Using Dell EqualLogic Storage with Microsoft Windows Server 2012

Improved Windows storage management with Offloaded Data Transfers, Storage Management Provider and Unmap

Dell Engineering
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B.2 Creating a Volume in an EqualLogic PS Series Group

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Authored by: Michael Pacheco

Revisions

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<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 2013</td>
<td>Initial release</td>
</tr>
</tbody>
</table>

Audience

The information in this guide is intended for technology professionals interested in using Dell™ EqualLogic™ storage in a Microsoft® Windows® environment.

Introduction

Storage plays a critical role in today’s business operations. With the ever-growing presence of new applications and data, storage demands continue to grow. EqualLogic provides support for both block storage, with PS Series Firmware, and Network Attached Storage (NAS) with FS Series Firmware, delivering high performance, high availability, scalability and on-demand provisioning in a unified storage environment.

Objective

Dell EqualLogic Host Integration Tools for Microsoft (HIT/Microsoft) provides enhanced management and streamlined configuration of EqualLogic storage from Microsoft Windows. From remote server management and improved availability with MPIO, to providing application-consistent data protection for SQL Server, Exchange Server, Hyper-V and SharePoint, to scripting management operations with PowerShell, HIT/Microsoft exposes a wide variety of Microsoft capabilities to EqualLogic storage administrators.

Microsoft Windows Server® 2012 was designed with a strong focus on storage, including improvements ranging from enhanced storage management and utilization to accelerated data transfers across the network. Dell has collaborated with Microsoft to provide support in the EqualLogic product portfolio for these latest storage innovations:

- Offloaded Data Transfers (ODX)
- Thin Provisioning and Unmap
- Storage Management Provider (SMP)
1 Offloaded Data Transfers

Today’s prevalence of server virtualization has resulted in increased demands for high-speed data transfers for storage and data migration. In the past, data transfers were traditionally performed through LAN networks. This legacy data transfer method burdened server capabilities and resulted in high utilization of server resources such as network, CPU and memory.

To maximize the full potential of intelligent storage arrays and high-speed Storage Area Networks (SANs), Dell and other storage vendors collaborated with Microsoft to develop a new T10 Standard for SAN data transfers called Offloaded Data Transfers (ODX).

ODX provides the ability to automatically and quickly transfer large amounts of data, including virtual machines and file shares, directly between EqualLogic volumes – without impacting valuable server performance. This reduces server resource usage such as CPU, memory and network by offloading the file transfers to a high-speed SAN.

ODX is a native feature of Windows Server 2012 and is on by default. EqualLogic PS Series Firmware v6.0 and later includes support for ODX.

During a system boot or storage target discovery operation, Windows Server 2012 queries the EqualLogic PS Series for ODX capability. If the storage is ODX-capable, Windows uses ODX by default.

If the ODX operation fails, file copy operations fail back to the previous legacy method – resuming from the first failure point in the offload write. NTFS marks the source and destination volumes as not ODX-capable for three minutes. Windows then retries the ODX operation and re-attempts to leverage the EqualLogic PS Series ODX features.

ODX introduces a ‘tokenized’ operation to move data on EqualLogic PS Series storage. The steps of the operation are:

1. Windows ODX sends an Offload Read Request to the EqualLogic PS Series array.
2. EqualLogic PS Series manages the copy operation and returns with a token which represents the data to be copied. As it is a synchronous operation, the copy manager of the EqualLogic PS Series provides progress and estimated completion.
3. Windows sends the token with an Offload Write Request to the destination EqualLogic PS Series volume.
4. EqualLogic PS Series moves the data from the source to the destination and returns the Offload Write result.
1.1 ODX usage scenarios

The source and destination files must be located on an EqualLogic PS Series volume and can be on a physical disk, virtual disk or NTFS File Share.

In scenarios when the server is constrained by network or CPU resources or separated by long distances from the source and target volumes, the benefits of ODX can improve dramatically in comparison to traditional non-ODX data movement operations or in configurations where the server is in very close proximity to the SAN and otherwise unconstrained by network resources. For example, when moving a large file between two NTFS file shares which are hosted by EqualLogic volumes on a remote server potentially thousands of miles away. ODX enables copy operations to succeed in these distance-bound configurations. In contrast, this copy operation would be impractical for traditional non-ODX data movement operations.

The supported usage scenarios for ODX with EqualLogic storage are:

- Move data within one EqualLogic volume hosted by one server
- Move data between two EqualLogic volumes hosted by one server
- Move data between an EqualLogic volume on a server and an NTFS File Share that is hosted on an EqualLogic volume on a remote server
- Move between two NTFS File Shares that are hosted on EqualLogic volumes on a remote server

Figure 1  Move data within one EqualLogic volume hosted by one server
Figure 2  Move data between two EqualLogic volumes hosted by one server

Figure 3  Move data between an EqualLogic volume on a server and an NTFS File Share that is hosted on an EqualLogic volume on a remote server
Figure 4  Move data between two NTFS File Shares that are hosted on EqualLogic volumes on a remote server
## 1.2 ODX requirements

To use ODX, your environment must support the following:

<table>
<thead>
<tr>
<th>Storage requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PS Series Firmware</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Software requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating system</strong></td>
</tr>
</tbody>
</table>
| **Disk partition** | - Files must be on an unencrypted basic partition.  
- Storage Spaces and dynamic volumes are not supported. |
| **Volume format** | Files must be on an NTFS volume. ReFS and FAT are not supported. |
| **Disk type** | Data must be located on a PS Series Volume of the following types:  
- A Physical Hard Disk  
- A Virtual Hard Disk (VHD or VHDx)  
- An NTFS File Share |
| **File size** | The files must be 256 KB or larger – smaller files are transferred using a traditional (non-ODX) file transfer. |
| **Application support** | The application that performs the data transfer must support ODX. The following applications currently support ODX:  
- Hyper-V - Management operations that transfer large amounts of data at a time, such as storage migrations, creating a fixed size Virtual Hard Disk (VHD, VHDx), merging snapshot, or converting Virtual Hard Disks.  
- Windows Explorer  
- Copy & Paste  
- Drag & Drop  
- Windows PowerShell Copy commands  
- Windows Command Prompt (including Robocopy & Richcopy) |
| **Hyper-V** | Data must be located on a PS Series Volume of the following configurations:  
- Virtual Hard Disks stored on an EqualLogic volume using the Host iSCSI initiator  
- Direct-attached disks using Guest iSCSI initiator  
- Remote NTFS File shares hosted on an EqualLogic volume mapped from the host or Virtual Machine |
| **Fragmentation** | Files should not be highly fragmented. Transfers of highly fragmented files will have reduced performance. |
1.3 Test ODX performance

Using Performance Monitor, you can record the baseline performance of data transfers. You should first disable ODX to establish a performance baseline and run a System Performance Report. You can then enable ODX, run another System Performance Report and compare the data to test and verify ODX performance.

1. **Disable ODX**
2. **Create a System Performance Report using Performance Monitor**
3. **Enable ODX**
4. **Verify ODX performance**

1.3.1 Disable ODX

In Windows Server 2012, ODX is enabled by default. To disable ODX support, verify that the following Registry key equals 1:

```plaintext
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\FilterSupportedFeaturesMode
```

![Registry Editor](image.png)

**Figure 5  Disable ODX**
1.3.2 Create a System Performance Report using Performance Monitor

1. Launch **Performance Monitor** from Windows.
2. Initiate a large data transfer that is similar to the workload you would normally use in an EqualLogic PS Series Group.
3. Start the System Performance Data Collector Set.
   a. Click to expand **Data Collector Sets**.
   b. Click to expand **System**.
   c. Right-click on **System Performance**, and then click **Start**. Performance Monitor will collect data for 60 seconds.

![Performance Monitor](image)

Figure 6 Start Performance Monitor
4. Select the System Performance Report.
   a. Click to expand Reports.
   b. Click to expand System.
   c. Click to expand System Performance.
   d. Click the most recent report.

5. Review the System Performance Report, and take note of the following counters:
   a. CPU Utilization (in the Resource Overview section)
   b. Network Utilization (in the Resource Overview section)
1.3.3 Enable ODX

In Windows Server 2012, ODX is enabled by default. To enable ODX support, verify that the following Registry key equals 0:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\FilterSupportedFeaturesMode
```

![Enable ODX](image)

Figure 8  Enable ODX

1.3.4 Verify ODX performance

After ODX is enabled, create a System Performance Report during a large offloaded data transfer. When you evaluate the performance of ODX, you should see the following differences from the baseline that you created when ODX was disabled:

- CPU utilization should be lower. This shows that the server did not manage the data transfer.
- Network utilization should be lower. This shows that the data transfer bypassed the server.

After you verify ODX performance, it is recommended to periodically create another System Performance Report during data movement operations to confirm that ODX is still operating as expected.
2 Thin provisioning and Unmap

2.1 Volume thin provisioning

Traditional, or thick, volumes consume a static amount of physical space. Upon creation of a traditional volume, all of the data blocks are allocated immediately and remain physically reserved for that specific volume. Over time, this can become inefficient, as large volumes can be initially allocated to servers, but may never be used to full capacity – essentially, wasting space.

Refer to Figure 9 for the space allocation and reservation properties for a traditional, or thick, 50 GB volume. Even though there are 50 GB of free space, 50 GB remain physically allocated and reserved for that specific volume and thus unavailable for allocation to other volumes in the storage pool.

![Figure 9 50 GB thick volume](image)

Thin provisioning, in a SAN environment, optimizes the utilization of available storage. As opposed to traditional volumes, thin volumes dynamically allocate blocks of data on-demand. Thin provisioning enables you to allocate a small amount of storage initially and then automatically increase capacity over time to support your business needs. Both EqualLogic PS Series Firmware and Windows Server 2012 provide support for thin provisioning, which maximizes usage of your EqualLogic SAN.

Refer to Figure 10 for the space allocation and reservation properties for a thin provisioned 50 GB volume. Even though the volume is 50 GB in size, since only 5 GB are in use, 45 GB are unreserved and are available for allocation to other volumes in the storage pool.

![Figure 10 50 GB thin provisioned volume](image)
To enable or disable thin provisioning on an EqualLogic volume, refer to section, *Creating a Volume in an EqualLogic PS Series Group*.

![Configure thin provisioning in Group Manager](image)

**Figure 11** Configure thin provisioning in Group Manager

### 2.2 Unmap

Prior to Windows Server 2012, as a server wrote data to a thin volume, additional physical space was dynamically allocated on the SAN volume for that data. If data was then deleted from that volume, the physical space allocation on the volume did not change, which created a ‘watermark’ effect. The SAN space was not de-allocated from the thin volume, and therefore the space was unavailable for allocation to other volumes.

EqualLogic PS Series Firmware v6.0 or later and Windows Server 2012 provide support for SCSI Unmap. This new feature is on by default and now provides the ability to reclaim storage that is no longer needed. As data is deleted from a thin volume in Windows Server 2012, the corresponding space is also re-claimed on the SAN – making it available for allocation by other volumes. This maximizes data utilization and provides improved storage efficiency.

For volumes using Unmap, frequent large file deletions can potentially affect the performance of other I/O to the volume. Therefore, it is recommended to disable support for Unmap if the volumes are used by highly volatile workloads where large file deletions are common. Backup targets are a perfect example of this type of workload.
2.2.1 Disable automatic Drive Optimization and defragmentation

Defragmenting a volume using Windows Server tools will consolidate the free space on the disk, which will improve the results of subsequent unmapping operations. Some operations, such as volume replication and Drive Optimization and defragmentation in Windows Server 2012, result in large numbers of unmapping operations. In some cases, this may impact storage performance. Support for Unmap is enabled by default in Windows 8 and Windows Server 2012. Dell recommends disabling support for Unmap and disabling automatic Drive Optimization processes on hosts that are using EqualLogic volumes that are configured for replication (both asynchronous and synchronous).

If support for Unmap is disabled, you can still use the Windows Defragment and Optimize Drives tool to perform space reclamation on-demand or on a scheduled basis.

To disable scheduling of Drive Optimization and defragmentation, perform the following steps:


![Launch Defragment and Optimize Drives](image-url)
2. Click to highlight the EqualLogic volume that is configured for asynchronous or synchronous replication and click Change settings.
   a. Click to de-select Run on a schedule.
   b. Click OK to save the settings. The selected volume will not be included in an automatic drive optimization and defragmentation schedule.

![Image of Drive Optimization Schedule](image1.png)

Figure 13 Disable Drive Optimization Schedule

### 2.2.2 Query Unmap support

To query the current status of Unmap support, run the following fsutil command from Windows Server 2012:

```
C:\> fsutil behavior query disabledeletenotify
```

A value of 0 indicates that the Unmap feature is enabled. A value of 1 indicates that the Unmap feature is disabled.

![Image of Command Prompt](image2.png)

Figure 14 Query Unmap support

The `disabledeletenotify` setting is a global Operating System setting that not only disables Unmap operations from being sent to the EqualLogic PS Series Groups, but also disables TRIM operations for Solid State Drives (SSD).
2.2.3 Disable Unmap support
Dell recommends disabling Unmap support on hosts that are using EqualLogic volumes that are configured for replication (both asynchronous and synchronous).

Note: Unmap support is required for the EqualLogic Host Integration Tools volume rethinning features.

If support for Unmap is disabled, you can still use the Windows Defragment and Optimize Drives tool to perform space reclamation on-demand or on a scheduled basis.

To disable Unmap support in Windows Server 2012, run the following command:

C:\> fsutil behavior set disabledeletenotify 1

Figure 15 Disable Unmap support

2.2.4 Enable Unmap support
Unmap support is required for the EqualLogic Host Integration rethinning tools. To enable Unmap support in Windows Server 2012, run the following command:

C:\> fsutil behavior set disabledeletenotify 0

Figure 16 Enable Unmap support
3 Storage Management Provider

To unify server and storage administration while simplifying management and growth of your storage environment, Windows Server 2012 introduces a new native interface that uses Windows Management Instrumentation (WMI) for streamlined management of storage. This new storage interface requires a management provider that is either based on industry standards such as Storage Management Initiative Specification (SMI-S) or provided by a third party Storage Management Provider (SMP).

Figure 17  Microsoft Windows Server 2012 storage management architecture

Host Integration Tools for Microsoft v4.5 or later includes a new SMP for Windows Server 2012 that uses this new storage interface. The EqualLogic SMP allows you to manage EqualLogic storage directly through native Windows tools such as File and Storage Services, PowerShell and WMI, as well as with System Center Virtual Machine Manager 2012 in HIT/Microsoft v4.6 or later.

Prior to the SMP feature of Windows Server 2012, Windows Server provided similar disk management capabilities with Virtual Disk Services (VDS). HIT/Microsoft also includes a VDS and VSS Hardware provider for Windows Server 2008.
3.1 Install the EqualLogic SMP

The EqualLogic PowerShell Tools are always installed with HIT/Microsoft and are required when using the EqualLogic SMP.

1. Perform a manual or remote installation of HIT/Microsoft (v4.5 or later) and select the Storage Management Provider (SMP) feature.

![Manual installation](image1)

![Remote installation](image2)

2. Upon successful installation, the SMP is managed by the EqualLogic SMP Host Service (EqlSMPHost).

![EqualLogic SMP Host Service](image3)
3.2 Configure the EqualLogic SMP

To manage EqualLogic storage with the EqualLogic SMP, you must first configure access to the PS Series Group. There are two methods to configure access to a PS Series Group:

- Configuring PS Group access with EqualLogic Auto-Snapshot Manager / Microsoft Edition
- Configuring PS Group access with EqualLogic PowerShell Tools

Refer to the above sections for additional information on configuring the EqualLogic SMP.

3.3 Use the EqualLogic SMP

By leveraging the EqualLogic SMP, you can perform native EqualLogic management functions from Windows tools such as File and Storage Services, PowerShell, WMI, as well as with System Center Virtual Machine Manager 2012 SP1.

Supported EqualLogic management functions include:

**Group Management:**
- Manage multiple PS Series Groups
- List Storage Pools
- Manage iSCSI Target Portals

**Volume Management:**
- List volumes and snapshots
- Retrieve RAID settings
- Create a volume
- Create a snapshot for a volume
- Create a clone for a volume
- Create thin clones for template volumes
- Manage volume access control
- Increase the size of a volume
- Offline a volume
- Delete a volume

**Array Management:**
- Blink the LED lights on EqualLogic PS Series arrays for identification
- Retrieve information on physical disks and slots in EqualLogic PS Series arrays

**Virtual Machine Management in System Center Virtual Machine Manager 2012 SP1:**
- Create and assign volumes to Hyper-V hosts
- Rapidly provision new Virtual Machines from EqualLogic template volumes
• VM Migration - Move entire VMs across a set of managed hosts or clusters
• VM Storage Migration - Move storage resources for VMs to another destination

3.3.1 Using the EqualLogic SMP with Windows File and Storage Services

The EqualLogic SMP enables multiple storage management capabilities from Windows File and Storage Services, including managing Groups, Volumes and Arrays.

3.3.1.1 Group management with SMP

You can manage multiple EqualLogic PS Series Groups and Storage Pools from Windows Server Manager.

To view and manage EqualLogic Storage Pools:

1. In Server Manager, go to File and Storage Services and click on Storage Pools. All EqualLogic PS Series Groups being managed by the SMP are listed.
2. Click to expand each PS Series Group. A list of storage pools is displayed. You cannot create new storage pools in an EqualLogic Group with the SMP. However, you can manage existing storage pools.
3. Click on the Storage Pool to view details for the volumes and physical disks in the Storage Pool.

Figure 21 Managing EqualLogic storage from Windows File and Storage Services
3.3.1.2 Volume management with SMP

You can manage volumes in an EqualLogic Group, including: creating new volumes, deleting volumes, resizing volumes and provisioning volume access.

To create a new volume in an EqualLogic Group:

1. In Server Manager, go to File and Storage Services.
2. In the Virtual Disks section, click on the Tasks drop-down menu and select New Virtual Disk.

![Create New Virtual Disk](image1)

Figure 22 Create New Virtual Disk

3. Select the desired storage pool in the EqualLogic Group and click Next.

![Select Storage Pool](image2)

Figure 23 Select Storage Pool
4. Specify a unique name and optional description for the volume and click **Next**.

![Specify virtual disk name](image)

**Figure 24** Specify virtual disk name

5. If there are multiple RAID policies available in the storage pool, a list of supported RAID policies is displayed. If required, select the storage layout by choosing the desired RAID policy and click **Next**.

![Select the storage layout](image)

**Figure 25** Select the storage layout
6. Specify the provisioning type and click **Next**.

![Specify the provisioning type](image)

**Figure 26** Specify the provisioning type

7. Specify the size of the volume and click **Next**.

![Specify the size of the virtual disk](image)

**Figure 27** Specify the size of the virtual disk
8. Review the settings and click **Create**.

![Confirm selections](image)

**Figure 28** Confirm selections

9. To optionally launch the New Volume Wizard to connect to the volume from a server, bring it online, create a logical partition, format the volume and assign a drive letter, first click to select **Create a volume when this wizard closes**.
   a. View the results and click **Close**.
   b. If the option to **Create a volume when the wizard closes** was selected, the New Volume Wizard will start. Upon completion of the Wizard, the volume will be available to the Windows operating system.

![View results](image)

**Figure 29** View results
10. Right-click on a Virtual Disk (volume) for additional options such as:
   a. Mask or Unmask - To add or remove iSCSI initiator access to the volume
   b. Extend Virtual Disk – To increase the size of the volume
   c. Delete Virtual Disk – To offline and delete the volume
   d. Properties – To view details such as name, description, capacity, allocated space, used space, health and advanced volume attributes

Figure 30  Additional Virtual Disk options

3.3.1.3  Array management with SMP
You can view information for the physical disks and slots of EqualLogic PS Series arrays as well as blink the array’s LED lights for identification.

1. In Server Manager, go to File and Storage Services. Right-click on the physical disk for additional options:
   a. Toggle Drive Light – To start or stop blinking the LED lights on the storage array for identification. This option will not blink the individual drive lights.
   b. Properties – To view details such as name, capacity, health, and advanced attributes.

Figure 31  Array management with SMP
3.3.2 Using the EqualLogic SMP with PowerShell

The native Microsoft PowerShell cmdlets in Table 2 invoke EqualLogic SMP functionality. Refer to Microsoft PowerShell documentation for additional information.

Table 2 Supported SMP PowerShell cmdlets

<table>
<thead>
<tr>
<th>Cmdlet</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get-StorageProvider</td>
<td>Retrieves SMP provider information</td>
</tr>
<tr>
<td>Get-StorageSubSystem</td>
<td>Retrieve EqualLogic Group information</td>
</tr>
<tr>
<td>Get-StoragePool</td>
<td>Retrieves EqualLogic storage pool information</td>
</tr>
<tr>
<td>Get-VirtualDisk</td>
<td>List volumes or snapshots</td>
</tr>
<tr>
<td>Get-MaskingSet</td>
<td>Retrieves particular masking sets</td>
</tr>
<tr>
<td>Get-InitiatorId</td>
<td>Retrieves iSCSI initiator information</td>
</tr>
<tr>
<td>Get-TargetPort</td>
<td>Retrieves target port information for volumes</td>
</tr>
<tr>
<td>Get-TargetPortal</td>
<td>Retrieves iSCSI target portal information EqualLogic PS Group</td>
</tr>
<tr>
<td>Get-PhysicalDisk</td>
<td>List physical disks and slots in EqualLogic PS Series arrays</td>
</tr>
<tr>
<td>Get-ResiliencySetting</td>
<td>Retrieves RAID settings for EqualLogic arrays</td>
</tr>
<tr>
<td>Get-VirtualDiskSupportedSize</td>
<td>Retrieves information regarding supported volume sizes in a particular storage pool</td>
</tr>
<tr>
<td>New-VirtualDisk</td>
<td>Creates a volume</td>
</tr>
<tr>
<td>New-VirtualDiskSnapshot</td>
<td>Creates a snapshot for a volume, or creates thin clone for a template volume</td>
</tr>
<tr>
<td>New-VirtualDiskClone</td>
<td>Clones a volume</td>
</tr>
<tr>
<td>New-StorageSubsystemVirtualDisk</td>
<td>Creates a volume on a particular EqualLogic Group</td>
</tr>
<tr>
<td>New-MaskingSet</td>
<td>Creates a new ACL table for the volume</td>
</tr>
<tr>
<td>Remove-VirtualDisk</td>
<td>Sets the volume or snapshot offline and deletes it.</td>
</tr>
<tr>
<td>Show-VirtualDisk</td>
<td>Adds ACL entries to a MaskingSet associated with a volume</td>
</tr>
<tr>
<td>Hide-VirtualDisk</td>
<td>Removes ACL entries from a masking set associated with a volume</td>
</tr>
<tr>
<td>Remove-MaskingSet</td>
<td>Deletes all ACL entries from a volume</td>
</tr>
<tr>
<td>Remove-InitiatorIdFromMaskingSet</td>
<td>Removes an iSCSI initiator ACL entry from a masking set</td>
</tr>
<tr>
<td>Cmdlet</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Remove-VirtualDiskFromMaskingSet</td>
<td>Removes a virtual disk from a masking set</td>
</tr>
<tr>
<td>Remove-TargetPortFromMaskingSet</td>
<td>Removes a target port from a masking set</td>
</tr>
<tr>
<td>Update-StorageProviderCache</td>
<td>Invalidates the provider cache, entirely or specific to a particular object and discovery level</td>
</tr>
<tr>
<td>Enable-PhysicalDiskIndication</td>
<td>Enables LED blinking on the member that owns this physical disk.</td>
</tr>
<tr>
<td>Disable-PhysicalDiskIndication</td>
<td>Stops LED blinking on the member that owns this physical disk.</td>
</tr>
</tbody>
</table>

### 3.3.3 Using the EqualLogic SMP with System Center Virtual Machine Manager 2012 SP1

Host Integration Tools for Microsoft v4.6 and later supports System Center Virtual Machine Manager (SCVMM) 2012 SP1. Using the EqualLogic SMP, you can perform essential EqualLogic storage management tasks in SCVMM, including:

- Create volumes and provision access to Hyper-V hosts
- Rapidly provision new Virtual Machines from EqualLogic template volumes
- VM Migration - Move entire virtual machines across a set of managed hosts or clusters
- VM Storage Migration - Move volumes for virtual machines to another destination

For more information on using the EqualLogic SMP with SCVMM, refer to the *Dell EqualLogic Host Integration Tools Installation and User’s Guide* at [http://eqlsupport.dell.com](http://eqlsupport.dell.com).

For more information on SCVMM, refer to: [http://www.microsoft.com/systemcenter/](http://www.microsoft.com/systemcenter/)
4 Managing EqualLogic storage in a Windows environment

To get started using EqualLogic storage in a Windows environment, refer to the following sections for additional information on creating new or expanding existing PS Series Groups and using Group Manager to create volumes:

- Creating a new PS Series Group
- Joining an existing PS Series Group
- Managing a Dell EqualLogic PS Series Group with Group Manager
- Creating a Volume in a Dell EqualLogic PS Group

4.1 Host Integration Tools for Microsoft

It is highly recommended to install HIT/Microsoft in your Windows environments.

HIT/Microsoft simplifies the configuration and administration of EqualLogic PS Series storage arrays on Windows computers.

For additional information on HIT/Microsoft, including Operating System support and EqualLogic product compatibility, refer to the Dell EqualLogic Host Integration Tools for Microsoft Installation and User’s Guide at http://eqlsupport.dell.com.
Table 3 lists the application and service components included with HIT/Microsoft:

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remote Setup Wizard</strong></td>
<td>Enables you to initialize a PS Series SAN array and set up or expand a PS Series Group. An alternate command-line interface (RSWCLI) can also be used from the Windows command prompt.</td>
</tr>
<tr>
<td><strong>PowerShell Tools</strong></td>
<td>Enables you to manage one or many PS Series Groups through a comprehensive set of PowerShell cmdlets.</td>
</tr>
<tr>
<td><strong>Volume Rethinning Tools</strong></td>
<td>Enables you to perform rethinning and optional defragmentation operations on one or more volumes.</td>
</tr>
<tr>
<td>Dell EqualLogic HPC iSCSI Provider</td>
<td>Allows the Microsoft High Performance Computing (HPC) Service to provision volumes and deploy compute nodes on EqualLogic SANs. This service is only available on systems running Windows HPC Server 2008 R2 or later.</td>
</tr>
<tr>
<td>Multipath I/O Device Specific Module (MPIO/DSM)</td>
<td>Windows Service: EHCM Service Supports multipathing. This is a driver module that works in conjunction with the Microsoft MPIO driver. This feature dynamically balances your iSCSI SAN traffic load over multiple network paths between the computer and the PS Series Group. You need multiple iSCSI Host Bus Adapters to use this feature.</td>
</tr>
<tr>
<td><strong>Auto-Snapshot Manager / Microsoft Edition (ASM/ME)</strong></td>
<td>Windows Service: EqIASMAgent Enables you to create and manage Smart Copies (snapshots, clones, and replicas). An alternate command-line interface (ASMCLI) facilitates custom operations and scripting.</td>
</tr>
<tr>
<td><strong>VSS Provider</strong></td>
<td>Windows Services: EqIReqService, EqIVss Supports VSS management of application-consistent Smart Copies.</td>
</tr>
<tr>
<td>Virtual Disk Service (VDS) Provider</td>
<td>Windows Service: EqIVdsHwPrv Enables you to use Microsoft VDS and Microsoft Storage Manager for SANs to create and manage volumes in a PS Series Group.</td>
</tr>
<tr>
<td><strong>SMP</strong></td>
<td>Windows Service: EQLSMPHost Enables you to manage EqualLogic storage through native Windows storage interfaces such as PowerShell cmdlets, File Services UI in Windows Server 2012, and WMI.</td>
</tr>
</tbody>
</table>

There are multiple methods that you can use to install HIT/Microsoft on a host, including via PowerShell and ASM/ME. For first-time installations, you are first required to perform a manual installation. After that, you can easily install HIT/Microsoft on any number of hosts using the remote installation process from the ASM/ME GUI or through PowerShell.
### 4.1.1.1 Perform a manual installation of HIT/Microsoft

1. Once you have downloaded the Host Integration Tools for Microsoft from the Dell EqualLogic Customer Support site at [http://eqlsupport.dell.com](http://eqlsupport.dell.com) (This requires a Dell EqualLogic Support account) double-click either **Setup64.exe** or **Setup.exe**.

![Double-click either Setup64.exe or Setup.exe](image1)

**Figure 32** Double-click either Setup64.exe or Setup.exe

2. The InstallShield Wizard installs the Host Integration Tools on your computer. To continue, click **Next**.

![Welcome to the InstallShield Wizard](image2)

**Figure 33** Welcome to the InstallShield Wizard
3. Read the License Agreement:
   a. Click **I accept the terms in the license agreement.**
   b. Click **Next.**

Figure 34  Read the license agreement carefully

4. Click **Next** to install to the default folder, or click **Change** to install to different folder.

Figure 35  Default installation folder
5. Choose the setup type that best suits your needs and click **Next**.
   a. Selecting **Complete** will install all program features listed in Table 3. For components such as Multipath I/O and Volume Rethinning, Windows may require a reboot.
   b. Selecting **Custom** will allow you to choose which program features you want installed and where they will be installed.

![Complete setup](image1)

**Figure 36** Complete setup

![Custom setup](image2)

**Figure 37** Custom setup

6. Click **Install** to begin the installation.

![Ready to Install the Program](image3)

**Figure 38** Ready to Install the Program
7. Click **Finish** to exit the wizard.

![InstallShield Wizard Completed](image)

In addition to installing the software components, the installation process automatically performs the following tasks so that HIT/Microsoft can run properly:

- Automatically start the Microsoft iSCSI Initiator Service
- To enable Multipath IO (MPIO) to function properly:
  - The Windows Firewall is configured allow ICMP echo requests
  - Automatically configure and starts the Microsoft Multi-Path Bus Driver service
- Install required Microsoft .NET components
- Install required Visual C++ redistributable components
- Create MSI logs directory at `%appdata%\EqualLogic\Logs`
4.2 Connecting to an EqualLogic volume from Windows

The Microsoft iSCSI Initiator enables you to connect a Windows computer to EqualLogic iSCSI storage through the server’s network adapters. Connecting to volumes with the Microsoft iSCSI Initiator will cause iSCSI SAN disks to appear as if they are locally attached to the server.

1. Launch iSCSI Initiator from Windows.
2. In the Discovery tab, click Discover Portal.

3. If required, specify the EqualLogic PS Series Group that you want to add.
   a. In the IP address or DNS name field, enter the IP address or DNS name of the EqualLogic PS Series Group.
   b. In the Port field, enter the network port number (Default is 3260).
   c. To enable CHAP authentication, click Advanced and configure the required settings.
   d. Click OK.
4. Discover all volumes that the server has access to.
   a. Click the **Targets** tab, and then click **Refresh**. A list of discovered volumes is displayed.
   b. Click to select the desired volume and click **Connect**.

![Discover iSCSI Targets](image1.png)

**Figure 42** Discover iSCSI Targets

5. Connect to the Target.
   a. To make the system automatically attempt to restore the connection to the volume upon reboot, click **Add this connection to the list of Favorite Targets**.
   b. To enable multi-path, click **Enable multi-path**.
   c. Click **OK**.

![Connect to iSCSI Target](image2.png)

**Figure 43** Connect to iSCSI Target
4.2.1 Making an EqualLogic volume available to Windows

After you have connected to the iSCSI target, you can make the volume available to Windows so that it can be used to store data.

1. Launch the **Disk Management** Console in Windows Server 2012.
   a. From the Action menu, select **Rescan disks**.

   ![Rescan disks](image1)

   **Figure 44** Rescan disks

2. Bring the new disk online.
   a. Right-click on the disk and select **Online**.

   ![Online disk](image2)

   **Figure 45** Online disk
3. You must initialize a disk before Disk Manager can access it.
   a. Right-click on the disk and select **Initialize Disk**.

![Initialize disk](image)

Figure 47  Initialize disk

4. Select the disk and partition style and click **OK**.

![Select disks](image)

Figure 48  Select disks
5. Create a Simple Volume on the disk.
   b. Right-click on the disk and select **New Simple Volume**.

   ![New Simple Volume](image)
   **Figure 49** New Simple Volume

6. Click **Next**.

   ![Welcome to the New Simple Volume Wizard](image)
   **Figure 50** Welcome to the New Simple Volume Wizard

7. Specify the volume size and click **Next**.

   ![Specify Volume Size](image)
   **Figure 51** Specify Volume Size
8. Optionally, assign a drive letter or path and click **Next**.

![Assign Drive Letter Or Path](image1.png)

**Figure 52** Assign Drive Letter Or Path

9. Format the partition by specifying **File system**, **Allocation unit size** and **Volume label** and click **Next**.

![Format Partition](image2.png)

**Figure 53** Format Partition

10. The volume is now available to Windows and is ready to store data.

   a. Review the settings, and click **Finish**.

![Completing the new Simple Volume Wizard](image3.png)

**Figure 54** Completing the new Simple Volume Wizard
4.2.2 Extending a volume in Windows

You can add more space to existing volumes by extending them using unallocated SAN space.

1. Access the Dell EqualLogic Group Manager GUI.
2. In the lower-left pane of the Group Manager GUI, click Volumes.
   a. Click to expand the Volumes tree.
   b. Click to select the desired volume.
3. In the Activities pane, click Modify settings.

![EqualLogic Group Manager](image)

Figure 55  EqualLogic Group Manager
4. To increase the size of the volume, click on the **Space** tab.
   a. Specify a volume size and click **OK**.

![Modify volume settings](image)

**Figure 56** Specify Volume Size

5. Launch the **Disk Management** Console in Windows Server 2012.
   a. From the Action menu, select **Rescan disks**. Disk Manager will discover unallocated space.

![Disk Management](image)

**Figure 57** Rescan Disks
6. Right-click on the volume with unallocated space that you want to extend and select **Extend Volume**.

![Figure 58 Extend Volume](image)

7. To continue, click **Next**.

![Figure 59 Welcome to the Extend Volume Wizard](image)
8. Click to select from the Available disks and click **Add**.
   a. Specify the amount of space in MB.
   b. Click **Next**.

   ![Select Disks](image)

   **Figure 60  Select Disks**

9. Review the settings and click **Finish** to close the wizard.

   ![Completing the Extend Volume Wizard](image)

   **Figure 61  Completing the Extend Volume Wizard**
4.3 Configuring EqualLogic PS Series Group Access settings

In order to successfully manage EqualLogic storage with ASM/ME and Windows Services such as Volume Shadow Copy Services, Virtual Disk Services, PowerShell and SMP, you must first configure access to one or more PS Series Groups.

PS Series Group Access settings are used for the following purposes:

- Allowing ASM/ME to access one or more PS Series Groups for creating and managing Smart Copies
- Enabling Virtual Shadow Copy Services, Virtual Disk Services, SMP, and EqualLogic PowerShell Tools to access a PS Series Group
- Enabling a Windows server to access Smart Copies that were created on another server
- Optionally, enabling Single Sign-On (SSO) to the Group

To use SSO, the PS Series Group must be running a minimum of PS Series Firmware Version 6.0 and must be configured to allow SSO. Refer to the Dell EqualLogic Group Manager Administrator’s Manual at http://eqlsupport.dell.com for information on configuring the Group for SSO. In addition, the ASM services must be configured to use Active Directory Domain accounts.

You can configure access to multiple PS Series Groups through ASM/ME or through the EqualLogic PowerShell Tools. Before setting these properties, CHAP must be configured on the PS Series Group, either locally or on an external RADIUS authentication server.

- Configuring PS Series Group Access in ASM/ME
- Configuring PS Series Group Access with Dell EqualLogic PowerShell Tools
4.3.1 Configuring CHAP

1. Access the Dell EqualLogic Group Manager GUI.
2. Click Group Configuration.
3. Click the iSCSI tab to manage CHAP accounts.

![Figure 62 Dell EqualLogic Group Manager - CHAP Configuration](image)

4. Click to VDS/VSS tab to manage VDS and VSS access to the Group. You must enable an existing CHAP user to access the PS Series Group using VDS and VSS.

![Figure 63 Dell EqualLogic Group Manager – VDS/VSS Configuration](image)

For additional information on configuring CHAP on the PS Series Group, see the Dell EqualLogic Group Manager Administrator’s Manual at [http://eqlsupport.dell.com](http://eqlsupport.dell.com).
4.4 Auto-Snapshot Manager/Microsoft Edition

HIT/Microsoft provides data protection and remote storage management with ASM/ME. ASM/ME enables you to create fast, space-efficient, point-in-time copies (Smart Copies) of EqualLogic volumes as part of a backup and recovery strategy for your data. You can quickly backup and restore EqualLogic volumes on multiple Windows machines, and also remotely manage storage configurations across multiple hosts from a single ASM/ME Graphical User Interface (GUI).

ASM/ME uses Microsoft Volume Shadow Copy Service (Microsoft VSS) to provide application-consistent backup and quick recoveries of SQL Server, Exchange Server, Hyper-V, and SharePoint data from a Windows Server environment.


Figure 64 and Table 4 describe the relationship between ASM/ME and VSS.
Table 4  ASM/ME and VSS

<table>
<thead>
<tr>
<th>Callout</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VSS Writer, integrated with the application, which prepares the application for the backup or restore operation.</td>
</tr>
<tr>
<td>2</td>
<td>VSS Requestor, usually a backup application, which requests the creation of shadow copies and provides an interface for backing up and restoring data. ASM/ME functions as a Requestor.</td>
</tr>
<tr>
<td>3</td>
<td>VSS Provider, which is installed when you install HIT/Microsoft. The Provider interacts directly with the PS Series Group.</td>
</tr>
</tbody>
</table>
The GUI for ASM/ME features a Dashboard that provides an at-a-glance overview of the hosts, volumes, iSCSI connections, Schedules, Smart Copies, Collections and Applications that you are managing with ASM/ME.

Refer to Table 5 for descriptions of each numbered feature in the main window.

![ASM/ME GUI](image-url)
## Table 5  
**ASM/ME Edition Features**

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
</table>
| **1**  | **Dashboard**  
You can interact with the available areas, which are specific to the selected host.  
- HIT Groups area displays the number of hosts that you are managing via ASM/ME  
- Array Volumes area displays the number of PS Series volumes connected to the host  
- iSCSI Connections area displays the total number of active iSCSI sessions for all volumes and VSS controls  
- Collections area displays the number of collections ASM/ME is managing  
- Schedules area displays the number of Smart Copy schedules that exist  
- Smart Copies area displays the number of Smart Copies that exist  
- SQL Databases area displays the number of SQL Databases that ASM/ME is managing  
- Exchange Mailstores area displays the number of Exchange Mailboxes that ASM/ME is managing  
- Hyper-V VMs area displays the number of Hyper-V virtual machines that ASM/ME is managing |
| **2**  | **Tree Panel**  
Related groups of objects organized in a navigation tree structure |
| **3**  | **Actions Toolbar**  
When you select a node in the Tree Panel, available actions for that node appear in the Actions Toolbar |
| **4**  | **Global Actions Toolbar**  
- Add Hosts option allows you to add a host to manage from ASM/ME  
- Refresh All Hosts option refreshes ASM/ME and updates the view with new information  
- Collect Logs option allows you to create a zip file with various selectable log files |
| **5**  | **Menu Bar**  
- File menu is used to add a host, export a host list or refresh all hosts  
- View menu is used to toggle the view between the Hosts view or the Settings view  
- Launch menu is used to open iSCSI Initiator, Remote Setup Wizard, SAN Headquarters, Windows Disk Manager, Windows Event Viewer or Windows Storage Manager for SANs  
- Customize menu is used to change the display properties and colors of the ASM/ME GUI  
- Help menu is used to open the online help system or collect logs |
| **6**  | **Navigation Area**  
- Selecting Hosts in this area displays the Tree Panel and the Hosts view  
- Selecting Settings in this area displays the user-configurable settings for ASM/ME |
| **7**  | **Status Bar**  
Displays errors, warnings and any refresh operations that are in progress |
4.4.1 Performing a remote installation of HIT/Microsoft

You can easily install or upgrade HIT/Microsoft on any number of hosts using the remote installation process from the ASM/ME GUI.

1. Copy the Setup.exe and Setup64.exe installation files into a directory of your choice. Since you must specify this directory multiple times if you are adding several hosts for management or pushing out multiple installations, you can simplify the process by copying the installation files onto a network shared directory that is accessible by the remote hosts.

2. In order for new installations to run successfully on remote hosts, allow incoming ping requests through the remote host’s firewall to the remote host. Use Windows Server Manager to create new inbound rules for your firewall. If both the local and remote hosts are in the same domain, allow the connections over the domain profile type.

3. The Remote Procedure Call (RPC) service must be running on all remote hosts. This service should be started by default on Windows systems, but if it is not running, or if the firewall is blocking it, the installation will not work.

4. Click Add Hosts from the Global Actions Bar to add hosts to the HIT Group. A HIT Group allows you to manage multiple remote hosts from the local host.

Figure 66  ASM/ME GUI

ASM/ME automatically detects whether a new installation or upgrade is required on the remote hosts. ASM/ME is then automatically installed or upgraded on the remote host, and then the host is added to the HIT Group.
You can discover hosts that are connected to a PS Series Group, browse the network, select hosts through manual entry of their IP address or Fully Qualified Domain Name, or auto-detect cluster and SharePoint farm nodes.

If you are running ASM/ME from a Cluster node, it is recommended that you select **Cluster and SharePoint farm nodes**. In cluster environments, all cluster nodes in a HIT Group have a reciprocal relationship. That is, adding cluster node B to the ASM/ME instance on cluster node A will automatically add cluster node A to the ASM/ME instance on cluster node B. You must always add an entire cluster to a HIT Group as opposed to a subset of cluster nodes. ASM/ME will then automatically set up the required trust relationship between each cluster node to ensure proper operation. If you only add a subset of cluster nodes to a HIT Group, then Smart Copy operations can fail. In contrast - in non-cluster environments, HIT Groups are host-specific. So, adding Host B to the ASM/ME instance on Host A does not automatically add Host A to the ASM/ME instance on Host B.

5. Click to select one or more methods for adding hosts to the HIT Group and click **Next**.

![Figure 67 Choose Host Selection Method](image-url)
6. Select the Hosts to Add or Upgrade and click **Next**.

![Figure 68 - Select the hosts to Add or Upgrade](image)

7. Administrative user credentials are required on the remote host(s) in order for HIT/Microsoft to be installed remotely. These credentials are not stored. They are only used for the installation.

   If you are installing to a Cluster, you must provide Domain user credentials with local admin rights to the cluster nodes. If you are installing to multiple Active Directory domains, it is recommended that you install to all the machines from one domain at a time.

   a. Select the host(s) from the **Hosts to Add or Upgrade** pane and enter the required Administrator credentials. You can multi-select hosts by using the **CTRL** key while clicking on the host name(s).

   b. Select your installation options such as MPIO, Rethinning and SMP. If you are using multipathing with the Dell EqualLogic MPIO DSM in a Cluster, it is highly recommended that you use an identical HIT/Microsoft version and configuration on each cluster node.

   c. In the Installer Directory field, browse to the folder containing both the setup64.exe and setup.exe installation files. It is recommended that you first copy both the setup64.exe and setup.exe installation files to a network shared directory.

   d. Click **Add Hosts** to install the Host Integration Tools to the remote host(s).

![Figure 69 - HIT Installation and Host Verification](image)
8. If the MPIO or Rethinning install options were selected previously, Windows may require the remote hosts to be rebooted. This summary screen allows you to reboot the hosts remotely, if required. When a host is rebooted remotely through this screen, a pop-up message appears on the console of the remote host informing users of the impending reboot.

![Figure 70 Reboot remote hosts](image)

![Figure 71 Summary of Hosts](image)

For more information about additional remote installation options, including customized installations with PowerShell and .MSI, refer to the *Dell EqualLogic Host Integration Tools/Microsoft Edition - Installation and User’s Guide* and the Dell EqualLogic support site at [http://eqlsupport.dell.com](http://eqlsupport.dell.com).
4.4.2 Managing a HIT Group

A HIT Group is a group of one or more hosts that you manage from ASM/ME. Ensure that all hosts in a HIT Group and Windows cluster all run the same version of HIT/Microsoft and have identical MPIO configurations. When a new host is added to a HIT Group, the Host Integration Tools get installed or upgraded on the host. HIT Groups are useful because they allow you to manage multiple hosts and clusters from any machine that is running ASM/ME. HIT Groups allow you to create and manage Smart Copies and Smart Copy schedules and simultaneously edit storage configuration settings on multiple hosts.

Refer to Table 6 for available settings.
<table>
<thead>
<tr>
<th>Settings</th>
<th>Description</th>
</tr>
</thead>
</table>
| General settings | The General Settings panel enables you to control the general behavior and options for ASM/ME on all hosts.  
• Set the default location for backup documents and collection files  
• Set Smart Copy verification options, enable iSCSI portal verification, set Smart Copies online as they are created  
• Specify a user account to run the ASM/ME services |
| Notification settings | The Notification Settings panel allows you to configure email settings so that you can send or receive email alerts when certain operations succeed or fail.  
• Enable or disable e-mail alerts  
• Set SMTP Server and Port  
• Configure E-mail recipients, From Address and Subject line |
| Alert settings   | The Alert Settings panel enables you to enable or disable all email alerts or specify a subset of alerts that will be emailed to you.                                                                       |
| Verification settings | The Verification Settings panel applies only to Microsoft Exchange and allows you to configure Checksum Verification and Soft Recovery on Smart Copies of Microsoft Exchange components. |
| PS Group Access  | The PS Group Access panel enables you to configure settings for the PS Series Groups that store the volumes and Smart Copies used by your applications.  
Before setting VDS/VSS and Smart Copy Access, CHAP must be configured on the PS Series Group, either locally or on an external RADIUS authentication server.  
• Configure access to a new PS Series Group  
• Delete access to an existing PS Series Group  
• Configure CHAP account for VDS/VSS access  
• Configure CHAP account for Smart Copy access  
• Configure PowerShell/SMP access  
• Enable SSO to a PS Series Group |
| MPIO settings    | The MPIO Settings panel enables you to:  
• Select the MPIO failover policy  
• Enable or disable MPIO for snapshots  
• Manage iSCSI connection attributes  
• Set minimum adapter speed for MPIO  
• Include or exclude a subnet from the MPIO configuration |
4.4.2.1 Configuring settings with ASM/ME

1. Click Settings in the Navigation Area.
2. Holding down the CTRL key on your keyboard, click to select the servers you want to apply the settings to.
3. In the left panel, select General Settings, Notification Settings, Alert Settings, Verification Settings, PS Group Access or MPIO Settings to view and modify the current settings.
4. Click Save to simultaneously apply the settings on all selected hosts.

Figure 72 ASM/ME settings

4.4.2.2 Configuration considerations

Backup Documents
In ASM/ME, you can specify a network folder or shared location for storing backup documents. If you intend to import Smart Copies on different hosts, consider using a network share accessible to all the computers that may need to import the Smart Copies. Note that a non-clustered host should have its own backup document directory for storing backup documents. So, if you want to use a network shared folder for storing backup documents of non-clustered hosts, each non-clustered host should have its own subdirectory in the network shared folder. In contrast, for clusters, all cluster nodes must always share the same exact backup document directory path. You should always ensure that your backup documents are backed up regularly.

ASM Services
If you installed HIT/Microsoft to a cluster, the EqIReqService and EqIASMAgent ASM Services should be configured to use Domain accounts with administrative access to the cluster nodes.
4.4.2.3 Configuring PS Series Group access in ASM/ME

You can use ASM/ME to configure access to multiple EqualLogic PS Series Groups.

1. Click Settings in the Navigation Area of ASM/ME. Refer to Figure 72.
2. Holding down the CTRL key on your keyboard, click to multi-select the servers you want to apply the settings to.
3. In the left panel, select PS Group Access to view and modify the current settings.
4. To add a new PS Series Group:
   a. Click Add PS Group and provide the PS Group name and Group IP.
5. To modify settings for a PS Series Group:
   a. In the PS Group Access window, select the PS Group to configure the following settings:
      i. VDS/VSS access – Specify VDS/VSS CHAP credentials
      ii. Smart Copy access – Specify CHAP credentials
      iii. PowerShell/SMP Access
         - Enter the PS Group Management IP address (this is the Group IP address, unless the Group has a Management Network configured).
         - Enter the PS Group Username and Password. The user name can be an account configured on the Group or a domain account.
         - Optionally, check the box to enable SSO to use Active Directory Domain credentials. To use SSO, the PS Series Group must be running a minimum of PS Series Firmware Version 6.0 and must be configured to allow SSO. For more information on configuring the PS Group for SSO, refer to the Dell EqualLogic Group Manager Administrator’s Manual at http://eqlsupport.dell.com. In addition, the ASM services must be configured to use Active Directory Domain accounts.
6. Click Save to apply the settings to the selected hosts.

4.4.3 Protecting and recovering your data

While the EqualLogic PS Series Group Manager GUI allows you to create snapshots, clones and replicas of volumes, ASM/ME provides the same capability and additionally allows you to create snapshots, clones and replica Smart Copies of Microsoft Exchange storage Groups or mailbox databases; SQL Server databases; Hyper-V virtual machines; and SharePoint components such as complete farms, farm components, search indices, or Search Service Applications (SSAs).

ASM/ME uses Microsoft VSS to provide a framework for backing up and restoring data in the Windows Server environment. ASM/ME creates copies of application volumes on your PS Series Group, ensuring that the backed-up data is easy to restore and recover.

Refer to Table 7 for the supported objects that you can create Smart Copies of with ASM/ME.
Table 7  ASM/ME - Supported objects

<table>
<thead>
<tr>
<th>Object</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volumes</td>
<td>PS Series volumes formatted using the NTFS file system, including Cluster Shared Volumes</td>
</tr>
<tr>
<td>Application components</td>
<td>Microsoft SQL Server databases, Microsoft Exchange Mailbox Databases, Microsoft SharePoint components, Hyper-V virtual machines</td>
</tr>
<tr>
<td>Collections</td>
<td>Related groups of volumes or application components. For example, you can Group multiple volumes or components together as a single collection and then create a Smart Copy of the collection. This is useful when you want the Smart Copies to be created simultaneously in one set.</td>
</tr>
</tbody>
</table>

Refer to Table 8 for a list of the three Smart Copy types.

Table 8  Smart Copy types

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snapshot</td>
<td>A space-efficient, point-in-time copy of a PS Series volume.</td>
</tr>
<tr>
<td>Clone</td>
<td>A new, independent volume containing the same data as the original volume at the time the clone is created.</td>
</tr>
<tr>
<td>Replica</td>
<td>A space-efficient, point-in-time copy of a PS Series volume. The original volume and the replica are located on different PS Series Groups that might be separated by distance for disaster tolerance. The Group and the volume must be configured for replication.</td>
</tr>
</tbody>
</table>

4.4.3.1  Smart Copies

To manage Smart Copies with ASM/ME, you must first configure access to the PS Series Group. There are two methods to configure access to an EqualLogic PS Series Group. Refer to these sections for additional information on configuring access to a PS Series Group:

- Configuring PS Series Group Access in ASM/ME
- Configuring PS Series Group Access with Dell EqualLogic PowerShell Tools

The main methods of creating Smart Copies are as follows:

- Create Smart Copies On Demand
- Create Smart Copy Collections
- Create Smart Copy Schedules
4.4.3.2 Torn Smart Copies
ASM/ME always takes a Smart Copy of an EqualLogic PS Series volume. Therefore, if multiple application components such as databases or VMs are located on a common volume, all application components included in the backup operation are also restored during a restore operation. If VMs are spanned across multiple volumes, a Smart Copy operation could potentially result in a Smart Copy that is torn. Therefore, Dell recommends that related data sets reside on separate volumes that are reserved for their exclusive use.

4.4.3.3 Create Smart Copies On Demand
When you create a Smart Copy, it consists of one or more snapshots, replicas, or clones, as well as a backup document describing the Smart Copy.

1. Click to expand a server from the Tree Panel.
2. Right-click on a volume or supported application component residing on an EqualLogic PS Series Group and select Create Smart Copy Set.

Figure 73 Create Smart Copy Set
3. Select Smart Copy options and Backup Type and click **Next**.

![Select Smart Copy Type](image1.png)

**Figure 74** Select Smart Copy Type

4. Review the summary to verify the Smart Copy snapshot settings and click **Create**.

![Smart Copy Creation Summary](image2.png)

**Figure 75** Smart Copy Creation Summary

5. Review the summary and click **Close**.

![Creating Smart Copy Complete](image3.png)

**Figure 76** Creating Smart Copy Complete
6. The Smart Copy will appear with a date and time stamp in the server’s Smart Copies node of ASM/ME.

4.4.3.4 Create Smart Copy Collections
ASM/ME enables you to define a logical collection of volumes, applications, or application components. You can then perform Smart Copy operations on the entire collection.

1. Click to expand a server from the Tree Panel.
2. Right-click on the **Collections** Master Node and select **Create Collection**.
3. Specify a unique name for the Collection, then click Next.

![Collection Name](image)

Figure 79  Collection Name

4. Select the Smart Copy components, then click Create.

![Smart Copy components](image)

Figure 80  Smart Copy components
5. Review the summary, then click **Close**.

![Creating Smart Copy Collection Complete](image)

Figure 81 Creating Smart Copy Collection Complete

6. The Smart Copy Collection will appear in the server's Collections node of ASM/ME. Optionally, right-click on the Collection to:
   - Create a Smart Copy Set of the Collection
   - Configure New Smart Copy Schedule for the Collection
   - Modify the Collection
   - Delete the Collection
   - Generate a command-line for the Smart Copy operation

![Right click on Smart Copy Collection](image)

Figure 82 Right click on Smart Copy Collection
4.4.3.5 Create Smart Copy Schedules

You can select a volume, application component, or collection and then create a Smart Copy schedule for that object. A schedule automates Smart Copy creation and allows you to control the timing, frequency, and number of retained copies.

1. Click to expand a server from the Tree Panel.
2. Right-click on a volume or supported application component residing on an EqualLogic PS Series Group and select Configure New Schedule.

3. Name the task, select how often it will run, and click Next.

Figure 83 Configure New Smart Copy Schedule

Figure 84 Smart Copy Schedule Name and Frequency
4. Configure the start time and date for the task, and when it should repeat. Depending on the previously selected schedule frequency, a different dialog box will be displayed. Specify the schedule options accordingly, then click **Next**.

![Figure 85 Smart Copy Schedule Settings](image1)

5. Configure the task start and end dates, and repeat settings. Depending on the previously selected schedule frequency, a different dialog box will be displayed. Specify the schedule options accordingly, and click **Next**.

![Figure 86 Smart Copy Advanced Schedule Settings](image2)
6. Select type of Smart Copy the schedule will perform and the number of smart copies to retain at a time, and click **Next**.

![Figure 87 Smart Copy Options](image)

**Figure 87 Smart Copy Options**

7. Specify the user account used to run the scheduled task and click **Create**. If you run the task as a specified user, the account must have appropriate access to backup documents. For Smart Copies of objects in a cluster, you must specify a Domain account with Administrator access.

![Figure 88 Provide User Account Information](image)

**Figure 88 Provide User Account Information**

8. The schedule will appear in the server’s Schedules node of ASM/ME. Optionally, right-click on the schedule to:
   - Run the schedule manually
   - Disable the schedule
   - Modify the schedule settings
   - Delete the schedule
4.4.3.6 Data recovery

ASM/ME enables you to implement different data recovery strategies by recovering data directly from a Smart Copy. The main methods of recovering data from Smart Copies are as follows:

- **In-Place Recovery**
- **Selective Component Recovery** (for SQL Server and Hyper-V)
- **Manual Recovery**

4.4.3.7 In-Place Recovery

An In-Place Recovery is a full recovery option that restores all data in an EqualLogic PS Series volume. You can use this option for snapshot Smart Copies of NTFS data volumes or for specific application components.

1. Click to expand a server from the Tree Panel.
2. Click to expand the **Smart Copies** Master Node.
3. Click to expand the Smart Copy of the component that you want to restore.
4. Right-click on the Smart Copy with the desired date and time stamp and select **Restore**.

5. Click **Yes** to restore the Smart Copy.

---

Figure 89  In-Place Recovery

---

Figure 90  Restore Smart Copy
4.4.3.8 Selective Component Recovery
With a Selective Component Recovery (for Hyper-V or SQL), you can specify one or more files or components to restore. ASM/ME uses ODX for Windows Server 2012 and SAN Data Copy Offload for Windows Server 2008 during selective restore operations. This accelerates file copy operations by freeing up server resources and potentially decreasing the time it takes to perform selective restores. With ODX and SAN Data Copy Offload, the server sends SCSI copy commands directly to the PS Series volume, and the data is copied to the destination volume within the PS Series Group itself, thus consuming far less CPU and memory on the server.


4.4.3.9 Manual Recovery
A Manual Recovery can be used in ASM/ME to mount a Smart Copy to a Windows drive letter or mount point. You can then manually copy data from the mounted Smart Copy to your target destination.
4.4.3.10 Mounting a Smart Copy

Mounting a Smart Copy makes its contents accessible to the computer. To restore individual files contained within a Smart Copy, you need to mount it first. Once a Smart Copy is mounted, you can use it to access the data you want to restore. The Mount option supports both Windows drive letters and mount points. A mount point is an empty folder on an existing NTFS file system that is an access point for a new mounted file system. Use the Mount option to access the data in a Smart Copy.

1. Click to expand a server from the Tree Panel.
2. Click to expand the **Smart Copies** Master Node.
3. Click to expand the Smart Copy of the component that you want to restore.
4. Right-click on the Smart Copy with the desired date and time stamp and select **Mount**.

Figure 91  Mount a Smart Copy
5. Click **Next**.

![Figure 92 Mount Smart Copy Wizard](image)

6. Specify where to mount the volumes and click **Mount**.

![Figure 93 Specify where to mount the volumes](image)
Notice that the server now has a mounted drive of the Smart Copy. You can now browse the contents of the Smart Copy from Windows Explorer and recover data by manually copying from the mounted Smart Copy to the target destination.

Figure 94  Mounted Smart Copy
4.4.3.11 Unmount and logoff a Smart Copy

When you have mounted a Smart Copy and you have finished any restoration operations, you can unmount and logoff the Smart Copy. As part of the unmount operation, ASM/ME will automatically set the Smart Copy offline on the PS Series Group.

1. Click to expand a server from the Tree Panel.
2. Click to expand the Volumes Master Node.
3. Right-click on the mounted Smart Copy and select Unmount and Logoff.

Figure 95 Unmount and Logoff Smart Copy
4. The mounted Smart Copy will now be logged off from the server’s iSCSI Initiator and unmounted. Click **Logoff**.

![Unmount and Logoff Volume](image)

Figure 96 Unmount and Logoff Volume

4.5 Volume rethinning

HIT/Microsoft includes tools that perform rethinning and optional defragmentation operations on one or more volumes.

Support for **Unmap** is on by default in EqualLogic PS Series Firmware v6.0. This feature enables volume rethinning operations from Windows to succeed.

Unmap support is required for the volume rethinning tools of HIT/Microsoft. In Windows Server 2012, it is normally not necessary to use the rethinning tools included in HIT/Microsoft, unless any of the following is true:

- You are running a version of Windows prior to Server 2012
- You upgraded to Windows Server 2012 from an earlier version of Windows
- You moved a thin-provisioned volume from a system running an earlier version of Windows

Rethinning a volume with snapshots can increase the amount of occupied snapshot reserve space for the volume, because the rethinned space is no longer part of the volume, but is still part of any snapshots taken before the rethinning operation. In some cases, this can result in the snapshot reserve exceeding 100 percent, which can trigger the automatic deletion of older snapshots. Therefore, it is possible that you will not see an immediate increase in available storage on the PS Series Group from rethinning a volume, even if a significant amount of space was reclaimed. In these instances, as additional volume snapshots are generated and older snapshots are deleted over time, the resultant space savings from rethinning operations will increase.

When you rethin a volume using HIT/Microsoft, a large temporary file is first created on the volume. This file is always deleted at the end of the operation. If the volume does not have sufficient free space, it is recommended to adjust the amount of free space occupied by the temporary file during the rethin operation. In these instances, this will prevent the temporary large file from potentially occupying all of the free space on the volume.

If you take a Smart Copy of a thin-provisioned volume during an active volume rethinning operation, the Smart Copy can potentially include the large temporary file that is created for rethinning. The temporary file is deleted automatically when the rethinning operation completes, however it will still exist in the
Smart Copy in these cases. If you then restore from this Smart Copy, the restored volume can potentially have limited free space available. To avoid this, do not take Smart Copies during volume rethinning operations and schedules.

During rethinning operations on volumes containing Microsoft Hyper-V Virtual Machines, the Virtual Machines might temporarily pause during the operation. The Virtual Machines will resume normal operation after the rethinning operations complete. It is recommended to schedule rethinning operations during off-peak hours. Note that you cannot rethin a Cluster Shared Volume with HIT/Microsoft.

Host Integration Tools for Microsoft v4.5 and later include the following rethinning tools:

Table 9  HIT/Microsoft volume rethinning tools

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EqlRethin.exe</td>
<td>EqualLogic utility for Windows that performs volume rethinning and optional defragmentation operations on one or more volumes.</td>
</tr>
<tr>
<td>Invoke-RethinEqlVolume</td>
<td>EqualLogic PowerShell cmdlet that performs volume rethinning and optional defragmentation operations on one or more volumes.</td>
</tr>
<tr>
<td>ASM/ME GUI Menu</td>
<td>Enables you to rethin a volume on demand and to configure rethinning schedules.</td>
</tr>
</tbody>
</table>

4.5.1 Volume Rethinning With Windows

To manually rethin an EqualLogic volume with the Windows utility, EQLRethin.exe:

Run the `C:\Program Files\EqualLogic\Bin\EqlRethin.exe` command (with the desired options) from Windows.

![EQLRethin.exe](image)

Figure 97 EQLRethin.exe

Usage:

`EqlRethin [OPTION] [DRIVE LETTER:]`

Options

- `-h` `[--help]` Display Help screen
- `-a` `[--analyze]` Show the possible results of rethinning a volume but do not rethin
- `-d` `[--defragment]` Defragment volumes before rethinning.
  - Defragmenting a volume can potentially take a very long time. Dell recommends using the defragment option only on volumes that are known to be fragmented, or where performing the volume rethinning operation alone does not return as much space as expected.
- `-n` `[--nounmap]` Skip sending SCSI unmap commands to the volume
- `-p` `[--percentage]` arg <=90> Percentage of free space to rethin
4.5.2 Volume Rethinning With PowerShell

To manually rethin an EqualLogic volume with the PowerShell utility, `Invoke-ReThinEqVolume`:

1. Launch Dell EqualLogic PowerShell Tools from Windows.
2. Run the **Invoke-ReThinEqVolume** command (with the desired options) from PowerShell.

![Invoke-RethinEqVolume](image_url)
Command Syntax
Invoke-RethinEqlVolume -DeviceId <string> [-Percentage <Int32>] [-DoUnmap [<Boolean>]] [-Defragment [<Boolean>]] [-Analyze [<Boolean>]] [<CommonParameters>]

Table 10  New-EqlGroupAccess command parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deviceld</td>
<td>Specifies the drive letter (mount point) of a PS Series volume for which a session exists in this PowerShell runspace.</td>
<td>Yes</td>
</tr>
<tr>
<td>Percentage</td>
<td>Specifies percentage of free space on the volume to rethin. The default (and recommended) value is 90%. Minimum: 1%, maximum: 100%. Use this parameter only if you are concerned about the volume experiencing out-of-space errors during the rethinning operation.</td>
<td>No</td>
</tr>
<tr>
<td>DoUnmap</td>
<td>Specifies whether the cmdlet issues the SCSI UNMAP commands. Default is TRUE.</td>
<td>No</td>
</tr>
<tr>
<td>Defragment</td>
<td>Specifies whether the cmdlet runs the Windows disk defragmentation tool before attempting to rethin the volume. Defragmenting a volume can potentially take a very long time. Dell recommends using the defragment option only on volumes that are known to be fragmented, or where performing the volume rethinning operation alone does not return as much space as expected.</td>
<td>No</td>
</tr>
<tr>
<td>Analyze</td>
<td>If used, returns an estimate of the amount of space that could be reclaimed by a rethinning operation.</td>
<td>No</td>
</tr>
</tbody>
</table>

4.5.3  Volume Rethinning With ASM/ME
With ASM/ME, you can manually rethin a volume or schedule volume rethinning operations to occur regularly.
4.5.3.1 Rethin a Volume Manually

To manually rethin an EqualLogic volume with ASM/ME:

1. Launch ASM/ME from Windows.
2. Click to expand a server from the Tree Panel.
3. Right-click on a volume residing on an EqualLogic PS Series Group and select Rethin Volume.

Figure 99 Manually Rethin Volume in ASM/ME

4. Review the before and after volume utilization information and click Next.

Figure 100 Rethin a Thin-Provisioned Volume
5. Specify the percentage of unused volume space to be used for rethinning and click **Next**.

![Figure 101 Rethinning Parameters](image)

6. Review the summary and click **Close**.

![Figure 102 Rethinning Volume Complete](image)
4.5.3.2 Creating a Volume Rethinning Schedule

For Windows Server versions prior to 2012, you can optionally create schedules to specify the frequency of volume rethinning operations. Because volume rethinning operations occur automatically in Windows Server 2012, it is not necessary to create volume rethinning schedules for that Operating System.

To create a volume rethinning schedule with ASM/ME:

1. Launch ASM/ME from Windows.
2. Click to expand a server from the Tree Panel.
3. Right-click on a volume residing on an EqualLogic PS Series Group and select Schedule Rethinning.

![Schedule Rethinning](image)

Figure 103 Schedule Rethinning
4. Name the task, and select how often it will run. Dell recommends a volume rethinning schedule of once a week. It is recommended to schedule the task to run when the volume is under the lowest workload, especially for Daily or more frequent schedules.
   a. In the Task Name field, enter a name for the schedule.
   b. Click to select Daily, Weekly, Monthly or One time only.
   c. Optionally, enter a comment.
   d. Click Next.

![Figure 104 Schedule Name and Frequency](image)

5. Configure the start time and date for the task and when it should repeat. Depending on the previously selected schedule frequency, a different dialog box will be displayed. Specify the schedule options accordingly, then click Next.

![Figure 105 Schedule Options](image)
6. Specify the parameters to be used for rethinning the volume.
   a. Specify the percentage of unused volume space to be used for rethinning.
   b. Optionally, click to select the option to **Defragment the volume before rethinning**.
   c. Click **Create**.

![Figure 106 Rethinning Parameters](image)

7. The schedule will appear in the server’s Schedules node of ASM/ME. Optionally, right-click on the schedule to:
   - Run the schedule manually
   - Disable the schedule
   - Modify the schedule settings
   - Delete the schedule

![Figure 107 Volume Rethinning Schedule Operations](image)
4.6 EqualLogic PowerShell Tools

HIT/Microsoft includes PowerShell Tools which provide a powerful, comprehensive set of cmdlets for managing multiple PS Series Groups from a Microsoft PowerShell interface.

You can use the PowerShell Tools to automate routine storage management tasks and incorporate EqualLogic PS Series storage management into existing data center processing scripts.

The PowerShell Tools can be used for the following storage management operations:

- Create management sessions and register PS Series Groups to manage
- Perform maintenance tasks on individual storage arrays
- Manage PS Series Group configuration settings, including managing storage pools and CHAP authentication
- Manage volumes, snapshots, clones, template volumes and thin clones in a PS Series Group, including managing volume Access Control List (ACLs)
- Configure and manage PS Series Group replication settings
- Manage snapshot and replication schedules


4.6.1 Getting started with PowerShell Tools

1. Launch the Dell EqualLogic PowerShell Tools from Windows.
   a. For a full list of Dell EqualLogic PowerShell cmdlets, type: **Get-EqlCommand**
   b. For help on a specific cmdlet, type: **Get-Help <cmdlet>**

![Figure 108 Dell EqualLogic PowerShell Tools](image_url)
4.6.1.1  Configuring PS Series Group Access with EqualLogic PowerShell Tools

You can use the New-EqlGroupAccess EqualLogic PowerShell cmdlet to register multiple PS Series Groups that you want to manage.

1. Launch Dell EqualLogic PowerShell Tools from Windows.
2. Run the **New-EqlGroupAccess** cmdlet (with the desired options) from PowerShell.

![Figure 109 New-EqlGroupAccess](image-url)
**Command syntax**

New-EqlGroupAccess [-GroupName <string>] [-GroupWKAddress <string>] [-MgmtWKAddress <string>]

[-UserName <string>] [-Password <string>] [-Credential <PSCredential>] [-UseSSO]

[-VSSUserName <string>] [-VSSPassword <string>] [-SnapshotUserName <string>]

[-SnapshotPassword <string>] [-UseCHAPForDiscovery [<Boolean>]] [-UseHostBusAdapters [<Boolean>]] [-SkipConnect] [<CommonParameters>]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>GroupName</td>
<td>Specifies the name of a PS Series Group.</td>
<td>Yes</td>
</tr>
<tr>
<td>GroupWKAddress</td>
<td>Specifies the IPv4 or IPv6 address of a PS Series Group.</td>
<td>Yes</td>
</tr>
<tr>
<td>MgmtWKAddress</td>
<td>Specifies the management IP address for the PS Series Group, if the Group has been configured to use a management network.</td>
<td>No</td>
</tr>
<tr>
<td>UserName</td>
<td>Specifies the name of an administrator with access to the specified PS Series Group or the Active Directory (Domain\Username) user enabled on the Group. You cannot use this parameter with the UseSSO or Credential Parameters.</td>
<td>No</td>
</tr>
<tr>
<td>Password</td>
<td>Specifies the password of an administrator with access to the specified Group.</td>
<td>No</td>
</tr>
<tr>
<td>UseSSO</td>
<td>Specifies whether to enable SSO on the PS Series Group. If you specify the UserName parameter with Domain\Username, then Active Directory authentication will be set. You cannot use this parameter with the Credential or UserName and Password parameters.</td>
<td>No</td>
</tr>
<tr>
<td>VSSUserName</td>
<td>Specifies a VSS/VDS user name.</td>
<td>No</td>
</tr>
<tr>
<td>VSSPassword</td>
<td>Specifies password for the VSS/VDS user.</td>
<td>Yes</td>
</tr>
<tr>
<td>SnapshotUserName</td>
<td>Specifies the CHAP user name configured in the Group to allow access to Smart Copies.</td>
<td>No</td>
</tr>
<tr>
<td>SnapshotPassword</td>
<td>Specifies the password if the SnapshotUserName is specified.</td>
<td>No</td>
</tr>
<tr>
<td>UseCHAPForDiscovery</td>
<td>Specifies whether to use CHAP for discovery.</td>
<td>No</td>
</tr>
<tr>
<td>UseHostBusAdapters</td>
<td>Specifies whether to use HBAs instead of the default software iSCSI initiator.</td>
<td>No</td>
</tr>
<tr>
<td>SkipConnect</td>
<td>Skip automatic connection to the Group.</td>
<td>No</td>
</tr>
</tbody>
</table>

Remote Setup Wizard (RSW) allows you to initialize multiple PS Series arrays. With RSW, you can select storage arrays to create a new PS Series Group or you can add arrays to expand an existing PS Series Group.

HIT/Microsoft also includes the Remote Setup Command Line Interface (RSWCLI). Use the RSWCLI utility to configure PS Series Groups and MPIO settings from a command line or in scripts.


1. Launch Remote Setup Wizard from Windows.

2. Optionally, register on the Dell EqualLogic Support Site for access to the latest versions of EqualLogic software and documentation, then click Next.

3. In addition to providing the ability to initialize one or more PS Series arrays or expand an existing PS Series Group, RSW also includes links to ASM/ME that optionally enable you to manage settings across multiple Windows servers in your environment.
   a. Configure MPIO Settings
   b. Configure PS Series Group Access
4. The server must be connected to the same Ethernet segment as the array and Layer 2 multicasting must not be blocked between the server and the array. To discover uninitialized PS Series arrays that are accessible from the server, click **Initialize PS Series Array**.

5. RSW discovers all accessible and uninitialized arrays on the SAN and displays them.
   a. Select a PS Series array to initialize and click **Next**.
6. To initialize the array you selected, specify the following values:

Table 12  Member information

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Member Name</td>
<td>Unique name used to identify the array in the Group. The name string must be fewer than 64 alphanumeric characters or hyphens. No other characters are permitted. The first character must be a letter or number.</td>
</tr>
<tr>
<td>IP Address</td>
<td>Network address for the Ethernet 0 network interface, which must be an IPv4 address. Each member must have at least one network interface on the same subnet as the Group IP address.</td>
</tr>
<tr>
<td>Subnet Mask</td>
<td>Identifies the subnet on which the Ethernet 0 network interface resides.</td>
</tr>
<tr>
<td>Default Gateway</td>
<td>A default gateway is used to allow the Ethernet 0 network interface to communicate outside the local network. The default gateway must be on the same subnet as the Ethernet 0 network interface.</td>
</tr>
</tbody>
</table>

7. You can [create a new PS Series Group](#) or you can [add an array to expand an existing PS Series Group](#).
   a. To create a new Group, select **Create a new group** and click **Next**.
   b. To add the array to expand an existing Group, select **Join an existing group** and click **Next**.

![Figure 114 Member Information](image)
A.1 Creating a new PS Series Group

To create a new Group, specify the following values and click Next.

Table 13  New Group settings

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Name</td>
<td>Unique name used to identify the Group. The name string must be fewer than 64 alphanumeric characters or hyphens. The first character must be a letter or number.</td>
</tr>
<tr>
<td>Group IP Address</td>
<td>Network address for the Group. The Group IP address is used for Group administration and computer access to data stored in the Group. You cannot specify IPv6 addresses when initializing a Group.</td>
</tr>
</tbody>
</table>
| RAID Policy      | RAID policy configured on the first member of the Group:  
|                  | • RAID 6: Of the total number of disks installed in the array, two disks are used for parity and one disk is a spare. The rest are data disks.  
|                  | • RAID 6-Accelerated: This has the same disk configuration RAID 6, but is used on PS Series arrays that have a mix of hard disk drives (HDD) and solid state disk drives (SDD).  
|                  | • RAID 10: Striping on top of multiple RAID 1 (mirrored) sets, with one or two spare disks.  
|                  | • RAID 50 [Not Recommended]: Striping on top of multiple RAID 5 (distributed-parity) sets, with one or two spare disks. |
| Note: To use RAID 5, you must configure the RAID policy using the Group Manager CLI. If you are adding an array to an existing Group, use the Group Manager GUI or CLI to set the RAID policy for the new member. |
| Admin Password   | Password that overrides the factory-set password (grpadmin) for the default grpadmin account. The password must have 3 to 16 alphanumeric characters and is case-sensitive. |
| Membership Password | Password required when adding members to the Group. The password must have 3 to 16 alphanumeric characters and is case-sensitive. |
| CHAP User name   | CHAP user name and password used to enable Microsoft services (VSS and VDS) to access to the Group. The user name must have between 3 and 54 alphanumeric characters. |
| CHAP Password    | The password must have 12 to 16 alphanumeric characters and is case-sensitive. |
| DCB Enabled      | Enable Data Center Bridging (DCB). |
| VLAN ID          | Designates the VLAN ID if you are using DCB. |
Figure 115 New Group settings
A.2 Joining an existing PS Series Group

To join an existing Group, specify the following values and click Next.

Table 14 Join Group settings

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Name</td>
<td>Unique name used to identify the Group. The name string must be fewer than 64 alphanumeric characters or hyphens. The first character must be a letter or number.</td>
</tr>
<tr>
<td>Group IP Address</td>
<td>Network address for the Group. The Group IP address is used for Group administration and computer access to data stored in the Group. You cannot specify IPv6 addresses when initializing a Group.</td>
</tr>
<tr>
<td>Membership Password</td>
<td>Password required when adding members to the Group. The password must have 3 to 16 alphanumeric characters and is case-sensitive.</td>
</tr>
<tr>
<td>DCB Enabled</td>
<td>Enable DCB.</td>
</tr>
<tr>
<td>VLAN ID</td>
<td>Designates the VLAN ID if you are using DCB.</td>
</tr>
</tbody>
</table>

Figure 116 Join Group Settings
B Managing a PS Series Group with Group Manager

The foundation of the EqualLogic storage solution is the PS Series Group, which includes one or more PS Series arrays that can be managed as a single entity, called a Group.

With the addition of an EqualLogic FS Series appliance, a single PS Series Group can provide both block storage and NAS (Network Attached Storage), delivering a unified storage solution that is easy to configure and manage.

By default, a Group provides a single pool of storage. If you have multiple members, you can divide Group space into different storage pools and then assign members to those pools. Pools help you organize storage according to usage.

EqualLogic Group Manager is a Java-based GUI that provides detailed information on SAN and NAS configuration and enables Group administration tasks such as provisioning volumes, managing snapshots, scheduling replication, and other array management functions quickly and easily. You can access Group Manager from any computer with a Web browser and a connection to the EqualLogic SAN. In addition to network ports 3002 and 3003, the GUI uses the standard HTTP port (80).

B.1 Accessing the EqualLogic Group Manager GUI

1. Enter the Group IP address in a Web browser.
2. In the login dialog box, enter the grpadmin account name and the password that was specified when the Group was created.

![Figure 117 Login to Group Manager](image)

In addition to accessing the Group Manager GUI using a Web browser, you can install the Group Manager GUI on a local computer and run it as a stand-alone application.

For additional information on Dell EqualLogic Group Manager, refer to the *Dell EqualLogic Group Manager Administrator’s Manual* at [http://eqlsupport.dell.com](http://eqlsupport.dell.com).
B.2 Creating a Volume in an EqualLogic PS Series Group

Create volumes to access storage space in a pool, and modify volume size and attributes on-demand.

1. In the lower-left pane of the Group Manager GUI, click **Volumes**.
2. In the Activities pane, click **Create Volume**.

![Dell EqualLogic Group Manager](image)

Figure 118 Dell EqualLogic Group Manager
   a. Provide a **Name** and **Description** (optional) for the volume.
   b. Select the storage pool to be used for the volume.
   c. Click **Next**.

![Figure 119 Volume Settings – General Properties](image)

4. Specify Volume space and Snapshot space.
   a. In the **Volume size** field, enter the desired volume size.
   b. To optionally enable **thin provisioning**, click to select **Thin provisioned volume**. Use the sliders in the **Reported volume size** section to adjust settings. You can enable or disable thin provisioning on a volume at any time.
   c. In the **Snapshot space** section, enter the desired percentage of the volume to be used for snapshots.
   d. Click **Next**.

![Figure 120 Volume Settings - Space](image)
PS Series Groups use access control records to prevent unauthorized computer access to iSCSI targets (volumes or snapshots). To log in to a volume or snapshot, the server’s iSCSI initiator must comply with conditions specified in the access control record. For additional information on access control records, refer to the Dell EqualLogic Group Manager Administrator’s Manual at http://eqlsupport.dell.com.

5. To enable multiple initiators to access the volume, as in a cluster configuration, optionally click to select **Allow simultaneous connections from initiators with different IQNs**.

6. Specify one or more of the following options and click **Next**.

### Table 15 Volume Settings - iSCSI Access

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authenticate using CHAP user name</td>
<td>Restricts access to computers that supply the specified CHAP user name and its associated password (or “secret”). The credentials must match a local CHAP account or a CHAP account on an external RADIUS server.</td>
</tr>
<tr>
<td>Limit access by IP address</td>
<td>Restricts access to iSCSI initiators that match the specified IP address.</td>
</tr>
<tr>
<td>Limit access to iSCSI Initiator name</td>
<td>Restricts access to iSCSI initiators that match the specified name.</td>
</tr>
</tbody>
</table>

Figure 121 Volume Settings – iSCSI Access
7. Review the summary click **Finish**.

Figure 122 Volume Settings - Summary
C iSCSI optimization and recommendations

To ensure high availability of your storage configuration, review the following recommendations:

1. Install the latest Microsoft recommended updates from Windows Update.
2. Install the Dell EqualLogic Host Integration Tools for Microsoft.