Block Storage Management using Microsoft System Center 2012 Virtual Machine Manager and SMI-S

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Session Objective(s):
Embrace storage automation – eliminate human error and enable on-demand consumption
Drive down the cost of storage – CAPEX and OPEX opportunities
Manage Storage at Scale – standardization and orchestration is vital to help drive efficiency

Storage management is native in Windows Server 2012

VMM 2012 SPI Beta available now
Customer Pain Points

- I have no visibility into storage. I do not know how my VMs and Hyper-V hosts relate to the underlying storage environment.
- I want to adopt the private cloud model in my datacenter. I need storage on-demand. Today when I need storage, the request can take days or weeks and sometimes is done incorrectly.
- I want to automate more storage tasks but I simply don’t have the time or expertise to do this.
Our Value Proposition

Connecting the Dots – E2E Discovery and Mapping

Storage On Demand – Minimize Deployment Friction

Storage Automation – Reduce Cost and Complexity

Foundation for the Future

Ease of Use

Breakthrough Insight

Storage on Your Terms
SC 2012 RTM VMM – Architecture

**Storage Management Service**
- Discovery of Array, Pool and LUNS
- LUN create, snapshot, clone
- Mask and Unmask

Discovery of portals and targets
- Log on & log off

**VMM Server**
- Storage Management Service
- VDS
- VDS h/w provider

**Host**
- iSCSI initiator
- HBA Provider
- NPIV Provider

- Enumerate
- Rescan
- Mount/UnMount
- Volume to Disk mapping
- Disk to LUN mapping

**FC Array / ISCSI Target**
- LUN

**SAN admin tool**

** Deprecated**
- Discovery of LUNS Mask and Unmask
- Set ISCSI CHAP

**SMI-S Provider**
- Enumerate
- Rescan
- Mount/UnMount
- Volume to Disk mapping
- Disk to LUN mapping

**Port to LUN mappings**
- Virtual to Physical port mappings
- Create & delete Virtual Ports
SC 2012 SP1 VMM – Architecture

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LUN create, snapshot, clone
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**VMM Server**
- SMI-S Provider
- Storage Management Service
- SMAPI

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SMP provider API

- Storage Management API and Passthrough Providers both communicate through the SMP schema
  - Layer is implemented as WMIv2 (new!) providers
    - Most PowerShell® cmdlets are auto-generated from the MOF
  - Replaces VDS interfaces for hardware and OS objects
  - Abstracts classes from SMI-S
    - Most SMP classes are aggregated by traversing associations and combining properties from multiple CIM classes
  - Vendors can implement a “native” SMP provider to this same schema
    - Must write a WMIv2 provider
    - Has access to the same functionality including “passthrough”
  - The Standard-based Storage Management Service maps the SMP schema to industry standard SMI-S
    - Provides extensive discovery, security, caching and other services
    - Allows the use of off-the-shelf providers using CIM-XML or WMI transports
    - Array, Virtualizer and Host Hardware RAID Controller profiles are surfaced all the way through the stack
    - Other profiles (e.g., Fabric) can be accessed using “passthrough” capability

- Grammar matching required
  - Microsoft “nouns” versus SMI-S definitions, e.g.
    - VirtualDisk = StorageVolume
    - PhysicalDrive = DiskDrive
Microsoft Standard-Based Storage Management Service

- Microsoft Standard-Based Storage Management Service is an SMI-S client
  - Manages a wide range of storage arrays through the following standards:
    - Storage Management Initiative - Specification (SMI-S)
    - Common Information Model (CIM)
    - Service Location Protocol (SLP)
- Optional component on Server product (not Windows client)
  - Installed through Server Manager’s “Add Roles and Features” or using the Add-WindowsFeature cmdlet
- Allows the Microsoft Storage Management API layer to communicate with SMI-S compliant servers
  - Application writers will not require extensive SMI-S knowledge
    - But can leverage the full range of functionality if they do have this
  - Higher level unified interface
- Supports Discovery, Provisioning, Monitoring
Operations

- **Discovery**
  - Search for SMI-S agents via SLP or manually configure
    - Credentials are securely cached
    - Maps Windows users to SMI-S provider creds
  - Arrays (Subsystems, Pools, Volumes, etc.)

- **Provisioning**
  - Creation/Deletion/Modification of Storage pools
  - Creation/Deletion/Modification of Storage Volumes
  - Masking/Unmasking/Mapping of logical units

- **Replication**
  - Snapshots
  - Clones

- **Monitoring** (through indications and polling of health properties)
  - Performance (through passthrough)
  - Instance lifecycle changes (create, modify, delete)

- **Passthrough** for operations not covered by the SMP schema
  - This is WMI (CIM) based
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<tr>
<td>Show</td>
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End-to-end Mapping
- Reconcile data from Hyper-V and storage arrays
- Identify storage in the context of a VM, host, or cluster

Host and Cluster Storage Capacity Management
- Adding storage to a host or cluster includes unmasking, initialization, partitioning, formatting, and CSV cluster resource creation (in shared storage case)

Rapid Provisioning
- Creation of new VMs leveraging the SAN to copy storage volume containing VHD
- Deploy to host or cluster at scale
Over 450 PowerShell cmdlets product wide
25 cmdlets specific to storage automation

- **StorageProvider**
  - Add/Get/Set/Remove

- **StorageArray**
  - Get/Set

- **StoragePool**
  - Get/Set

- **StorageClassification**
  - New/Get/Set/Delete

- **StorageLogicalUnit**
  - New/Get/Set/Delete
  - Register/Unregister

- **StorageDisk**
  - Get/Set
  - Mount/Unmount

- **StorageVolume**
  - Get/Set

- **InternetSCSIHBA**
  - Set
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The Fantastic 12 of System Center Virtual Machine Manager

1. End to End Mapping
2. Storage Classification
3. Allocation and Assignment
4. Rapid Provisioning

Block Storage - Array, pool, logical units, SPC

Host Storage – Disks Volumes, Initiators, Ports

Correlation of Block Storage to Host Storage

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2. Storage Classification
2. Storage Classification
3. Allocation and Assignment
4. Rapid Provisioning

Indicates Storage SLA or Performance Guarantee
Assigned to Storage Pool and Inherited by Logical Units
Placement Based on Classification and Usage
demo

Discovery and Mapping
Allocation of Logical Units and Pools to Host Groups

Assignment of (unmasking and masking) Logical Units

Creation and Deletion of Logical Units (Thick and Thin)

Host Disk Initialization, Partitioning, Volume Formatting
demo

Host Group and Host, Cluster Storage Management
SAN based VM Creation using Snapshot/Clone

VM Creation to Host and Cluster

One VM per LUN
demo

Rapid Provisioning
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3. SAN Migration
5. SAN Migration
5. Array Onboarding
6. Cluster Storage Management

Unmasking and Masking
iSCSI Initiator Log-On/Log-Off
NPIV vPort Creation/Deletion
Persistent iSCSI Sessions (Explicit or Subnet Match)
Initiator Log-On
SPC per Cluster or per Node in Cluster
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5

7

7

8

9

Cluster Storage Management

Cluster Storage Management

Storage Automation

Scalable Provisioning

Disk Initialization, Partitioning, and Formatting

Add and Remove Cluster Available Storage

Add and Remove Cluster Shared Storage

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6

Storage Automation

8

Scalable Provisioning

9

Scalable Provisioning

9

Extensive Array Support

10

25 Cmdlets Specific to Storage Automation

Scalable Parallel Operations on Large Clusters

Rapid Provisioning at Scale
The Fantastic 12 of System Center Virtual Machine Manager

VMM Tested – NetApp, EMC, HP, Dell EQL, LSI

Partner Testing – Hitachi, Fujitsu, Dell, IBM, StarWind

Fiber Channel, ISCSI and SAS arrays supported.
SMI-S 1.4 Providers

Attendance at SMILab Plugfests

SMI-S Supported in Win8
The Fantastic 12 of System Center Virtual Machine Manager

Test Harness Developed by VMM Team

Provided to All Partners

Primitives and End to End Scenarios (Functionality and Scale)
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CIM operations using Pass Through

```powershell
# Set up CimOperationOptions with the server, namespace and credentials
$Opt.SetCustomOption("TargetNamespace", "root/ontap", $false)
$Opt.SetCustomOption("TargetPassword", "!!123abc", $false)
$Opt.SetCustomOption("TargetUsername", "ntap", $false)
$ns = "root/Microsoft/Windows/Storage/PT"
$se = New-CimSession

# Retrieve class schema
$se.GetClass($ns, "CIM_StorageVolume", $Opt)

# Retrieve subclasses
$se.EnumerateInstances($ns, "CIM_StorageVolume", $Opt)

# Retrieve all instances of a super class and go through the Enumeration
$volumeEnum = $se.EnumerateInstances($ns, "CIM_StorageVolume", $Opt).GetEnumerator()
while ($volumeEnum.MoveNext())
{
    $ptVolume = $volumeEnum.Current
    ($ptVolume.CimInstanceProperties | where Name -eq "ElementName").Value
}```
demo

CIM Pass-through API
Resources - Microsoft

- Documents
  - Microsoft SMI-S Requirements (Block, Indications, FC Switch requirements)

- Window Server 2012
  - Standards-Based Storage Management

- File and Storage Blog
Resources - Microsoft

- System Center Virtual Machine Manager 2012 SP1 Beta
- SC 2012 - VMM SMI-S Supported Providers
- VMM Provider Validation Overview
- VMM Validation Test Harness
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