Module 13
Implementing Server Virtualization with Hyper-V
Module Overview

• Overview of Virtualization Technologies
• Implementing Hyper-V
• Managing Virtual Machine Storage
• Managing Virtual Networks
Lesson 1: Overview of Virtualization Technologies

• Server Virtualization
• What Is Windows Azure?
• Desktop Virtualization
• Presentation Virtualization
• What Is Microsoft Application Virtualization?
Benefits of server virtualization with Hyper-V:

- Invisible to users
- Guest machines can use different operating systems
- More efficient use of hardware
- Service and application isolation
- Workload consolidation

Simplifies server deployment by using:

- Virtual machine templates
- Virtual machine self-service portals
What Is Windows Azure?

- Windows Azure is a cloud-based platform for hosting virtual machines and applications
- You pay only for the resources that you use
- You can increase and decrease capacity automatically and swiftly
- You can use Windows Azure to:
  - Host websites
  - Host production applications
  - Host virtual machines
  - Test proof-of-concept solutions
Desktop Virtualization

Desktop virtualization includes the following technologies:
  • Client (Local) Hyper-V
  • VDI

RemoteFX allow virtual machines to display rich graphics and video capabilities

RemoteFX requires:
  • GPU that supports DirectX 9.0c or later
  • CPU that supports SLAT
Presentation Virtualization

Differences between desktop virtualization and presentation virtualization

Desktop virtualization:
• Users are assigned their own virtual machines that are running a client operating system
• The desktop and apps run within virtual machines

Presentation virtualization:
• Users sign in and run separate sessions on the server
• The desktop and apps run on the host server

Presentation virtualization technologies include:
• Remote Desktop Services
• Full Desktop with RDC
• Applications using RemoteApp
• Remote Access through RD Gateway
What Is Microsoft Application Virtualization?

Benefits of App-V

- Application isolation
- Incompatible applications can run on the same server
- Application streaming
- Application deployment is quicker
- Application portability
- Applications can follow users across multiple computers

UE-V

- Application and operating system settings follow users across multiple computers
Lesson 2: Implementing Hyper-V

- What Is Hyper-V?
- Hardware Requirements for Hyper-V
- Virtual Machine Hardware
- What Is Dynamic Memory?
- Configuring Virtual Machine Integration Services
- Configuring Virtual Machine Start and Stop Actions
- Hyper-V Resource Metering
- What’s New with Hyper-V in Windows Server 2012 R2
What Is Hyper-V?

Hyper-V:

- Is the hardware virtualization role in Windows Server 2012
- Gives virtual machine guests direct access to the host’s hardware

Compatible Windows Server operating systems:

- Windows Server 2012
- Microsoft Hyper-V Server 2012
Factors to consider when planning hardware for servers running Hyper-V:

- Processor characteristics
  - Must have an x64 platform that supports hardware assisted virtualization and Data Execution Protection
- Processing capacity
- Memory
- Storage subsystem performance
- Network throughput (typically multiple NICs)
Virtual machines have the following simulated hardware by default:

- BIOS
- Memory
- Processor
- IDE Controller 0 and 1
- SCSI Controller
- Synthetic Network Adapter
- COM 1 and 2
- Diskette Drive

You can add the following hardware to a virtual machine:

- SCSI Controller (up to 4)
- Network Adapter
- Legacy Network Adapter
- Fibre Channel adapter
- RemoteFX 3D video adapter
What Is Dynamic Memory?

Dynamic Memory settings for a virtual machine

You can configure options for assigning and managing memory for this virtual machine. Specify the amount of memory that this virtual machine will be started with.

**Startup RAM:** 1024 MB

**Dynamic Memory**

You can manage the amount of memory assigned to this virtual machine dynamically within the specified range.

- **Enable Dynamic Memory**
- **Minimum RAM:** 512 MB
- **Maximum RAM:** 1048576 MB

Specify the percentage of memory that Hyper-V should try to reserve as a buffer. Hyper-V uses the percentage and the current demand for memory to determine an amount of memory for the buffer.

- **Memory buffer:** 20%

**Memory weight**

Specify how to prioritize the availability of memory for this virtual machine compared to other virtual machines on this computer.

- **Low**
- **High**
Possible integration services:

• Operating system shutdown
• Time synchronization
• Data exchange
• Heartbeat
• Backup (volume snapshot)
Configuring Virtual Machine Start and Stop Actions

Possible automatic start actions:
- Nothing
- Automatically start if it was running when the service stopped
- Always start this virtual machine automatically

Possible automatic stop actions:
- Save the virtual machine state
- Turn off the virtual machine
- Shut down the guest operating system
Parameters that you can measure with resource metering:

- Average CPU use
- Average physical memory use, including:
  - Minimum memory use
  - Maximum memory use
- Maximum disk space allocation
- Incoming network traffic for a network adapter
- Outgoing network traffic for a network adapter
What’s New with Hyper-V in Windows Server 2012 R2

<table>
<thead>
<tr>
<th>New or improved</th>
<th>Feature</th>
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| New to Windows Server 2012 R2 | • Shared virtual hard disk  
 • Automatic virtual machine activation  
 • Enhanced session mode  
 • Storage quality of service  
 • Virtual machine generation |
| Improved in Windows Server 2012 R2 | • Resize virtual hard disk  
 • Live migration  
 • Failover Clustering  
 • Integration services  
 • Export  
 • Replica  
 • Linux support  
 • Management |
Lesson 3: Managing Virtual Machine Storage

- What Is a Virtual Hard Disk?
- What Is SMB 3.0
- Creating Virtual Disk Types
- Managing Virtual Hard Disks
- Reducing Storage Needs with Differencing Virtual Hard Disks
- Using Checkpoints
What Is a Virtual Hard Disk?

VHDX format has the following benefits over the VHD format:

• The disks can be larger (64 TB versus 2 TB)
• The disk is less likely to become corrupted
• The format supports better alignment when deployed to a large sector disk
• The format supports larger block size for dynamic and differencing disks

• Shared Virtual Hard Disks can be used by multiple virtual machines
• Storage QoS allows you to limit virtual hard disk IOPS
What Is SMB 3.0

SMB 3.0 can be used as shared storage to host highly available virtual machines.

The following features of SMB 3.0 are useful when supporting highly-available virtual machines:

- SMB Transparent Failover
- SMB Scale Out
- SMB Multichannel
- SMB Direct (SMB over RDMA)
- SMB Encryption
- VSS for SMB File Shares
Creating Virtual Disk Types

Fixed-size virtual hard disks vs. dynamic virtual hard disks

- 100 GB used
- 600 GB allocated
- 600 GB fixed-size disk

- 100 GB used
- 100 GB allocated
- 600 GB dynamic disk
Managing Virtual Hard Disks

The following are maintenance operations you can perform on virtual hard disks:

✓ Convert from fixed to dynamic
✓ Convert from dynamic to fixed
✓ Convert from VHD to VHDX format
✓ Convert from VHDX to VHD format
✓ Shrink a dynamic virtual hard disk
✓ Expand a dynamic or fixed virtual hard disk
Reducing Storage Needs with Differencing Virtual Hard Disks

When using differencing disks, you:

• Can reduce space that is used by storage, but at the cost of performance
• Can link multiple differencing disks to a single parent disk
• Cannot modify the parent disk
• Can use the Inspect Disk tool to reconnect a differencing disk to a missing parent
Using Checkpoints

• A checkpoint is a static image of the data on a virtual machine at a given moment
• Checkpoints are not replacements for backups
• You can perform a virtual machine export of a checkpoint
• When you create a checkpoint, Hyper-V writes differencing virtual hard disk
• When you apply a checkpoint, the virtual machine reverts to the configuration as it existed at the time the checkpoint was created
Using Checkpoints

- A checkpoint is made every day
Using Checkpoints

- A checkpoint is made every day
- A problem is found after Tuesday’s checkpoint is made
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- To solve the problem, revert back to the Monday checkpoint
Using Checkpoints

- A checkpoint is made every day
- A problem is found after Tuesday’s checkpoint is made
- To solve the problem, revert back to the Monday checkpoint
- The problem is solved, the next checkpoint is made Wednesday
Lesson 4: Managing Virtual Networks

- What Is a Virtual Switch?
- What are Virtual Local Area Networks
- Virtual Switch Extensions
- Managing Virtual Machine MAC Addresses
- Configuring Virtual Network Adapters
- Network Adapter Advanced Features
- What Is NIC teaming?
What Is a Virtual Switch?

Hyper-V on Windows Server 2012 supports the following three types of virtual switches:

**External**  Used to map a network to a specific network adapter or network adapter team

**Internal**  Used to communicate between the virtual machines on the host and between the virtual machines and the host itself

**Private**  Used to communicate between virtual machines, but not between the virtual machines and the host itself

VLAN IDs are used to extend VLANs within the host’s network switch to VLANS on the external network
What are Virtual Local Area Networks

When you use Virtual Local Area Networks, you can:

• Logically segment network traffic running on the same physical and virtual networks
• Configure tagging on each virtual switch
• Configure tagging on each virtual network adapter

Note that host NICs must support VLAN tagging
Virtual Switch Extensions

- Virtual Switch Extensions enable third-party vendors to create virtual switches.
- You can manage virtual switches by using the same toolset that you use to manage physical switches.

Virtual switches

Physical switches
Managing Virtual Machine MAC Addresses

Virtual Switch Manager Window

You can define the range of media access control (MAC) addresses that can be assigned dynamically to virtual network adapters.

Minimum: 00-15-5D-0F-AB-00

Maximum: 00-15-5D-0F-AB-FF

Changing this setting does not affect network adapters that have already been configured. To apply a new setting to an existing network adapter, recreate the network adapter by removing it and adding it again.
Configuring Virtual Network Adapters

• Properties of a network adapter:
  • Virtual Switch
  • VLAN ID
  • Bandwidth Management

• Features of a virtual network adapter:
  • MAC address allocation
  • DHCP Guard
  • Router Guard
  • Port Mirroring
  • NIC Teaming
Network Adapter Advanced Features

- Virtual Machine Queue delivers network traffic directly to the guest
- IPsec task offloading enables the host’s network adapter to perform calculation-intensive security association tasks
- SR-IOV enables multiple virtual machines to share the same Peripheral Component Interconnect (PCI) Express physical hardware resources
- vRSS balances the network processing across multiple virtual processor cores in a virtual machine
What Is NIC teaming?

NIC Teaming:
- Provides redundancy and aggregates bandwidth
- Is supported at the host and virtual machine level

NIC Teaming in virtual machines:
- Requires multiple virtual network adapters
- Must be enabled on virtual network adapters
- Can then be implemented in virtual machine OS (if supported)
Lab: Implementing Server Virtualization with Hyper-V

- Exercise 1: Installing the Hyper-V Role onto a Server
- Exercise 2: Configuring Virtual Networking
- Exercise 3: Creating and Configuring a Virtual Machine
- Exercise 4: Using Virtual Machine Checkpoints

Logon Information

- Virtual machine: 20410C-LON-HOST1
- User name: Adatum\Administrator
- Password: Pa$$w0rd

Estimated Time: 75 minutes
Lab Scenario

Your assignment is to configure the infrastructure service for a new branch office.

To use the server hardware that is currently available at branch offices more effectively, your manager has decided that all branch office servers will run as virtual machines. You must now configure a virtual network and a new virtual machine for these branch offices.
Lab Review

• What type of virtual network switch would you create if you wanted to allow the virtual machine to communicate with the LAN that is connected to the Hyper-V virtualization server?

• How can you ensure that no one single virtual machine uses all available bandwidth provided by the Hyper-V virtualization server?

• What Dynamic Memory configuration task was not possible on previous versions of Hyper-V, but which you can now perform on a virtual machine that is hosted on the Hyper-V role on a Windows Server 2012 server?
Module Review and Takeaways

- Review Questions
- Best Practices
- Common Issues and Troubleshooting Tips
- Tools