Managing Storage for Virtual Machines using SCVMM 2008 R2

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Session Objectives

- How VMM manages virtualization and storage
- Walk thru of VM migrations and storage
- Share challenges of a heterogeneous storage environment
Key Takeaways

- Storage is a key pillar of virtualization
- Storage and virtualization are moving targets
- Limited adoption of standards for storage management
- COLLABORATE WITH US TO DELIVER VALUE TO THE CUSTOMERS!
Topics we will cover

- VMM basics
- VMM & SANs
- VMM & Clusters
- Storage Migration and Rapid Provisioning
- Post VMM plans
VMM BASICS
What is VMM’s challenge?

- Manages 100s of hosts
- Manages 1000s of VMs

- Datacenters demand agility and availability
  - VMs need to be created & deployed asap
  - VMs need to move around with minimal or no service interruption
  - VMs need to be highly available (HA)
What storage does a VM need

VM

VHD

Pass-thru disk
Types of VM storage

- **Local**

- **Remote** (dedicated)

- **Remote** (shared)
VMM & SAN
VM on a SAN

- Disk0
- Disk1
- Disk4
- Disk5 (offline)
- HBA
- LUN0
- LUN1
VMM on a SAN: Technologies

- Discovery of portals and targets
- Log on & log off

- Discovery of LUNs
- Mask and Unmask
- Set ISCSI CHAP

- Port to LUN mappings

- Virtual to Physical port mappings
  - Create & delete Virtual Ports

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

FC Array / ISCSI Target

SAN admin tool

Host

VDS

iSCSI initiator

HBA Provider

NPIV Provider

VMM

VDS

VDS h/w provider

SAN admin tool
SAN Migration Requirements

- VDS hardware provider
- VM can have multiple LUNs.
- Each LUN needs to be dedicated to VM.
- Available for Hyper-V hosts.
VM SAN Migration

VMM

Host

VM1

LUN1

VM1.VHD

Pass Through

LUN2

Host
SAN Migration (FC)

- LUN Migration process
  - SetMask() VDS API is used
  - Mask LUN from source host
  - UnMask LUN to target host

- FC Requirements
  - VDS provider should be masking capable.
  - Source and Destination hosts can see LUN
NPIV (N-port Virtualization)
SAN Migration (NPIV)

- **LUN Migration**
  - Deletes Vport from source host.
  - Create Vport on target host.

- **NPIV Requirements**
  - Source and Destination Hosts connected to same SAN (via FC fabric).
  - Source and Destination HBA’s are NPIV capable.
  - NPIV WMI provider installed on Host
NPIV Interface

- class MSFC_FibrePortNPIVMethos
  - CreateVirtualPort
  - RemoveVirtualPort

- class MSFC_VirtualFibrePortAttributes

- class MSFC_FibrePortNPIVAttributes

- class MSFC_NPIVLUNMappingInformation
SAN Migration (iSCSI Mask)

- LUN Migration process
  - SetMask() VDS API is used
  - Mask LUN from source host
  - UnMask LUN to target host

- iSCSI Mask migration requirements
  - Source and target hosts logged into iSCSI target.
  - VDS provider is Masking capable.
SAN Migration (iSCSI Logon/Logoff)

- **LUN Migration**
  - iSCSI initiator logoff from source host and
  - iSCSI initiator logon on destination host.

- **iSCSI Logon/Logoff migration requirements**
  - Source and target hosts can access iSCSI target.
  - One LUN per iSCSI Target
SAN Vendors

- iSCSI
  - EMC, NetApp, EqualLogic, MS ISCSI

- FC
  - EMC, HP, NetApp, LSI, Compellent, Hitachi

- NPIV (N-Port Virtualization)
  - Emulex, Qlogic and Brocade HBA
VMM & HYPER-V CLUSTER
Cluster Storage

- Dedicated storage
  - Windows cluster disk resource
  - 3rd party custom disk resource (e.g. Symantec/Veritas)

- Shared storage
  - Cluster Shared Volume (Win2k8 R2)
  - 3rd party cluster file systems (e.g. SANBOLIC MelioFS)
VM on a Dedicated Cluster Storage

Host Cluster

VM1

VM2

Disk0

VHD

Disk4

Disk5

VHD

Y:

HBA

LUN1

LUN2

SAN

Storage Developer Conference

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VM on a Cluster Shared Storage
Hyper-V Cluster VM Migration

- Quick Migration
  - Win2k8, Win2k8 R2

- Live Migration
  - Win2k8 R2
  - Live migration queuing
Cluster SAN Migration

- Cluster SAN Migration requirements
  - Dedicated Storage
  - Meets all requirements of SAN Migration.
  - Only FC and iSCSI SAN migrations supported.

- LUN Migration
  - Deletes Disk resource from source cluster.
  - Disconnects LUN from all source nodes.
  - Connects LUN to all target nodes.
  - Creates Disk resource on target cluster.
STORAGE MIGRATION & RAPID PROVISIONING
Quick Storage Migration

- **Purpose**
  - Allow migration of virtual storage device attached to a **running** VM with minimal service interruption

- **Scenarios**
  - Low disk space
  - Migration from old SAN to new SAN
  - Upgrading & downgrading storage tier
  - Standalone LUN ↔ CSV
  - Site to site migration (consolidation)
QSM Algorithm

VM

VHD

Save State

Snapshot

VHD

Save State

Snapshot
# Migration Summary

<table>
<thead>
<tr>
<th>Migration Type</th>
<th>VM State</th>
<th>When</th>
<th>Expected Downtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIVE</td>
<td>Running</td>
<td>VM is highly available &amp;&amp; source and target are nodes of win2k8 r2 cluster</td>
<td>None</td>
</tr>
<tr>
<td>QUICK</td>
<td>Any</td>
<td>VM is HA &amp;&amp; when live migration is not possible.</td>
<td>&lt; 1 Min</td>
</tr>
<tr>
<td>SAN</td>
<td>Any</td>
<td>Meets SAN migration requirements &amp;&amp; it can’t be migrated LIVE/Quick.</td>
<td>&lt; 2 Mins</td>
</tr>
<tr>
<td>QSM</td>
<td>Running</td>
<td>VM storage is changed</td>
<td>&lt; 2 Mins</td>
</tr>
<tr>
<td>LAN</td>
<td>Any</td>
<td>When none of the above is possible.</td>
<td>&lt; 1 hour</td>
</tr>
</tbody>
</table>

VMM chooses the **best** VM migration type
Rapid Provisioning

- **Purpose**
  - Decrease deployment time for VMs
  - Allows customers to use SAN based LUN cloning instead of copying VHDs over the network
  - Can also be used for differencing disks

- **Scenarios**
  - Automated and rapid deployment of large systems
    - VDI large scale deployments
  - Automated and concurrent deployment of VMs
Rapid Provisioning Scenarios

- Multiple VMs share the same base VHD

- LUNs with data provisioned outside of VMM (snapshot, clone, etc)
Rapid Provisoning Sample script

- PS C:\> Get-VMMServer -ComputerName "VMMServer1.Contoso.com"

- PS C:\> $JobGroupID = [Guid]::NewGuid().ToString()

- PS C:\> $Template = Get-Template | where {$_._.Name -eq MyTemplate}"

- PS C:\> $VMHost = Get-VMHost | where {$_._.Name -eq "VMHost.Contoso.com"}

- PS C:\> Move-VirtualHardDisk -IDE -BUS 0 -LUN 0 -Path "L:\OS.VHD" -JobGroup $JobGroupID

- PS C:\> New-VM -Name "VM06" -Path "L:\" -Template $Template -VMHost $VMHost -JobGroup -$JobGroupID -UseLocalVirtualHardDisks
POST VMM PLANS
Future directions

- Pooling of raw storage and LUN provisioning (inc. cloning)
- Discovery & visualization of storage
- Classification based on the back-end hardware and SAN features enabled (replication, snapshots etc)
- Health and performance monitoring
- Disaster Recovery
- Standards-based model to reach as wide a range of devices as possible (SMI-S)
Microsoft Storage Management Service (Using SMI-S)

- VMM VNEXT
- WMI Server
- Storage Service (WMI Provider)
  - SMI-S Module
  - SLP Discovery Module
  - Host Resource Module
  - CIM-XML Client
  - WS-Man Client
  - SLP Client
  - CIM-XML
  - WS-Man
  - SMI-S Servers
  - Future SMI-S Servers
  - WMI-DCOM
  - WMI Servers
  - Microsoft Host Resources Providers (SMI-S Based)
Related SDC Content

Microsoft Storage Management Update

Mohamed Lawindi
Software Development Engineer II, Microsoft Corporation

Michael Brasher
Principal Software Development Engineer, Microsoft Corporation
Summary

- Challenges of working across different vendors
  - Communicate plans, progress, status
  - Communicate frequently
  - Communicate with management/dev/QA
  - Test, Test, Test

- Integration paths with 3rd parties
  - SAN vendors:
    - VDS h/w provider for VMM
    - SMI-S for VMM VNEXT
  - HBA vendors: SMI-S, NPIV mof
  - Clustered File System
  - Custom cluster disk resources
  - Monitoring: Ops Manager MP, VMM Pro Packs
  - Extensibility and Value-Add: PowerShell + WF
More information

- VMM blogs by MS employees:
  - http://blogs.technet.com/chengw/ - Cheng Wei - Senior Program Manager
  - http://blogs.technet.com/m2/ - Michael Michael - Senior SDE

- VMM community

- VMM public forum