wish to enable it? [yes]:
What PS Group IP address would you like to add as a Send Target discovery
address (optional)? : 192.168.0.200
What CHAP user would you like to use to connect to volumes on this group
(optional)? : BLUEcluster
What CHAP secret would you like to use to connect to volumes on this
group (optional)? :
```

Configuring iSCSI networking with following settings:

Using a standard vSwitch 'vSwitchISCSI'
Using NICs 'vmnic2,vmnic3'
Using IP addresses '192.168.0.215,192.168.0.216'
Creating a highly available vmkernel port with IP '192.168.0.214'
Using netmask '255.255.255.0'
Using MTU '9000'
Using prefix 'iSCSI' for VMKernel Portgroups
Using SW iSCSI initiator
Enabling SW iSCSI initiator
Adding PS Series Group IP '192.168.0.200' with CHAP user

'CHAPuser' to Send Targets discovery list.

The following command line can be used to perform this configuration:

```
setup.pl --configure --server=10.124.6.223 --vswitch=vSwitchISCSI --  
mtu=9000 --nics=vmnic2,vmnic3 --ips=192.168.0.215,192.168.0.216 --  
heartbeat=192.168.0.214 --netmask=255.255.255.0 --vmkernel=iSCSI --  
nohwiscsi --enableswiscsi --groupip=192.168.0.200 --chapuser=BLUEcluster
```

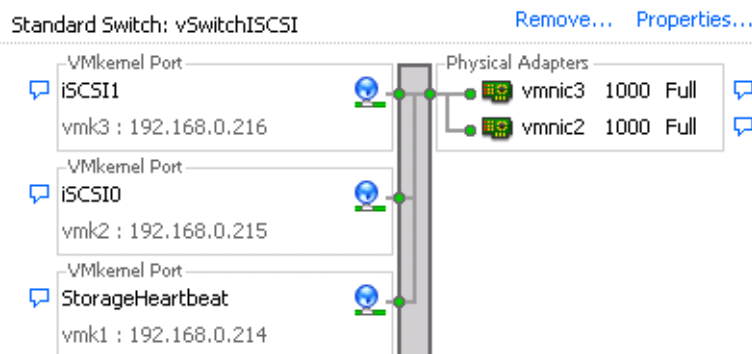
Do you wish to proceed with configuration? [yes]:

At the end of the Interactive Mode configuration it presents a command line that can be used, after modifying hostname and IP information, to configure additional ESXi hosts with the same vSwitch. For example:

```
setup.pl --configure --server=10.124.6.224 --vswitch=vSwitchISCSI --  
mtu=9000 --nics=vmnic2,vmnic3 --ips=192.168.0.225,192.168.0.226 --  
heartbeat=192.168.0.224 --netmask=255.255.255.0 --vmkernel=iSCSI --  
nohwiscsi --enableswiscsi --groupip=192.168.0.200 --chapuser=BLUEcluster
```

Note that the CHAP secret is not displayed as part of the command line that Interactive Mode will generate. To add this, include the parameter `--chapsecret` along with the secret.

3. As the script executes, it will provide status notifications as it proceeds through several steps to create the vSwitch.
4. Once complete a multipathing iSCSI vSwitch, like the example shown below, will be created on the ESXi host.



A detailed list of all the parameters options and there usage can be found in the *EqualLogic MEM Installation and User Guide*. Additional configuration examples can be found in Appendix A.

Installing the EqualLogic MEM for vSphere

The EqualLogic MEM can be installed using the command line tools, CLI or vMA, or with VMware Update Manager (VUM). The command line tools are used in this example. See Appendix C for install instructions on using VUM.

Prior to installing the MEM the virtual infrastructure bundle (VIB), `dell-eql-mpio-<version>.zip`, must be copied to either the local datastore, to a shared datastore that the ESXi host can access, or web share. In the example below the `dell-eql-mpio-<version>.zip` was previously uploaded to folder called MEM-1.1 on a shared datastore called ISOs.

1. Using the vMA or vSphere CLI, for each host the MEM is to be installed to execute the following:

```
esxcli --server="hostname" software vib install -d  
//vmfs/volumes/[datastore]/dell-eql-mpio-<version>.zip
```

This will take a few minutes to install the module.

2. At this stage the plugin's multipathing functionality is available. However, new `esxcli` commands that are used to control and report status of the plugin will not be available until the `hostd` process is restarted. This can be achieved by either restarting the ESXi host, or by restarting the `hostd` service by executing the following command issued on the host:

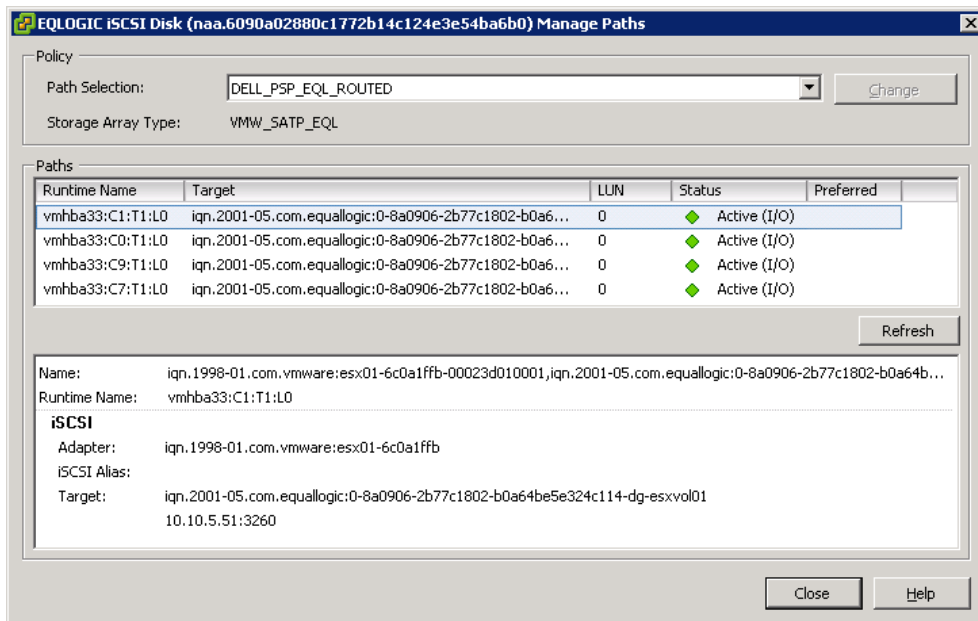
```
/etc/init.d/hostd restart
```

See VMware Knowledge Base article KB2004078 for more information.

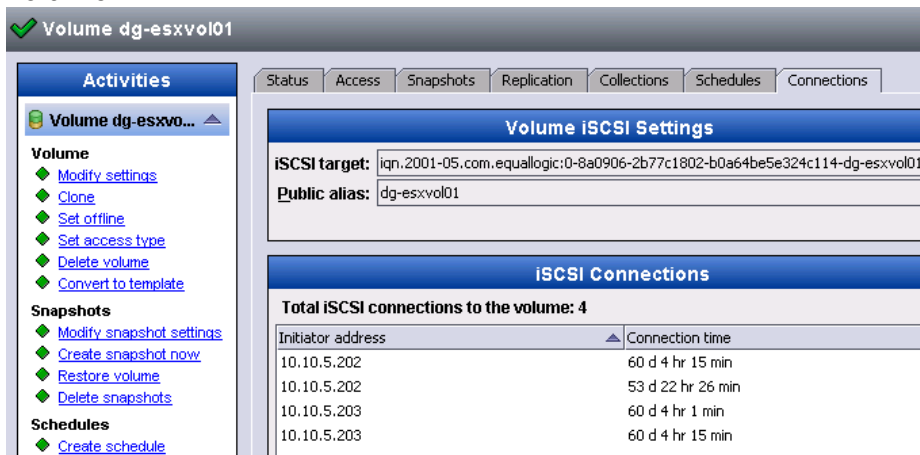
Verification of MEM iSCSI Session Creation

By default the EqualLogic MEM will claim any existing and new EqualLogic volumes and create the additional iSCSI session used by the MEM to route the iSCSI data. To verify these additional sessions, perform the following steps:

1. In the vSphere client click on the **Configuration** tab. In the **Hardware** pane select **Storage**.
2. Right click on the datastore, select **Properties**, and then click the **Managed Paths** button.



3. In the example above the Path Selection Policy has been set to use the MEM, as path selection shows DELL_PSP_EQL_ROUTED. Four sessions to the volume have been created, as the volume resides in a two member storage pool.
4. This can also be verified from the array web GUI by clicking on the volume's **Connections** tab. As shown in the example below, two iSCSI sessions have been established from each of the VMkernel Ports on the ESXi host to the volume.



Summary

The EqualLogic MEM, through its intelligent routing and load balancing, can provide a reduction in network latency and an increase in bandwidth to PS Series Storage arrays. Through automated setup and host connection management, the MEM also reduces the steps for deployment and ongoing management of advanced vSphere iSCSI configuration.

Technical Support and Customer Service

Dell's support service is available to answer your questions about PS Series SAN arrays. If you have an Express Service Code, have it ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently.

Contacting Dell

Dell provides several online and telephone-based support and service options. Availability varies by country and product, and some services might not be available in your area.

For customers in the United States, call 800-945-3355.

Note: If you do not have access to an Internet connection, contact information is printed on your invoice, packing slip, bill, or Dell product catalog.

Use the following procedure to contact Dell for sales, technical support, or customer service issues:

1. Visit support.dell.com or the Dell support URL specified in information provided with the Dell product.
2. Select your locale. Use the locale menu or click on the link that specifies your country or region.
3. Select the required service. Click the "Contact Us" link, or select the Dell support service from the list of services provided.
4. Choose your preferred method of contacting Dell support, such as e-mail or telephone.

Online Services

You can learn about Dell products and services using the following procedure:

1. Visit www.dell.com (or the URL specified in any Dell product information).
2. Use the locale menu or click on the link that specifies your country or region

Appendix A: Example iSCSI vSwitch configurations

This appendix provides some examples of the additional parameters used with the setup.pl configuration script. A detailed list of all the parameters and their usage can be found in the EqualLogic MEM Installation and User Guide

Overriding hardware iSCSI offload default utilization

With vSphere 4.1 and above, ESXi can utilize the iSCSI offload capabilities of the Broadcom NetXtreme II network adaptors, resulting in significantly lower software iSCSI CPU utilization. The setup.pl configuration script will, by default, utilize this iSCSI offload capability if it is present. If there is a preference not to use the iSCSI offload capability this must be specified when configuring the iSCSI vSwitch. This is shown below:

```
setup.pl --configure --server=172.17.5.121 --nics=vmnic2,vmnic3
--ips=192.168.0.215,192.168.0.216 --nohwiscsi
```

Utilizing a vNetwork Distributed Switch

With Enterprise Plus licensing VMware provides a virtual switch which spans many ESXi hosts. This abstracts the configuration of individual vSwitches on the host level and enables centralized management through vSphere vCenter Server. If utilizing a vNetwork Distributed Switch for iSCSI traffic the --vds parameter must be specified. Should the name of the vNetwork Distributed Switch differ from the default utilized by the configuration script, it can be specified using the --vswitch parameter. This is shown below:

```
setup.pl --configure --server=172.17.5.121 --nics=vmnic2,vmnic3
--ips=192.168.0.215,192.168.0.216 --vswitch vdsISCSI --vds
```

Enabling Jumbo Frames

With the vSphere release of ESXi support for Jumbo Frames has been extended to VMkernel traffic, which includes the iSCSI stack. To utilize Jumbo Frames they must be enabled on all networking components used. By default the setup.pl script uses an MTU of 1500 when creating the iSCSI vSwitch and VMkernel interfaces. To use a larger value specify it as demonstrated in the example below.

```
setup.pl --configure --server=172.17.5.121 --nics=vmnic2,vmnic3
--ips=192.168.0.215,192.168.0.216 --mtu=9000
```

Setting the iSCSI discover address

It is possible to specify the group IP of an array to be set as the Send Targets discovery address for the iSCSI initiator.

```
setup.pl --configure --server=172.17.5.121 --nics=vmnic2,vmnic3
--ips=192.168.0.215,192.168.0.216 --groupip=192.168.0.200
```

Appendix B: Installing the MEM with VMware Update Manager

VMware Update Manager has the ability to install and upgrade third party packages to the ESXi hosts. This enables administrators to not only manage the patching and updating of ESXi hosts but also to update third party packages installed on the ESXi hosts.

Installing the MEM consists of four major steps:

- Steps 1-3 need to be done once per version release of the MEM
 - Importing the MEM to the Patch Repository
 - Creating an extension baseline that includes the MEM
 - Attaching the baseline to the environment
- Step 4 needs to be done for each host in the cluster, or datacenter
 - Installing the MEM to each host

Step 1: Importing the MEM to the Patch Repository

1. Download Dell's EqualLogic MEM from the EqualLogic Support website.
2. Unpack the ZIP archive. Do not unpack the embedded zip file, this is a VIB offline bundle and is expected to be in this format.
3. From the vSphere client **Home** section, select **Update Manager** from under **Solutions and Applications**.
4. From the **Admin View** select the **Patch Repository** tab and then click on **Import Patches** to start the Import Patches wizard.
5. Click on **Browse...** and browse to where the Zip archive was unpacked and select the embedded Zip file named dell-eql-mem-<versionnumber>.zip, click **Open** and then click **Next**.
6. The Import Patches wizard will upload and analyze the file; this may take a few minutes, and will then present a Confirm Import page. Verify the details are as expected and click **Finish**.

Step 2: Creating an Extension Baseline

7. From the vSphere client select **Update Manager** -> **Admin View** and select the **Baselines and Groups** tab.
8. On the Baselines and Group tab, in the Baseline section, click **Create...** to start the New Baseline wizard.

9. Provide the baseline with a suitable name and optional description, select the baseline type **Host Extension** and then click **Next**, as shown in the example below.

10. From the list of extensions, highlight the Dell EqualLogic iSCSI MEM 1.1.0, click the selection button and then click **Next**. If there are a large number of extensions in the repository, use EqualLogic as a keyword for filtering.
11. On the Ready to Complete page of the wizard verify that the information is correct, and click **Finish**.

Step 3: Attaching the Extension Baseline

12. From the vSphere client select **Update Manager -> Compliance View**.
13. From the tree pane, on the left, select the Datacenter, Cluster, or Host that the MEM Extension Baseline is to be attached to, and then click on **Attach...** to start the Attach Baseline wizard.
14. Select the MEM extension baseline created above and click on **Attach** to attach the Extension Baseline to the vSphere Datacenter, Cluster or Host.

Step 4: Installing the MEM

15. From the vSphere client select **Update Manager -> Compliance View**.
16. In the Attached Baselines pane highlight the MEM extension baseline that was attached earlier and click the **Remediate** button to start the Remediation wizard.
17. On the Remediation Selection page of the wizard verify that the correct baseline is listed, and unselect any host to which the EqualLogic MEM is not to be installed to at this time. Click **Next** to continue.
18. The Patches and Extensions page lists the patches and extensions to be applied. Click **Next** to continue.
19. On the Schedule page change the Task Name, if desired, and optionally provide a Task Description. There is also the option to schedule the deployment for a future time and date, rather than Immediately which is selected by default. Click **Next** to continue.

20. On the Host Remediation Options and Cluster Remediation Options pages there are options for altering the behaviors of the virtual machines, hosts, and cluster during the install. Refer to the *vCenter Update Manager Installation and Administration Guide* for details. Click **Next** to continue.
21. On the Ready to Complete page, verify that the information is correct, and click **Finish**. Unless the task was schedule to run at a later time it will be immediately executed.
22. As the task is been executed it will display status updates in the Recent Tasks pane of the vSphere client. If several host were selected the task will execute against one host at a time, until the MEM has been installed on all the selected hosts.
23. Once the task has been completed the MEM will have been installed or updated on all the hosts selected.
24. As shown in the screenshot below, the vCenter Update Manager can provide a clear graphical view of which ESXi hosts the MEM is installed or updated on, and which hosts it has yet to be installed or updated on.

The screenshot displays the vCenter Update Manager interface. The top navigation bar includes tabs for Summary, Virtual Machines, Hosts, DRS, Resource Allocation, Performance, Tasks & Events, Alarms, Permissions, Maps, and Profile. The main content area is divided into several sections:

- Attached Baseline Groups:** A list showing 'All Groups and Independent Baselines' and 'New Baseline Group'.
- Attached Baselines:** A table listing 'All', 'Dell EqualLogic MEM' (Extension), 'Non-Critical Host Patches' (Patch), and 'Critical Host Patches' (Patch).
- Host Compliance:** A summary table showing the status of hosts.

Host Compliance	# Hosts
All Applicable Hosts	2
Non-Compliant	1
Incompatible	0
Unknown	0
Compliant	1
- 50% Compliant:** A circular progress indicator showing 50% completion.
- Hosts Table:** A table listing the hosts and their compliance status.

Host Name	Patches	Upgrades	Extensions	Attached Baselines	Last Patch Scan Ti...
172.17.5.121	Non-Compliant		(3) Critical Host Patches, Non-Critical Host Patches, Dell Equ...		6/11/2010 10:57:1...
172.17.5.122	Compliant		(3) Critical Host Patches, Non-Critical Host Patches, Dell Equ...		6/11/2010 10:57:1...

At the bottom, there are buttons for 'Hide Hosts', 'Stage...', and 'Remediate...'.

Note: vCenter Update Manager is only capable of install the MEM. vMA or vCLI will need to be utilized to configure the iSCSI vSwitch for the MEM.