SMB 3, Hyper-V and Data ONTAP

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Windows Server 2012 and Hyper-V over SMB

- Windows Server 2012 introduces support for storing Hyper-V virtual machines over SMB
- Litany of new/improved protocols to help support and optimize that, including:
  - SMB 3
  - Witness
  - Remote VSS
  - ODX
- How have we incorporated this into Data ONTAP?
Data ONTAP Cluster-Mode Architecture

NetApp’s scale-out cluster

Contains:
- Heterogeneous collection of HA pairs
- High speed interconnect between them
- Split network and disk “blade” architecture within each node
• A single SMB server is spread across multiple nodes in the cluster
  • Multiple SMB servers can exist in the cluster and even on a single node
• SMB traffic through any node can reach a volume in any other
SMB 3 and NDO

- Non-Disruptive Operations
  - Volume move – not disruptive to SMB1+
  - LIF move – not disruptive to SMB2+

- Now with SMB 3
  - Node failure or physical disk move – not disruptive when using Continuously Available shares and persistent handles
SMB 3 and Persistent Handles
SMB 3 and a Node Failure

Diagram showing network nodes and disks.
Witness

- Witness client makes a connection to a node separate from the initial SMB connection
  - Witness server notifies the client of a node failure affecting the SMB connection

- Used by Data ONTAP to allow SMB 3 connections to recover even faster after failure
  - Witness server on every node
    - Scoped by HA pair
Witness

Before

1. SMB 3

2. Witness (discover)

LIF 1

N1

LIF 2

N2

3. Witness (monitor)

After

4. Witness (report)

5. SMB 3 (reconnect)
Remote VSS

- Volume Shadow Copy Services (VSS) is traditionally local backup technology
- Hyper-V now stores virtual machines in SMB shares
- Remote VSS extends VSS over SMB shares to enable virtual machine backup
- Implemented a new VSS hardware provider as well as the new FSRVLP protocol in Data ONTAP
Remote VSS

Basic workflow

1. Target VMs are selected through our SnapManager for Hyper-V product
2. All VMs within a share are SIS cloned
3. SIS clones are exposed via a temporary share for VSS “auto-recovery”
4. SnapManager for Hyper-V makes a backup of the VMs by taking a snapshot
5. After completion, the temporary SIS clones and share are removed
ODX (Offloaded Data Transfer)

- Server performs optimized copies on behalf of a client request
- T10 XCOPY implementation
- Used by default with Windows 8 and Windows Server 2012

- Optimization depends on the scope of the copy
  - Intra-volume: SIS clones
  - Inter-volume and inter-node: Back-end copy engine
Implications for Hyper-V over SMB
- Rapid provisioning
- Rapid storage migrations

Even within a VM, using SCSI emulated disks
- Offloaded VHDX <> VHDX copies
- Offloaded VHDX <> SMB share copies
Each of these components are a major piece of our Hyper-V over SMB solution:

- SMB 3 and NDO
  - Completely non-disruptive operation
- Witness
  - Faster failure recovery
- Remote VSS
  - Backup, optimized with SMHV
- ODX (Offloaded Data Transfer)
  - Optimized provisioning and migrations
Thanks for attending!

Questions?
Further reading

- **Data ONTAP**

- **Specifications:**
  - **SMB 3**
  - **Witness**
  - **Remote VSS**
  - **ODX**
Data ONTAP Cluster-Mode Terminology

- **Vserver** – Cluster-wide configuration container
- **Aggregate** (owned by a cluster node)
  - Volume container mapping to physical disk
  - Mobility between nodes in an HA pair
- **Volume** (owned by a Vserver, run by aggregate)
  - Mobility between any aggregate in the cluster
- **LIF** (owned by Vserver, run by port)
  - Mobility between any port in the cluster