Enterprise-Grade Array-Based Replication and Disaster Recovery with SMI-S, Windows Server, System Center and Azure Site Recovery

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Session objectives

- Understand Microsoft Azure Site Recovery solution for business continuity
- Benefits of supporting SAN based replication using Azure Site Recovery and Virtual Machine Manager
- Deep dive into standards based work that enables this solution
- See it working!
Business Continuity Challenges

- Too many complications, problems and mistakes
- Too much data with insufficient protection
- Not enough data retention
- Time-intensive media management
- Untested DR & decreasing recovery confidence
- Increasing costs
Azure Site Recovery – one solution

On premises to On premises

Protect to Azure
ASR and VMM with SAN Replication

- SAN Replication
  - Take advantage of SAN replication capabilities provided by enterprise storage partners for both FC and iSCSI
  - Supports synchronous replication for the lowest RTO/RPO and asynchronous replication for flexibility
  - Full DR orchestration for Hyper-V vms that are sitting on SAN storage
  - Integration with SAN via SMI-S – VMM discovers and enumerates existing storage providing comprehensive SAN management
How it works

- Discover and Enumerate Storage in VMM
  - Discover storage via SMI-S provider
  - Bring storage pools and LUNs under management
  - Create Replication Group
  - Expose Replication Groups to VMM Cloud

- Orchestration with ASR
  - Create ASR vault and register DR provider
  - Configure Clouds – ASR verifies SAN configuration
  - Map Storage Arrays and Pools
  - Enable Protection on RG
  - Map Networks
  - Enable VM protection
VMM recap – discover and enumerate

- Configure devices for replication (device console)
- Install SMI-S provider
- Add provider to VMM
# VMM recap – manage Pool and LUNs

- **Add storage pools to VMM**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Storage Device</th>
<th>Pool ID</th>
<th>Classification</th>
<th>Total Capacity</th>
<th>Available Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>GoldSource</td>
<td>000195700768</td>
<td></td>
<td></td>
<td>95,968.94 GB</td>
<td>72,436.37 GB</td>
</tr>
<tr>
<td></td>
<td>1,117.86 GB</td>
<td>346.13 GB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>23,148.89 GB</td>
<td>20,550.14 GB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>57,508.75 GB</td>
<td>37,356.16 GB</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Enumerate StorageVolume**

**Enumerate SPCs**
VMM recap – provision storage

- Assign storage to Hyper-V clusters
Discovering Replication artifacts

Clause 26 from the SMI-S Block Book
What is a Replication Group

Primary

Secondary
What is Replication Group

Replication Group

Primary

Secondary
Replication Group in the SMI-S profile

Source Group

- Storage Volume

Target Group

- Storage Volume

- Storage Synchronized

- Group Synchronized with ConsistencyEnabled=True

OrderedMemberOfCollection
Replication Capabilities

- GetSupportedGroupFeatures – how should the replica be created, DR operations
- GetSupportedGroupOperations – What operations does the provider support
- GetSupportedGroupCopyStates – What copy states does the provider support
- GetSupportedReplicationSettingDataDateTime – what RPO does the provider advertise
Enable Protection

Pair Storage + Enable Replication

Primary

Secondary
SMIS methods for enabling protection -

- **CreateGroupReplica** parameters
  - **RelationshipName** => a user relevant provided name.
  - **SyncType** => Mirror (6) => determined through capabilities
  - **Mode** => Sync (2) or Async (3) => determined through capabilities
  - **SourceGroup** => Based on features either an empty group or group of source volumes
  - **SourceElement** => null
  - **SourceAccessPoint** => Reference to source access point information.
  - **TargetGroup** => based on features, either null or target group with target volumes
  - **TargetElementCount** => null
  - **TargetAccessPoint** => Reference to target access point information.
  - **Consistency** => "Sequential Consistency".
  - **ReplicationSettingData** => with “Create New”
  - **Job** => this method should have job support which can be queried for success or failure. The new target element can be accessed using AffectElement associator of the job. After the job is completed, we should be able to query for the new groupsynchronized association
  - **Synchronization** => null
  - **TargetSettingGoal** => setting goal when targetpool is passed.
  - **TargetPool** => if no targetgroup is specified then pool will be passed
  - **WaitForCopyState** => “Unsynchronized”

- **CreateGroupReplicaFromElements** parameters
  - **Out SourceGroup** => new SourceGroup that gets created after the call
  - **SourceElements** => List of source storage volumes
  - **TargetPool** => StoragePool reference from the target system on which the new target elements are created
Deploying a workload (VM)

VM deployed CSVs
VM configuration registered

CSVs not exposed to servers
VM exists in VMM database
Capacity reserved for failover

Primary

Secondary

Replicating

L1  L2  L3

L1' L2' L3'
Enable Protection
Workload Failover – Planned Failover / Reverse Replication

Primary

Secondary

Synchronizing
Synchronized
Workload Failover – Unplanned Failover

Primary

Synchronizing
Broken

Secondary

Replicating
Workload Failover Drill – Test Failover

 RG Replicating

 Synchronizing

 RG Replicating

 Snapshot/Clone

 Primary

 Secondary
 DEMO

- DR operations
Availability status -

- ASR and SCVMM are GA – SCVMM UR6
- Partners – GA
  - EMC
  - NetApp
  - HP 3PAR
  - IBM
- Partners – In development
  - Hitachi
  - Dell Compellent
  - Fujitsu
  - Huawei
Wrap up – Q and A

Thank You
Appendix and Additional details
## Single vs Multi provider discovery

<table>
<thead>
<tr>
<th><strong>&quot;Requires full discovery of target ComputerSystem&quot;</strong></th>
<th>Provider requires the remote ComputerSystems to be discovered. The absence of this capability indicates the service supports undiscovered resources.</th>
<th>Single provider managing both the primary and the remote subsystem</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>&quot;Remote resource requires remote CIMOM&quot;</strong></td>
<td>Client is required to interact with two providers: the provider controlling the source element and the provider controlling the target element.</td>
<td>Multi provider</td>
</tr>
</tbody>
</table>
Replication Service includes the necessary methods to create and manage the instances representing undiscovered resources.
Enable Protection

Start

GetSupportedFeatures == ReplicationGroups

SupportedAsynchronousActions == CreateGroupReplicaFromElements

Yes

Invoke CreateGroupReplicaFromElements using SourceElements and TargetPool

No

CIM_RSC.GetSGF == CreateGroupReplica

OnlyAcceptsEmptyGroups

Yes

Create source and target replica groups with no elements

No

Create source replica group with source volumes

CIM_RSC.GetSGF == TargetGroup

ShallNotBeSupplied

Yes

Target is a Storagepool

TargetPool

Get the TargetPool requirements using ReplicationServiceCapabilities.GetSupportedFeatures

No

Create new TargetElements on the Target computersystem

Create new TargetElements on the Target computersystem

Create new TargetElement for creation of the new target element

Create a new ReplicationSettingData with CreateNew

Invoke CreateGroupReplica with TargetPool and ReplicationSettingData

Get StoragePool from Target computersystem

Create new TargetSettingGoal for creation of the new target element

Create new TargetReplicationSettingData with CreateNew

Invoke ModifyReplicaSynchronization with AddSyncPairs to add the new element replicas to the group replica

Error out

Stop

Get the new TargetGroup as Job.AffectedElement

Monitor the job for completion => Success or Fail

Invoke CreateGroupReplica with TargetReplicaGroup

Get the TargetPool requirements using ReplicationServiceCapabilities.GetSupportedFeatures

Call the CreateElementReplica workflow for each of the source volumes to create the elementreplicas

Invoke CreateGroupReplica using empty groups

Invoke CreateGroupReplica with TargetReplicaGroup

Create new TargetReplicationSettingData with CreateNew

Target is a Storagepool

Target is a Storagepool

Create target replica group With new target storage volumes

Invoke CreateGroupReplica with TargetReplicaGroup

Invoke CreateGroupReplicaFromElements using SourceElements and TargetPool

No

Yes
Legend:
MR("operation") => ReplicationService.ModifyReplicaSynchronization("operation", ...)
SF("feature")? => ReplicationServiceCapabilities.GetSupportedFeature(...) contains "feature"?
SPS => StorageProtectionService

Start

Get CIM_Synchronized based on source and target ReplicationGroups

Stop writing on StorageVolume and mask from source

Unsynchronized Initialized Prepared

Check CopyState?

Synchronized

Unmask target

Failedover

MR("Resync")

MR("Resume")

MR("Activate")

SF("Failover requires split")?

Yes

MR("Split")

MR("Failover")

No

MR("Failover")

MR("Split")

Inactive

Skewed Fractured Split Aborted Broken Partitioned Invalid

Suspected

Finish
Reverse Roles

Legend:
MR("operation") => ReplicationService.ModifyReplicaSynchronization("operation", ...)
SF("feature")? => ReplicationServiceCapabilities.GetSupportedFeature(...) contains "feature"?
SPS => StorageProtectionService
Unplanned FO

Legend:
- MR("operation") => ReplicationService.ModifyReplicaSynchronization("operation", ...)
- SO("operation") => ReplicationServiceCapabilities.GetSupportedOperations(...) contains "operation"?

Start

Get CIM_Synchronized based on source and target ReplicationGroups

Check CopyState?

- Initialized
- Prepared
- Failedover

Synchronized
- Skewed
- Fractured
- Split
- Unsynchronized
- Suspended
- Inactive
- Broken
- Partitioned
- Partitioned
- Invalid
- Aborted

SO("Failover")?

- Yes
  - MR("Failover")

- No
  - Finish

Failure

Finish
Test FailOver

1. Start
2. Get CIM_StorageSynchronized Based on target StorageVolume
   - Check CopyState?
     - Initialized
     - Prepared
     - Synchronized
     - Skewed
     - Fractured
     - Split
     - Suspended
     - Inactive
     - Failedover
     - Unsynchronized
     - Suspended
     - Aborted
     - Partitioned
     - Invalid
3. Fail
4. Finish
5. Create local clone of target element
6. Unmask cloned volume