Microsoft Perspective on SMI-S

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Abstract

- Microsoft is working on adopting SMI-S standards for Windows storage components and services.
- Goals for this presentation
  - Share Microsoft thoughts about SMI-S profiles considered for Windows storage components and services.
  - Share insights into some Microsoft SMI-S compliant providers prototypes.
Agenda

- Standards
- WS-Management
- SMI-S Providers on Windows
- SMI-S for Microsoft Windows Storage Components
- Microsoft SMI-S Prototypes currently under development:
  - File Sharing Management
  - iSCSI Target Management
  - Disk and Volume Management
Standards Based

- Investigate adding SMI-S support based on
  - SMI-S v1.3
  - DMTF CIM 2.15
  - DMTF WS-Management Specifications.
    - WS-Management 1.0 [DMTF-DSP0226]
    - WS-CIM Mapping 1.0 [DMTF-DSP0230]
    - WS-Management – CIM binding [DMTF-DSP0227]
WS-Management

- WS-Management is a standard that has been ratified final by DMTF in April 2008.
- Builds on top of existing web service standards
  - Compatible with CIM (through WS-CIM mapping).
- WinRM (Windows Remote Management) is the Microsoft implementation of WS-Management Protocol.
SMI-S Profiles can be implemented as WMI (Windows Management Instrumentation) providers.

WMI in combination with WinRM allows SMI-S profiles to be implemented as WMI Providers.
SMI-S WMI Providers

WS-MAN and SMIS WMI Providers architecture

WS-MAN Client

HTTP/HTTPS

WinRM (WS-Man)

Windows Management Service (CIM Object Manager)

CIM / WMI Repository

WMI infrastructure

WMI providers and managed objects

SNMP WMI Provider

SMIS ServerProfile Provider

SNMP Managed Object(s)

SMIS NAS Profile Provider

Win32 Managed Object(s)

SMIS VolumeManagement Profile Provider

More SMIS Profile Provider(s)

More MS Managed Object(s)

MS iSCSI Target Ports Subprofile Provider

MS iSCSI Target Managed Object(s)

MS FileSharing Managed Object(s)

MS VolumeManaged Managed Object(s)
SMI-S for Windows Storage Components

Windows storage components considered for SMI-S

- File Sharing
- Microsoft iSCSI Target
- Windows Disk and Volume Management
- Initiator Ports
  - FC HBA
  - iSCSI Initiator
- Storage in Windows Failover Cluster Environment
SMI-S prototypes currently under development for Windows storage component/services:
- File Sharing Management
- iSCSI Target Management
- Disk and Volume Management
- SMI-S servers required profiles
  - Server
  - Profile Registration
NAS Provider Architectural View

SMI-S Client

WinRM

WMI

SMI-S NAS Provider

Microsoft File Sharing Management APIs
SMI-S Profiles being prototyped to provide management for Microsoft File Sharing:

- Self-Contained NAS
- Indication
- File System
- File Storage
- File Export
- Physical Package
- Block Services
- Health
- File Export Manipulation
SMI-S methods being prototyped for Microsoft File Sharing:

- File Export Manipulation
  - CIM_FileExportService
    - CreateExportedShare
    - ModifyExportedShare
    - ReleaseExportedShare
Microsoft iSCSI Target Ports
Provider Architectural View

SMI-S Client

WinRM

WMI

SMI-S iSCSI Target Ports Provider

Microsoft iSCSI Target Engine
SMI-S Profiles being prototyped to provide management for Microsoft iSCSI Target:
- Array
- iSCSI Target Ports
- Block Services
- Physical Package
- Health
- Masking and Mapping
Microsoft iSCSI Target Management

- **Microsoft iSCSI Target StorageVolumes and StoragePools**
  - Microsoft iSCSI Target is a software iSCSI Target which resides on a Windows file system.
  - Microsoft iSCSI Target Disks (LUNs) are:
    - Represented as instances of CIM_StorageVolumes.
    - File based.
    - Created on top of File Systems which require healthy Windows Volumes.
  - Windows Volumes will form the Microsoft iSCSI Target SMI-S StoragePools (Concrete Pool and a Primordial Pool)
Microsoft iSCSI Target Management UML Diagrams:

- UML: Microsoft iSCSI Target StorageVolumes and StoragePools
- UML: Microsoft iSCSI Target File-Based Disks (LUNs) and StorageVolumes
- UML: Microsoft iSCSI Target StorageVolumes – The Big Picture
## Microsoft iSCSI Target Management

<table>
<thead>
<tr>
<th>Microsoft Object</th>
<th>SMI-S/CIM Object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft iSCSI Target Disk (LUN)</td>
<td>CIM_StorageVolume (iSCSI Target Ports Subprofile)</td>
</tr>
<tr>
<td>• Backed by a file on a Windows Volume</td>
<td></td>
</tr>
<tr>
<td>Microsoft iSCSI Target <em>Target</em> (iSCSI Node)</td>
<td>CIM_SCSIProtocolController (iSCSI Target Ports Subprofile)</td>
</tr>
</tbody>
</table>
Microsoft iSCSI Target Active Management

- SMI-S methods being prototyped for Microsoft iSCSI Target:
  - iSCSI Target Ports
    - CIM_iSCSIConfigurationService
      - CreateiSCSINode
      - DeleteiSCSINode
  - BlockServices
    - CIM_StorageConfigurationService
      - CreateOrModifyElementFromStoragePool
      - ReturnToStoragePool
  - Masking and Mapping
    - CIM_ControllerConfigurationService
      - ExposePaths
      - HidePaths
SMI-S Profiles being prototyped for Disks and Volumes:

- Host Elements
  - Disk Partition
- Block Devices
  - Block Services Package
  - Disk Drive
  - Disk Drive Lite
  - Extent Composition
Disk and Volume Management

- Block Devices (Cont.)
  - Extent Mapping
  - Pool Management Policy
  - Storage Virtualizer
  - Volume Composition
  - Block Storage Views
  - Block Server Performance
  - Copy Services
Disk and Volume Management

- Block Devices (Cont.)
  - Disk Sparing
  - Block Server Performance
  - Pool Management Policy
- File Systems
  - File Storage
  - File System Quota
## Disk and Volume Management

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<tr>
<th>Windows Object</th>
<th>SMI-S/CIM Object</th>
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<tbody>
<tr>
<td><strong>Disk Pack or Disk Group</strong></td>
<td><strong>CIM_StoragePool (Concrete)</strong></td>
</tr>
<tr>
<td>• A logical grouping of disks. For basic disks, the relationship between a disk and its pack is one to one. For dynamic disks, a pack may contain multiple disks.</td>
<td></td>
</tr>
<tr>
<td><strong>Disk</strong></td>
<td><strong>CIM_StorageExtent</strong></td>
</tr>
<tr>
<td>• An OS disk device exposed by Windows PNP. May be backed by an internal disk drive, direct attached storage, or, a LUN exposed by a HW array.</td>
<td><strong>CIM_SystemDevice</strong></td>
</tr>
<tr>
<td><strong>Disk Partition</strong></td>
<td><strong>CIM_GenericDiskPartition</strong></td>
</tr>
<tr>
<td>• A contiguous set of bytes on an OS disk device. May be a Primary partition or and Extended partition.</td>
<td><strong>CIM_StorageVolume (on basic disks only)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>CIM_SystemDevice</strong></td>
</tr>
</tbody>
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## Disk and Volume Management

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<th>Windows Object</th>
<th>SMI-S/CIM Object</th>
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<tr>
<td>Logical Disk</td>
<td>• CIM_LogicalDisk</td>
</tr>
<tr>
<td></td>
<td>• CIM_StorageVolume</td>
</tr>
<tr>
<td></td>
<td>• CIM_SystemDevice</td>
</tr>
</tbody>
</table>

- A contiguous set of bytes on an OS disk device. A type of disk partition with the characteristic that it is contained within an Extended partition.
## Disk and Volume Management

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<th>Windows Object</th>
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<tr>
<td><strong>Volume</strong></td>
<td><strong>CIM_StorageExtent</strong></td>
</tr>
<tr>
<td>• A volume object as seen by the Windows operating system. Windows volumes are composed of disk extents. A basic disk volume is composed of a set of contiguous bytes on a single disk. A dynamic disk volume may have multiple extents located on multiple disks.</td>
<td><strong>CIM_StorageVolume</strong></td>
</tr>
<tr>
<td><strong>LUN</strong></td>
<td><strong>CIM_StorageExtent (OS provider view)</strong></td>
</tr>
<tr>
<td>• A logical unit of storage exposed by a HW array or PCI RAID card.</td>
<td><strong>CIM_StorageVolume (HW array provider view)</strong></td>
</tr>
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</table>
Disk and Volume Management

Figure 91 - Storage Virtualizer System Instance
Disk and Volume Management

- UML OS_01, LUN to Disk to StoragePool.
- UML OS_06, Disk, partition and volume devices.
- UML01, Shows Disk and Volume Management to NAS, and to iSCSI
Transition Points Between Providers

- LUN to OS Disk
  - LUNs are represented as instances of CIM_StorageVolumes by the HW providers.
  - Disk and Volume Management provider storage pools will be composed of extents associated with LUNs and IDE disks.
  - LUNs are represented using the CIM_StorageExtent object by the Disk and Volume Management provider.
  - OS Disks are mapped to LUNs using the CIM_LogicalIdentity association.
    - The Disk and Volume Management provider will build the CIM_LogicalIdentity association by matching OS disks to their underlying LUNs using the mode page 80/83 information.
Transition Points Between Providers (Cont.)

- OS Volume to iSCSI Target LUN
  - OS Volumes are represented as using the CIM_StorageExtent object by the iSCSI Target provider.
  - iSCSI Target provider storage pools will be composed of extents associated with OS Volumes.
  - OS Volume extents are represented using the CIM_LogicalDisk and CIM_StorageVolume objects by the Disk and Volume Management provider.
  - OS Volumes are mapped to iSCSI Target provider LUNs using the CIM_LogicalIdentity association.
    - The iSCSI Target provider will build the CIM_LogicalIdentity association by querying the Disk and Volume Management provider for lists of LogicalDisks and StorageVolumes.
Transition Points Between Providers (Cont.)

- **OS Volume to NAS File System Directory**
  - OS Volume directories are represented using the CIM_LogicalFile object by the NAS provider.
  - OS Volume extents are represented using the CIM_LogicalDisk and CIM_StorageVolume objects by the Disk and Volume Management provider.
  - OS Volumes may be associated with a CIM_LocalFileSystem object. The Disk and Volume Management provider makes this association when it is present.
  - CIM_LocalFileSystem objects are mapped to the NAS provider’s CIM_LogicalFile using the FileStorage association.