Storage Management Initiative Specification - SMI-S

Overview

The release of Purity 4.6 introduced support for the Storage Management Initiative Specification (SMI-S). The SMI-S specification was created by the Storage Networking Industry Association (SNIA) to provide a unified interface for multiple storage vendors within a network. With the introduction of SMI-S support, FlashArray administrators can manage the array from an SMI-S client over HTTPS. A great example of an SMI-S client is Windows Server which introduced the Windows Storage Based Management feature starting with Windows Server 2012.

Functionality provided by the Pure Storage SMI-S provider includes the following profiles:

- **Block Services Package** -- Models existing storage capacity, the assignment of capacity to storage pools, and the allocation of capacity to be used by external devices or applications.
- **Copy Services** -- Provides a way to manage local mirrors, local snapshots and clones.
- **Disk Drive Lite Subprofile** -- Models disk drive devices.
- **FC Target Ports** -- Models the Fibre Channel specific aspects of a target storage system. Specializes the Generic Target Ports Profile.
- **Location Subprofile** -- Models location information.
- **Masking and Mapping Subprofile** -- Provides a way to manage which logical units (LUNs) are visible (exposed) to specific initiators through specific target ports.
- **Multiple Computer System Subprofile** -- Models multiple systems that cooperate to present a “virtual” computer system with additional capabilities or redundancy.
- **Physical Package** -- Models information about a storage system's physical package and optionally about internal sub-packages.
- **Software Subprofile** -- Models software or firmware installed on a computer system.
- **iSCSI Initiator Profile** -- Models a network interface that acts as a client to an iSCSI target device.
- **Indications Profile** -- Provides support for event notifications. This can be a component profile of any other profile, and is a specialization of the DMTF Indications profile that adds SNIA elements and constraints.

Read the [SMI-S Provider Guide](#) for further details.

Managing SMI-S

The implementation model with our SMI-S provider is embedded within Purity vs using a Proxy which requires more complex management. An administrator has just two services to enable as shown below, these are disabled by default.

1. **Service Location Protocol (port 427)** -- This protocol is used by SMI-S clients as a directory service to identify resources.
2. SMI-S Provider (HTTPS, port 5989) -- FlashArray administrators use the SMI-S provider to manage the FlashArray through an SMI-S client (Eg. Windows Server, System Center Virtual Machine Manager, SolarWinds, ServiceNow).

The SMI-S provider is optional and must be enabled before use. The services can be enabled through the Web Management interface or via the Purity Command Line Interface (CLI) using `puresmis`. Below is an example of using the Web Management interface and `puresmis` command.

Example of enabling using the Purity CLI:

```
pureuser@solutions-lab-m20-c09-29> puresmis list
Name                      SLP       WBEM-HTTPS
solutions-lab-m20-c09-29  disabled  disabled
pureuser@solutions-lab-m20-c09-29> puresmis enable
Name                      SLP      WBEM-HTTPS
solutions-lab-m20-c09-29  enabled  enabled
```

Another option is to use a Pure Storage PowerShell cmdlet, `New-PfaCliCommand`, this runs a command from PowerShell which passes the CLI command to the FlashArray for configuration.

```
PS C:\> New-PfaCLICommand -EndPoint 10.0.0.1 -UserName pureuser -CommandText "puresmis enable"
```

Windows Server SMI-S Client

Windows Server 2012, 2012 R2 and 2016 can function as an SMI-S client using the Windows Standards-Based Storage Management feature that is included with Windows Server. This is a quick and simple way to test the functionality of the Pure Storage SMI-S provider. To enable Windows Server as an SMI-S client the Windows Standards-Based Storage Management feature needs to be installed using either the Server Manager or Windows PowerShell.

**Server Manager**

1. Open up **Server Manager**. By default Server Manager starts when logging into Windows Server.
2. Click **Manage** and select **Add Roles and Features** to start the Add Roles and Features Wizard.
3. Navigate to the **Features** step of the wizard.
4. Scroll down in the list of Features and check the **Windows Standards-Based Storage Management** feature.
5. Click **Next** and **Install**.

The below screenshot is from Windows Server 2016, but Windows Server 2012 and 2012 R2 are the same with the exception of the dialog borders.

**Windows PowerShell**

The Windows Feature name was changed to **WindowsStorageManagementService**.

```
PS C:\> Add-WindowsFeature -Name 'WindowsStorageManagementService'
```

<table>
<thead>
<tr>
<th>Success</th>
<th>Restart Needed</th>
<th>Exit Code</th>
<th>Feature Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>No</td>
<td>Success</td>
<td>{Windows Standards-Based Storage Management}</td>
</tr>
</tbody>
</table>

**Using the SMI-S Provider with Windows PowerShell**

Once this feature is added to the instance of Windows Server, using the SMI-S Provider is very straightforward. The first task is to register the SMI-S Provider. The PowerShell to register the provider is below. The **Get-Credential** will provide a dialog to enter credentials that will be used with the **Register-SmisProvider** cmdlet.

```
PS C:\> $Creds = Get-Credential
```
The SMI-S Provider is registered there are a few cmdlets that can be used to check the FlashArray. Using `Get-StorageProvider` will show that the FlashArray registered is from the Manufacturer PureStorage and it is of Type SMI-S. The `Get-StorageSubSystem` will retrieve details about the FlashArray’s HealthStatus, OperationalStatus and FriendlyName.

```powershell
PS C:\> Get-StorageProvider

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMP</td>
<td>Windows Storage Management Provider</td>
<td>Microsoft Corporation</td>
</tr>
<tr>
<td>SMI-S</td>
<td>10.0.0.1</td>
<td>PureStorage</td>
</tr>
</tbody>
</table>

PS C:\> Get-StorageSubSystem

<table>
<thead>
<tr>
<th>FriendlyName</th>
<th>HealthStatus</th>
<th>OperationalStatus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Storage on SERVER01</td>
<td>Healthy</td>
<td>OK</td>
</tr>
<tr>
<td>solutions-lab-m20-c09-29</td>
<td>Healthy</td>
<td>OK</td>
</tr>
</tbody>
</table>
```

Next is to update the cache of the PureStorage provider and associated child objects from the FlashArray.

```powershell
Update-StorageProviderCache -Name 10.0.0.1 -DiscoveryLevel Full -Manufacturer PureStorage
```

The below screenshot illustrates the tasks being performed as indicated by the Windows PowerShell progress notifications.

Now the physical disks can be viewed from a specific storage vendor. In the below example the display shows all of the drives and details for the FlashArray//M20.

```powershell
PS C:\> Get-PhysicalDisk -Manufacturer PureStorage | Format-Table -AutoSize

<table>
<thead>
<tr>
<th>FriendlyName</th>
<th>SerialNumber</th>
<th>CanPool</th>
<th>OperationalStatus</th>
<th>HealthStatus</th>
<th>Usage</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

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The last example to show is how to provision a new volume. The name of the volume is SMIS-VOL and will be 2 TB in size. Along with showing how to create a new volume the Web Management interface shows that the volume has been created and ready for use.

```powershell
PS C:\> New-StorageSubsystemVirtualDisk -StorageSubSystemFriendlyName solutions-lab-m20-c09-29 -FriendlyName 'VOLUME01' -Size 2.5TB
```

<table>
<thead>
<tr>
<th>FriendlyName</th>
<th>ResiliencySettingName</th>
<th>OperationalStatus</th>
<th>HealthStatus</th>
<th>IsManualAttach</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOLUME01</td>
<td></td>
<td>OK</td>
<td>Healthy</td>
<td></td>
<td>2.5 TB</td>
</tr>
</tbody>
</table>

The below screenshot of the FlashArray management interface shows the new volume, VOLUME01, has been created.

The final task is to unregister the SMI-S provider.

```powershell
Unregister-SmisProvider -ConnectionUri https://10.0.0.1
```
Technical References

- Storage Networking Industry Association (SNIA)
- Storage Management Initiative Specification (SMI-S) Releases
- SMI-S Conformance Testing Program Official Results
- Pure Storage SMI-S Provider Guide
- Storage Management Technical Specification, Part 3 Common Profiles Version 1.6.1, Revision 5
- Storage Management Technical Specification, Part 4 Block Devices Version 1.6.1, Revision 5