Lesson 8: Creating and Configuring Virtual Machine Storage

MOAC 70-410: Installing and Configuring Windows Server 2012

Microsoft Official Academic Course

WILEY

Overview

- Exam Objective 3.2: Create and configure virtual machine storage.
- Working with Virtual Disks
- Connecting to a SAN

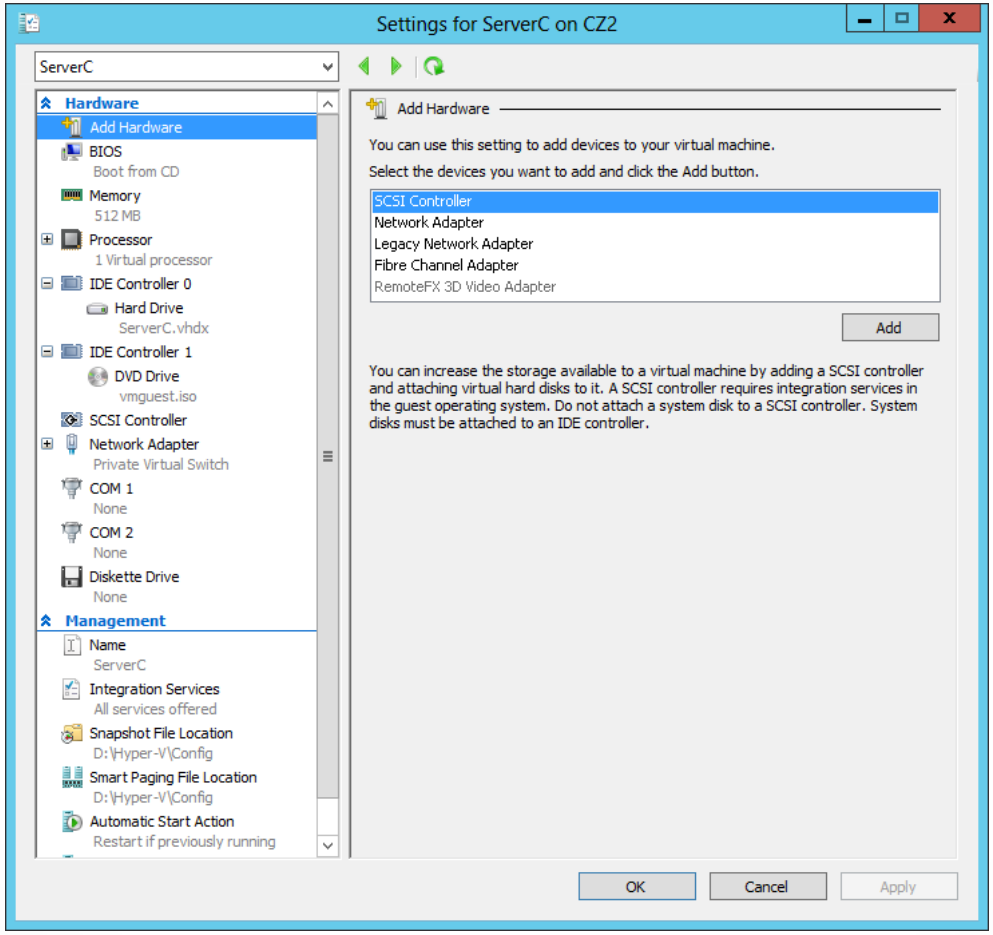
Working with Virtual Disks

Lesson 8: Creating and Configuring Virtual Machine Storage

Working with Virtual Disks

- Hyper-V uses a **virtual hard disk (VHD)** format to package part of the space on a physical disk to appear to the VM as though it is a physical hard drive.
- You can construct virtual storage subsystems to emulate almost any physical storage solution.
- The New Virtual Machine Wizard creates the following virtual storage subsystem:
  - 2 IDE (Integrated Drive Electronics) controllers (system drive + DVD drive)
  - 1 SCSI (Small Computer Systems Interface) controller (unpopulated)

Working with Virtual Disks



The default VM drive controller configuration

Virtual Disk Formats

Three types of VHD formats:

- **Fixed hard disk image**: An image file of a specified size in which all the disk space required to create the image is allocated during its creation.
- **Dynamic hard disk image**: An image file with a specified maximum size, which starts out small and expands as needed to accommodate the data the system writes to it.
- **Differencing hard disk image**: A child image file associated with a specific parent image. The system writes all changes made to the data on the parent image file to the child image, to facilitate a rollback at a later time.

Virtual Hard Disk Formats

- **VHD**
  - Limited to 2 TB
  - Compatible with all versions of Hyper-V, Virtual Server, and Virtual PC
- **VHDX**
  - Up to 64 TB
  - Support 4 KB logical sector sizes
  - Larger block sizes (up to 256 MB)
  - Not backwards compatible

Creating Virtual Disks

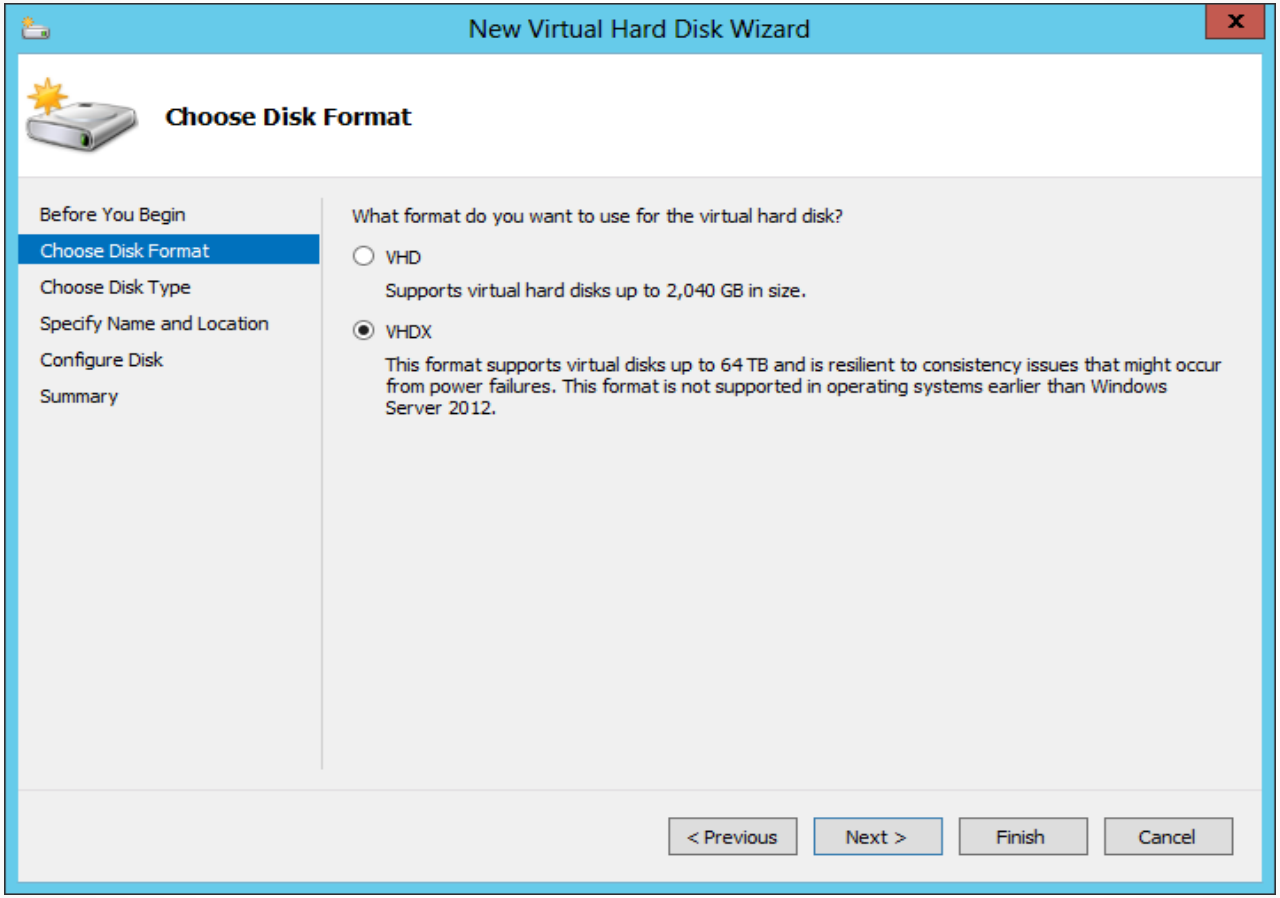
- Hyper-V allows you to create virtual hard disks as a part of a virtual machine, or create them later and add them to a VM.
- Hyper-V Manager provides access to most of the VHD parameters.
- Windows PowerShell provides the most granular control.

Creating a Virtual Disk with a VM

The New Virtual Machine Wizard includes a Connect Virtual Hard Disk page, with which you can add a single disk to your new VM with these options:

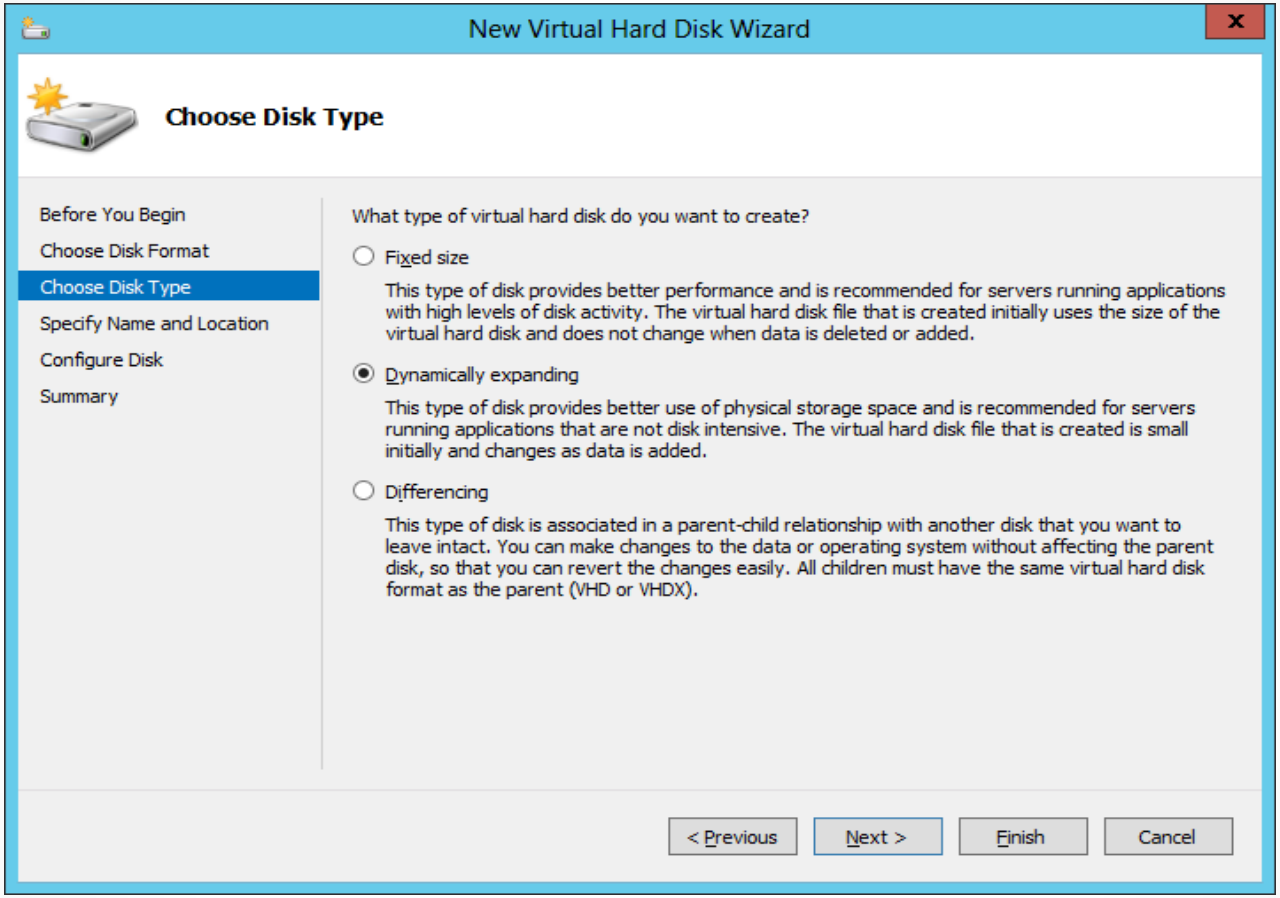
- **Create a virtual hard disk:** Enables you to specify the name, location, and size of a new virtual hard disk, but you can only create a dynamically expanding disk using the VHDX format.
- **Use an existing virtual hard disk:** Enables you to specify the location of an existing VHD or VHDX disk, which the VM will presumably use as its system disk.
- **Attach a virtual hard disk later:** Prevents the wizard from adding any virtual disks to the VM configuration. The assumption is that you will manually add a disk later, before you start the virtual machine.

Create a New Virtual Disk



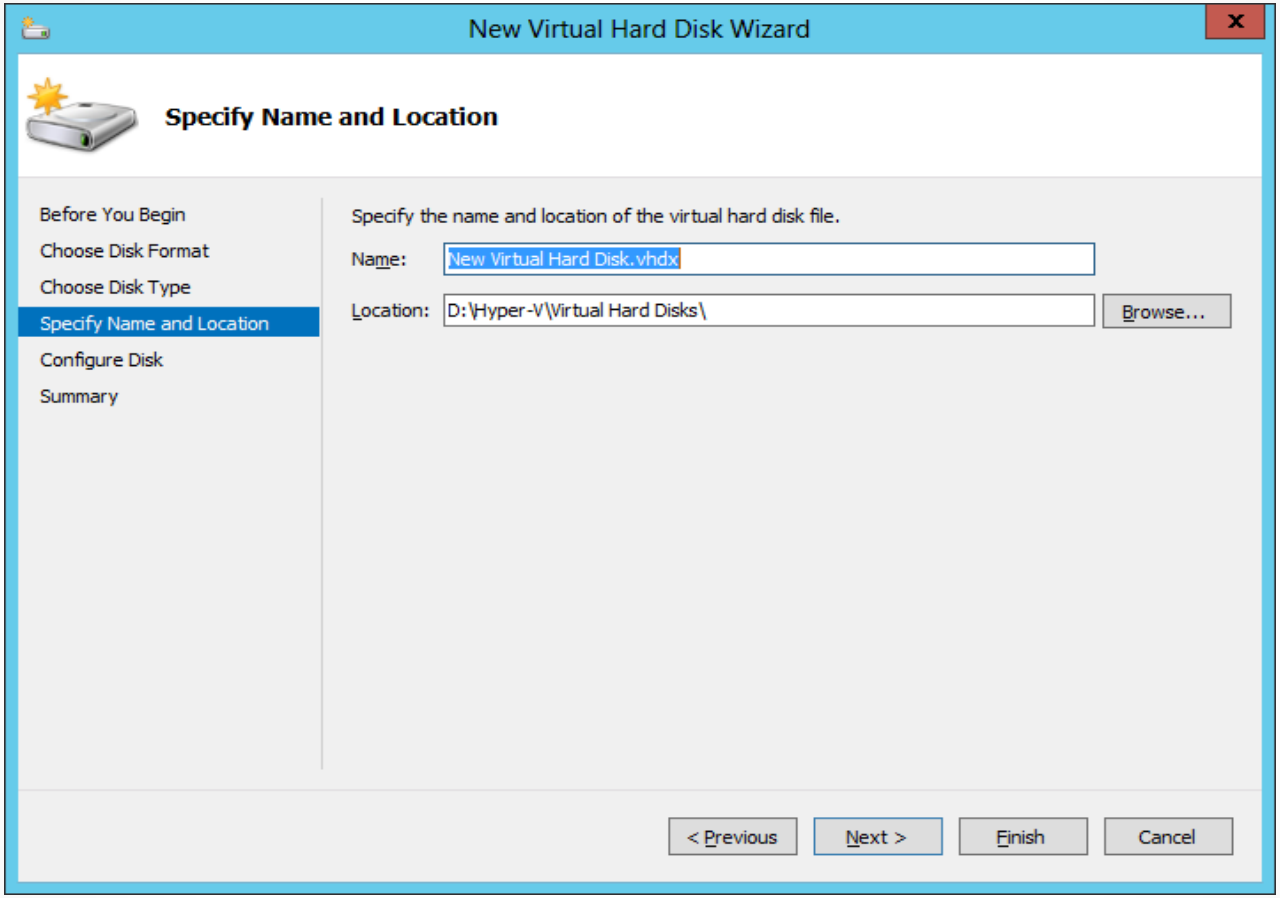
The Choose Disk Format page of the New Virtual Hard Disk Wizard

Create a New Virtual Disk



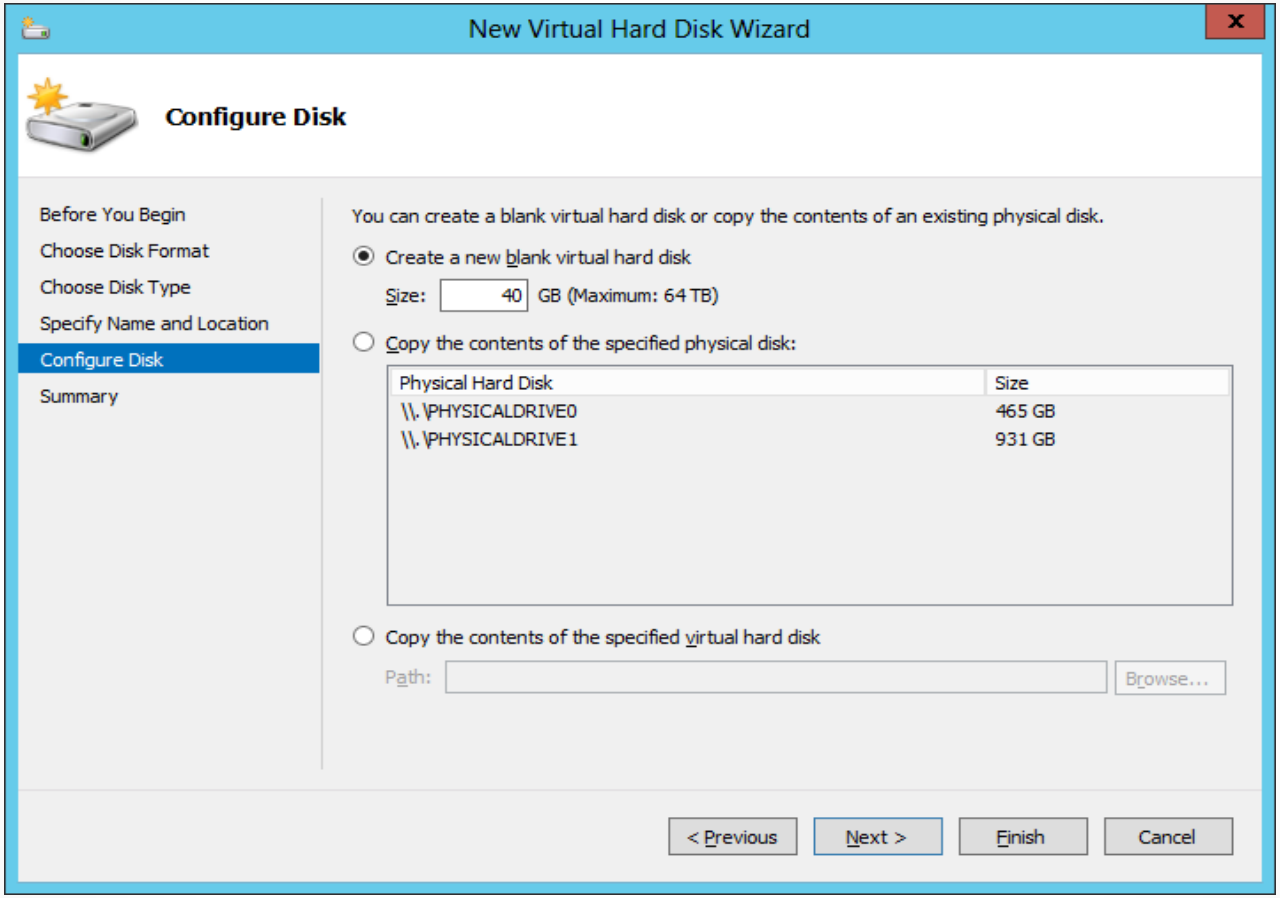
The Choose Disk Type page of the New Virtual Hard Disk Wizard

Create a New Virtual Disk



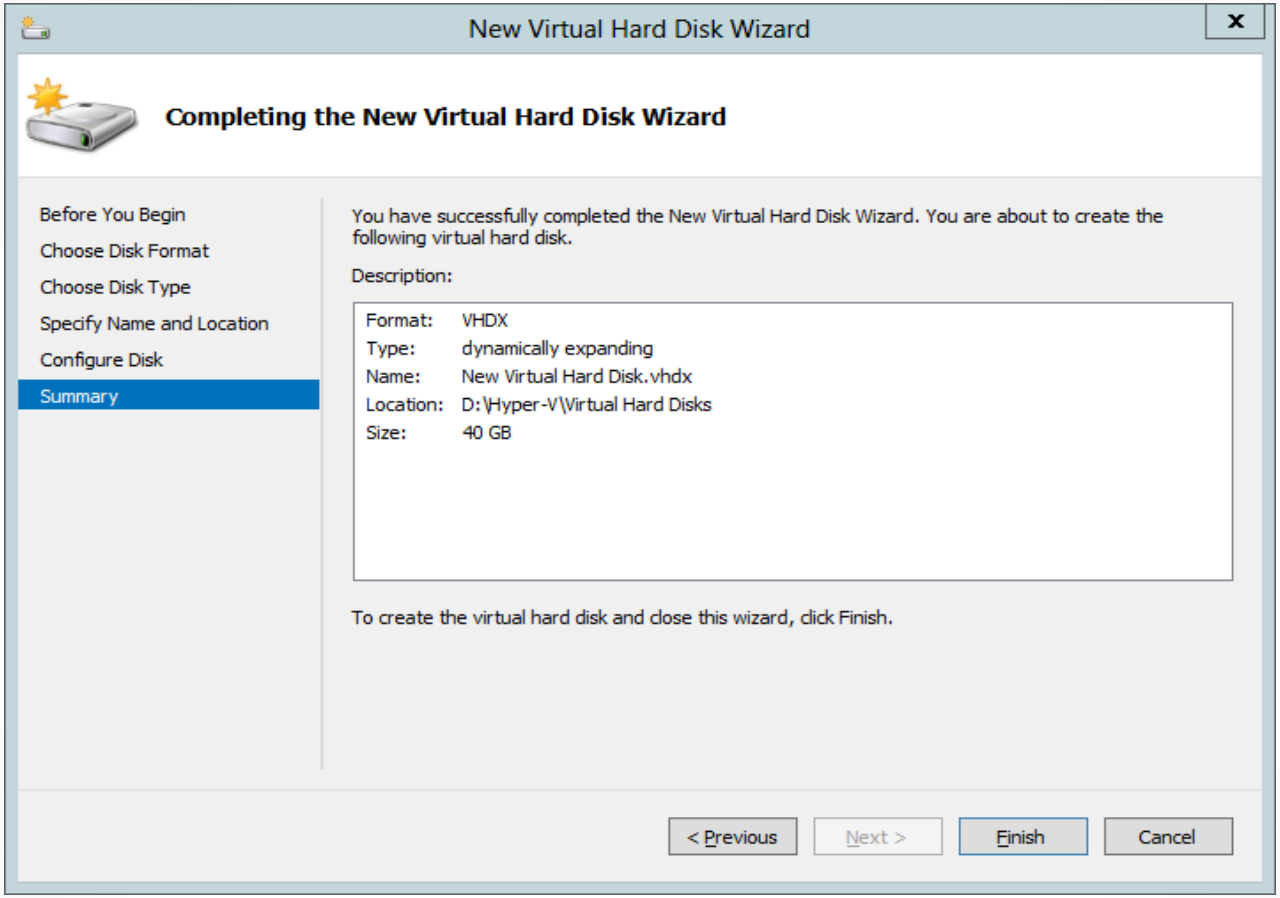
The Name and Location page of the New Virtual Hard Disk Wizard

Create a New Virtual Disk



The Configure Disk page of the New Virtual Hard Disk Wizard

Create a New Virtual Disk

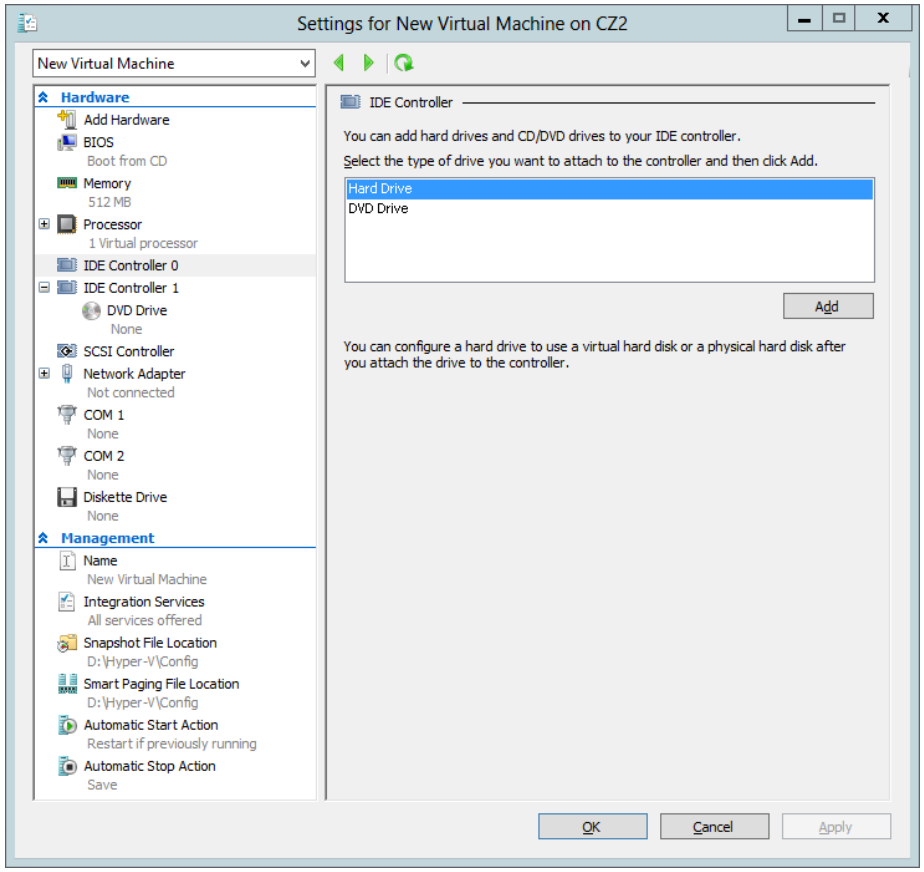


The Completing the New Virtual Hard Disk Wizard page of the New Virtual Hard Disk Wizard

Adding Virtual Disks to Virtual Machines

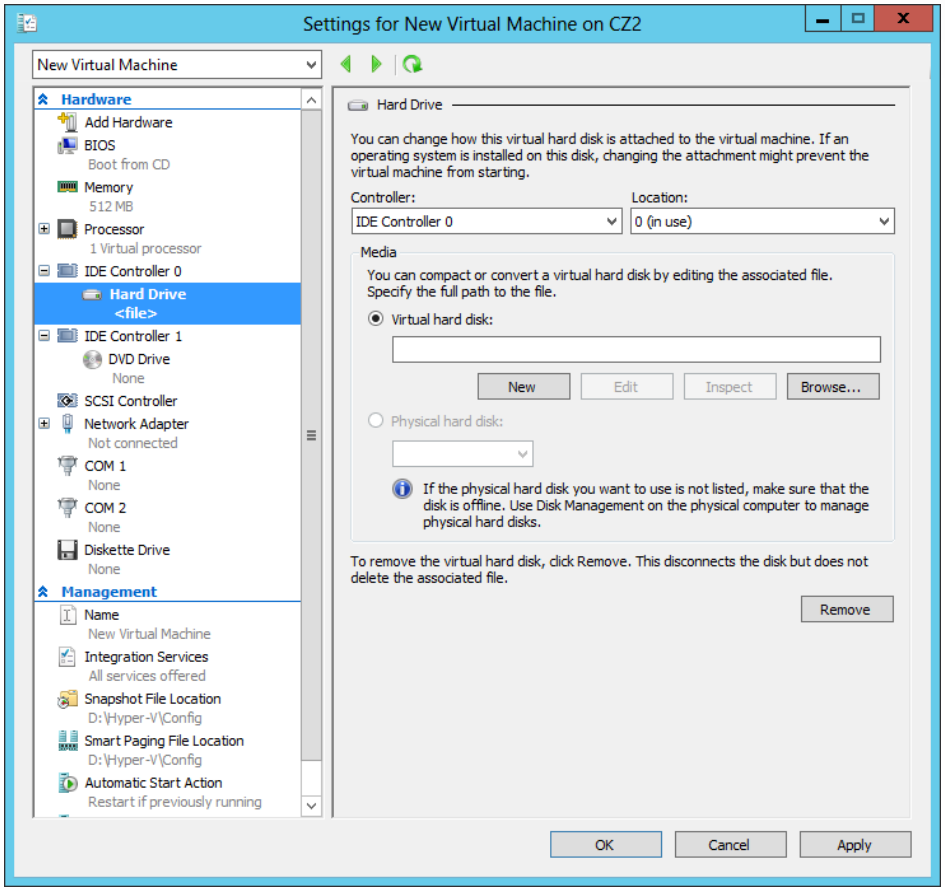
- If you chose the **Attach a virtual hard disk later** option when creating your virtual machine, you will need to attach a virtual hard drive to one of your controllers.
- In the VM's settings you will see 2 IDE controllers (IDE 0 and IDE 1) and 1 SCSI controller.

Add a Virtual Disk to a Virtual Machine



The IDE Controller interface in the Settings dialog box

Add a Virtual Disk to a Virtual Machine

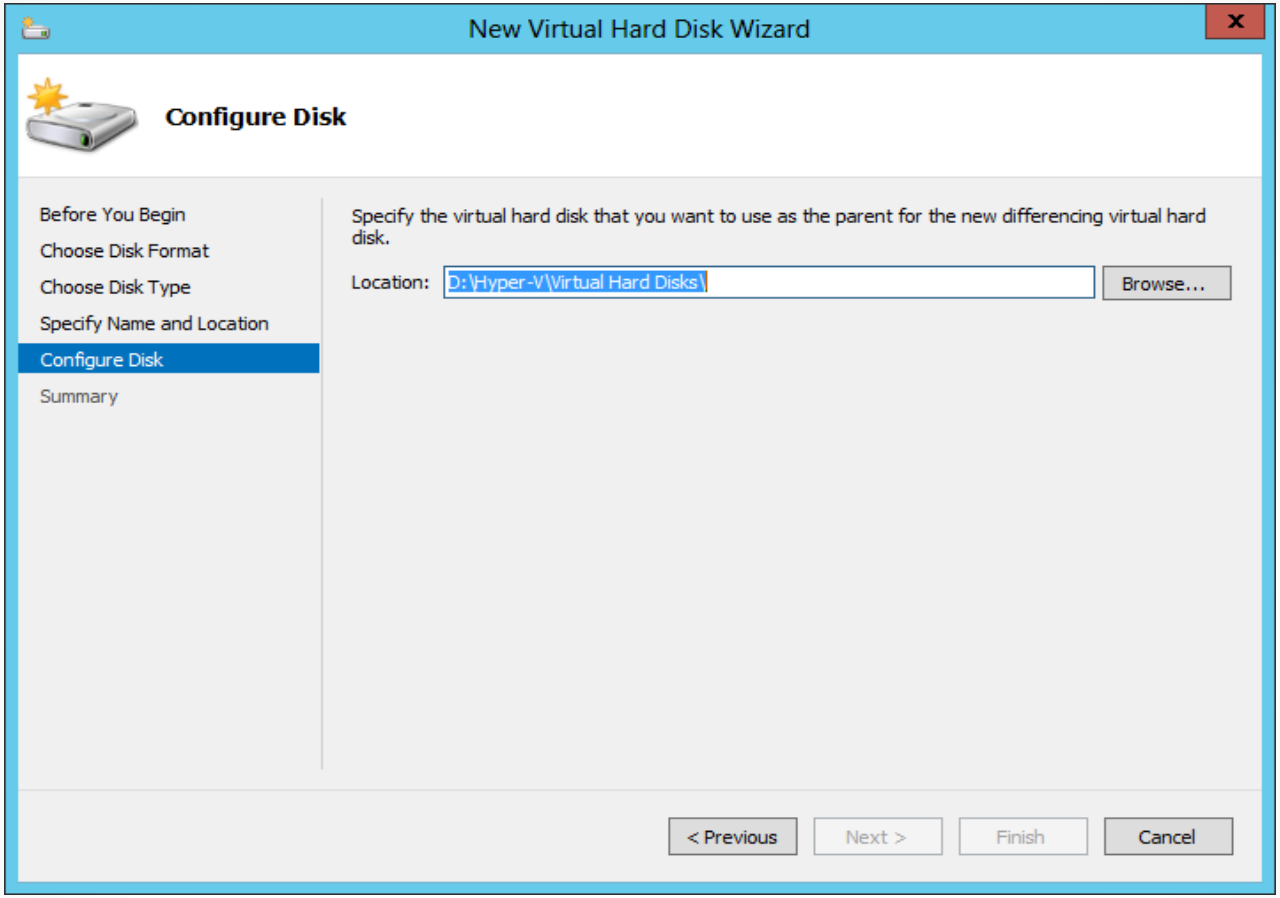


The Hard Drive interface in the Settings dialog box

Creating Differencing Disks

- Allows you to create a cloned version of a baseline installation
- The parent disk is the baseline installation
- The child is the differencing disk
- Make changes to the child differencing disk without changing the baseline
- You can revert back to the baseline installation anytime
- Excellent tool for testing or labs

Create a Cloned Installation with a Differencing Disk

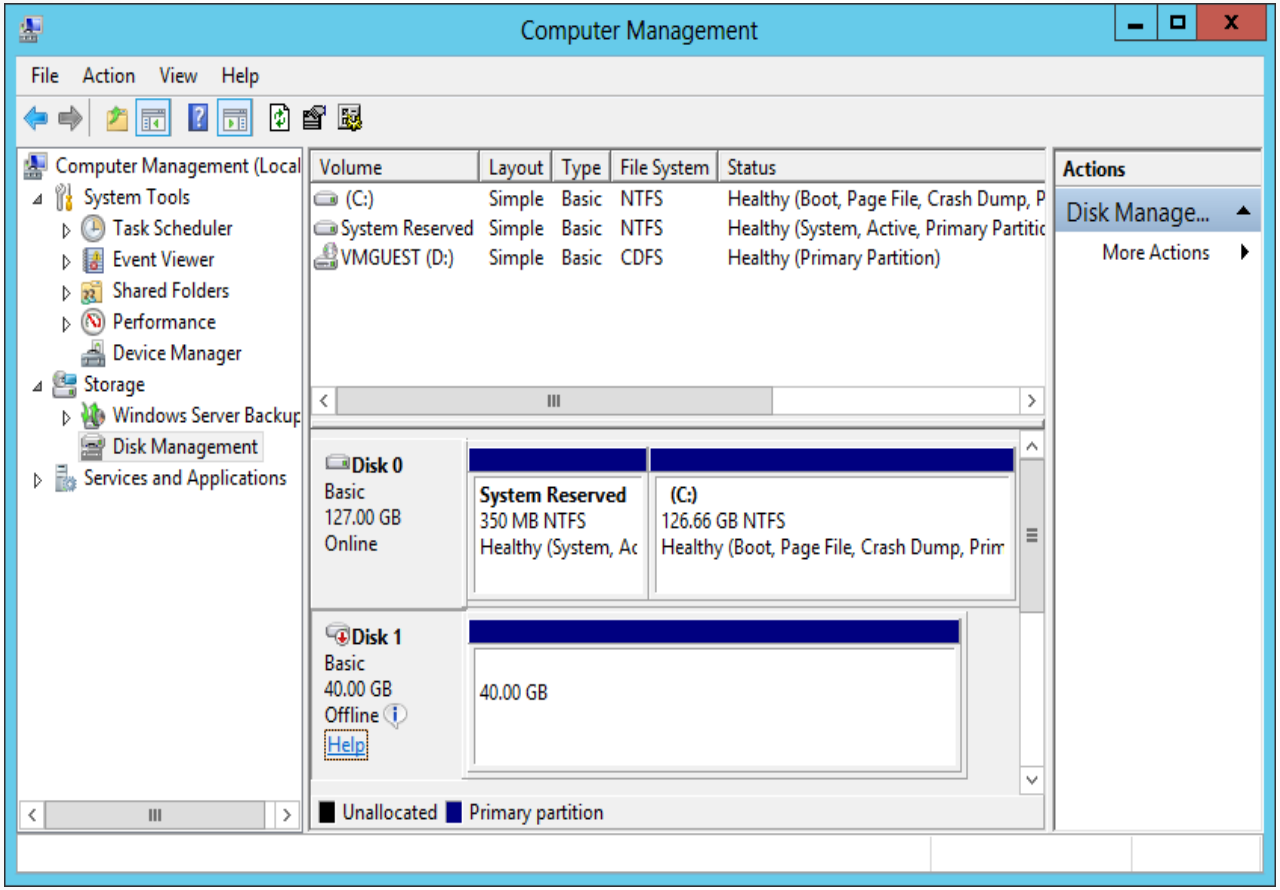


The Configure Disk page in the New Virtual Hard Disk Wizard, when creating a differencing disk

Configuring Pass-Through Disks

- A **pass-through disk** is a type of virtual disk that points not to an area of space on a physical disk, but to a physical disk drive itself, installed on the host computer.
- The VM must have exclusive access to the physical disk.
- You must take the disk offline in the parent operating system.

Configuring Pass-Through Disks

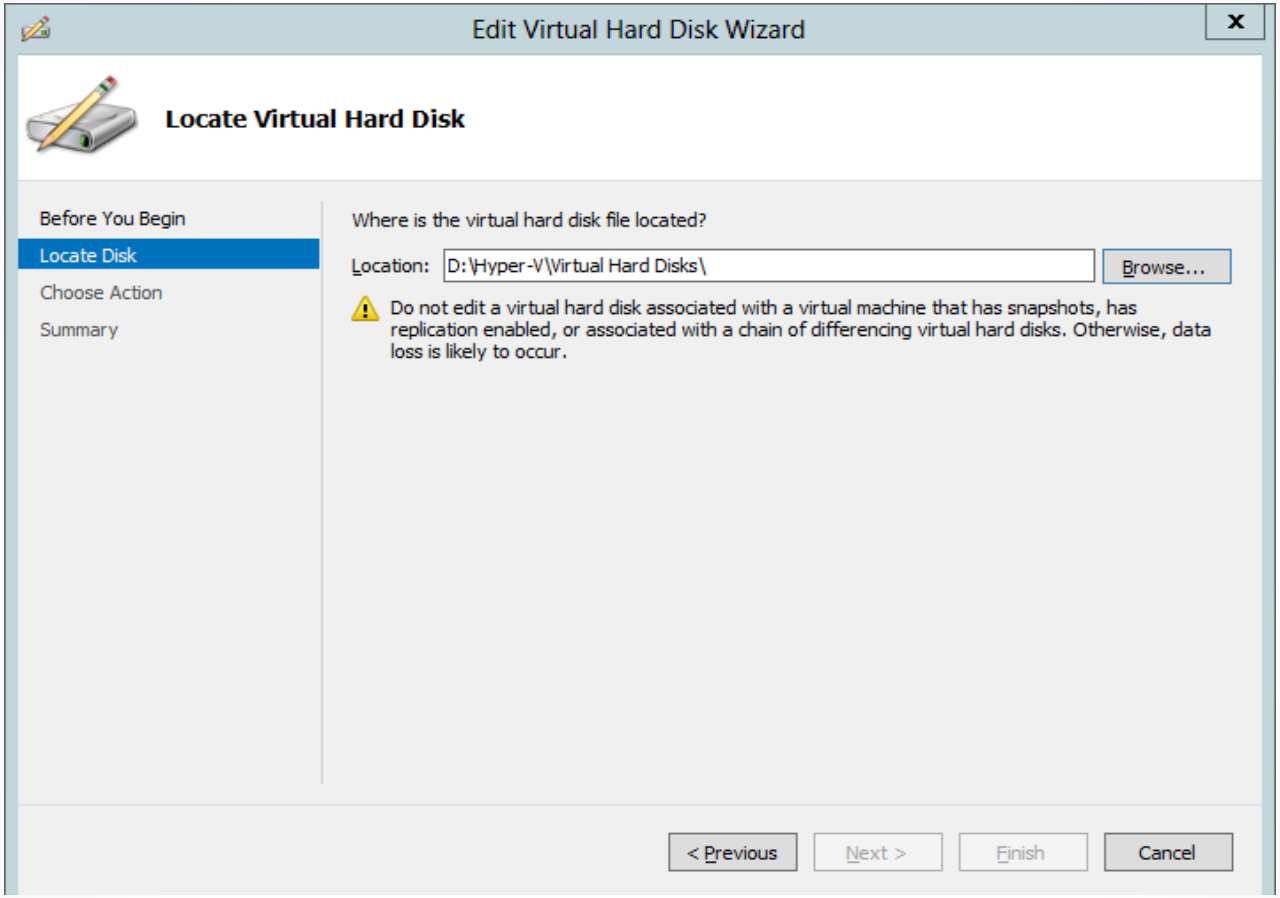


An offline disk in the Disk Management snap-in

Modifying Virtual Hard Disks

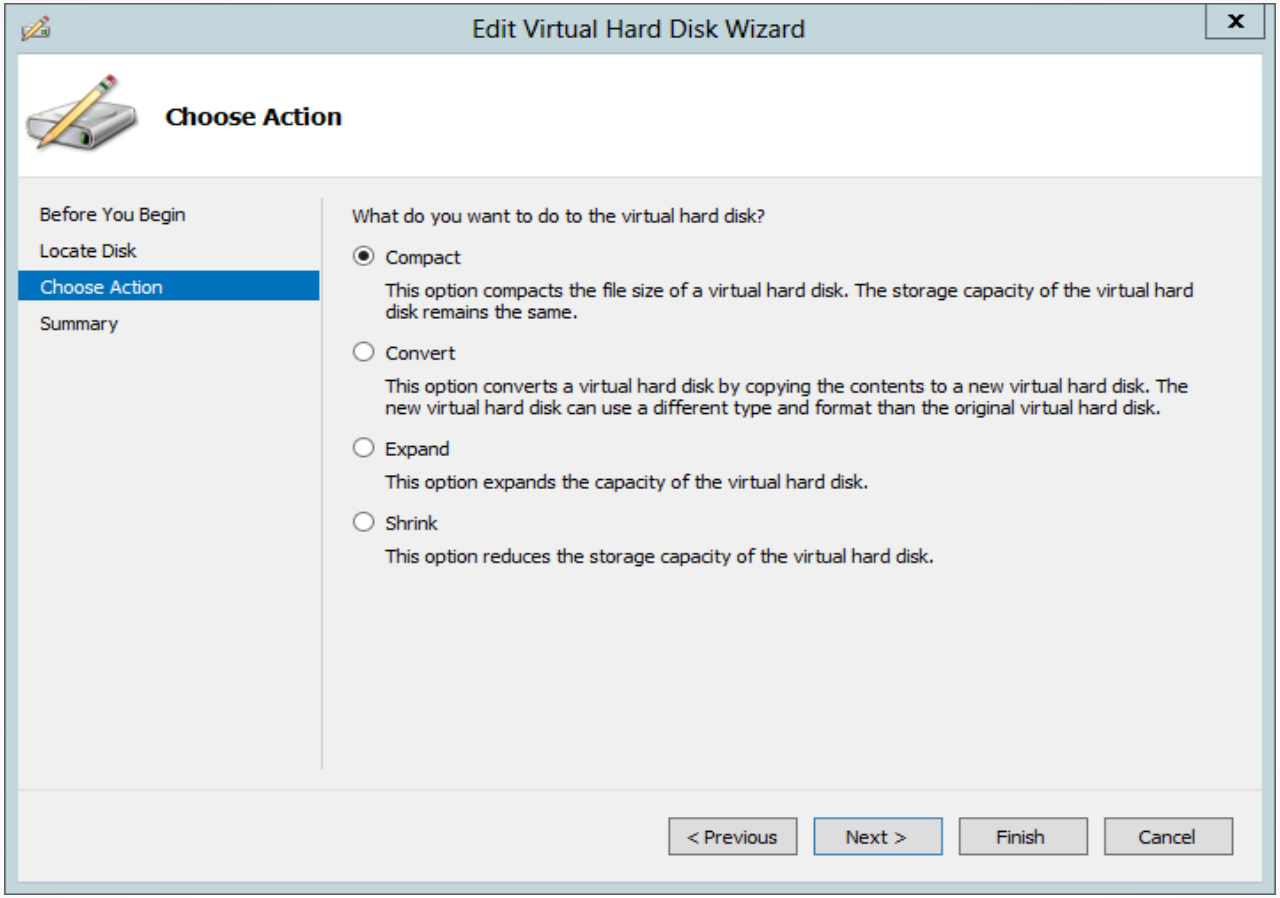
- You can edit a virtual hard disk, whether you have attached it to a VM or not.
- Use the **Edit Virtual Hard Disk Wizard** in the Hyper-V Manager.

Edit a Virtual Hard Disk



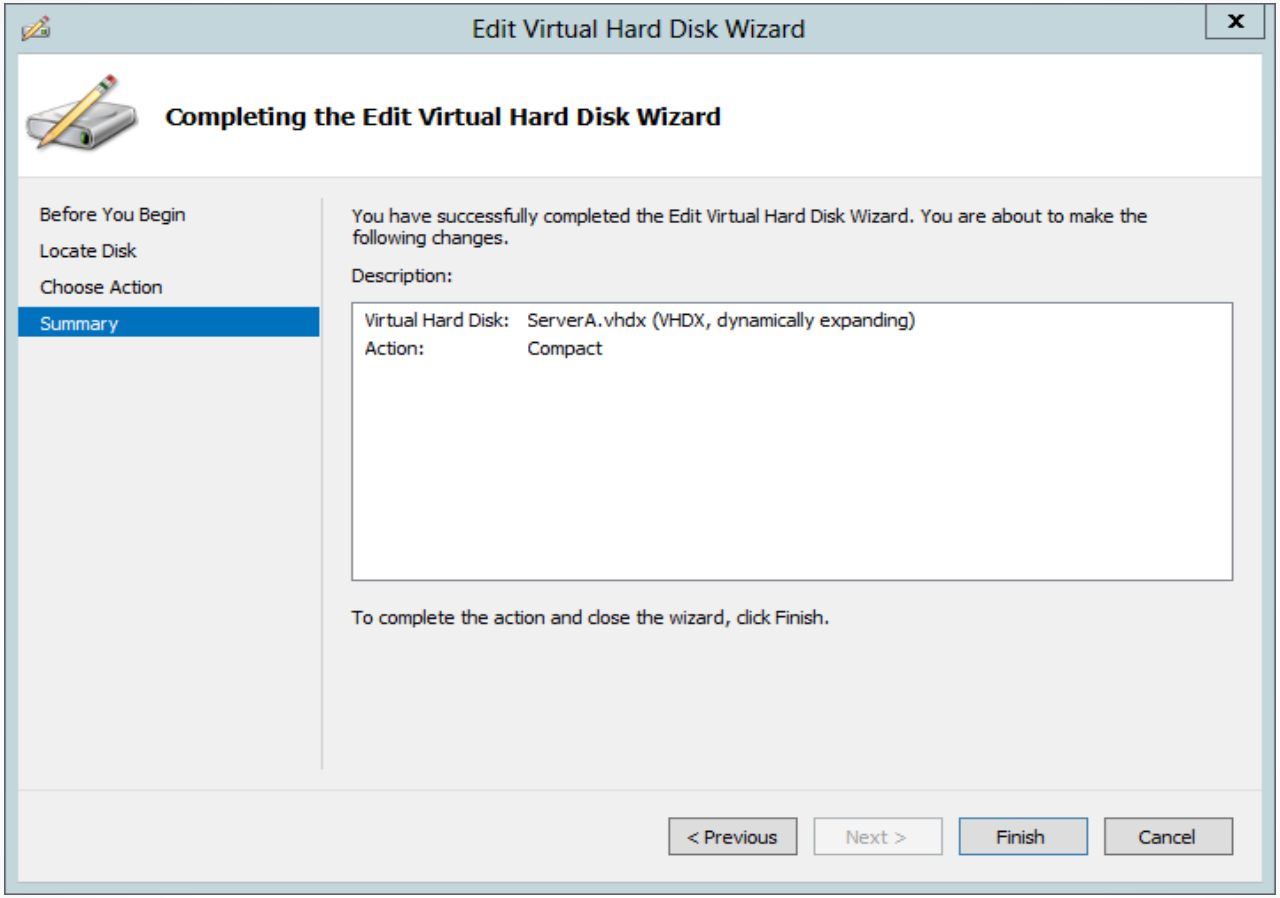
The Locate Disk page in the Edit Virtual Hard Disk Wizard

Edit a Virtual Hard Disk



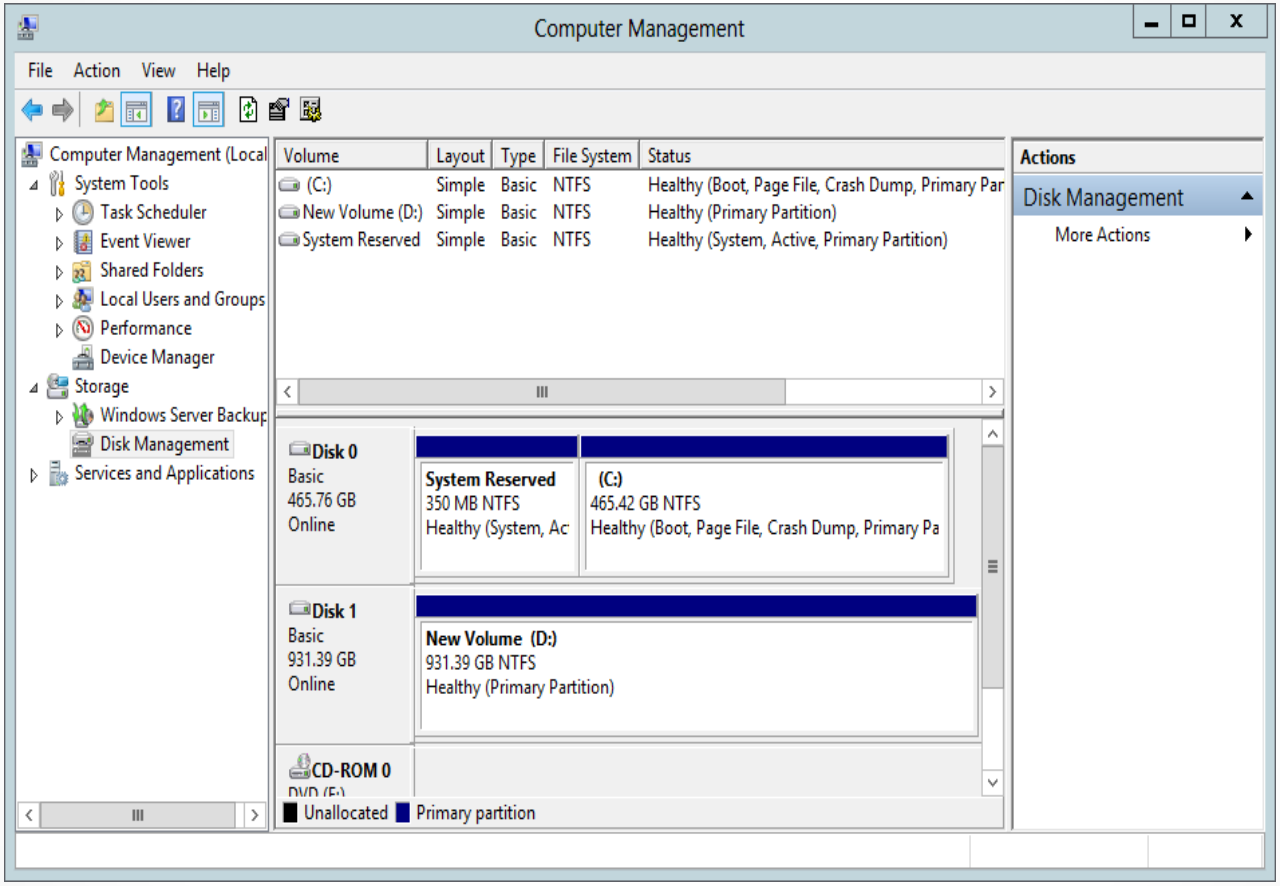
The Choose Action page in the Edit Virtual Hard Disk Wizard

Edit a Virtual Hard Disk



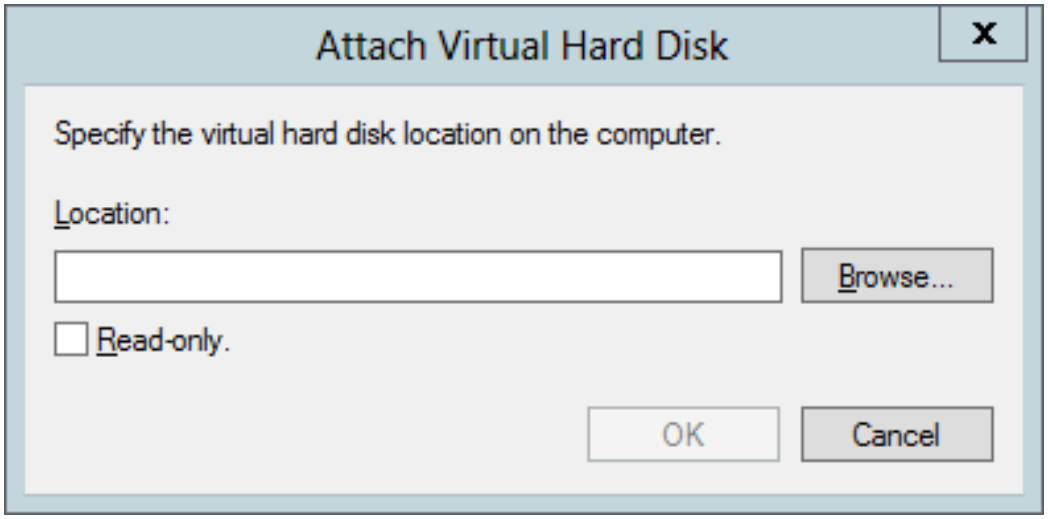
The Completing the Edit Virtual Hard Disk Wizard page in the Edit Virtual Hard Disk Wizard

Mount a Virtual Hard Disk



The Disk Management snap-in

Mount a Virtual Hard Disk

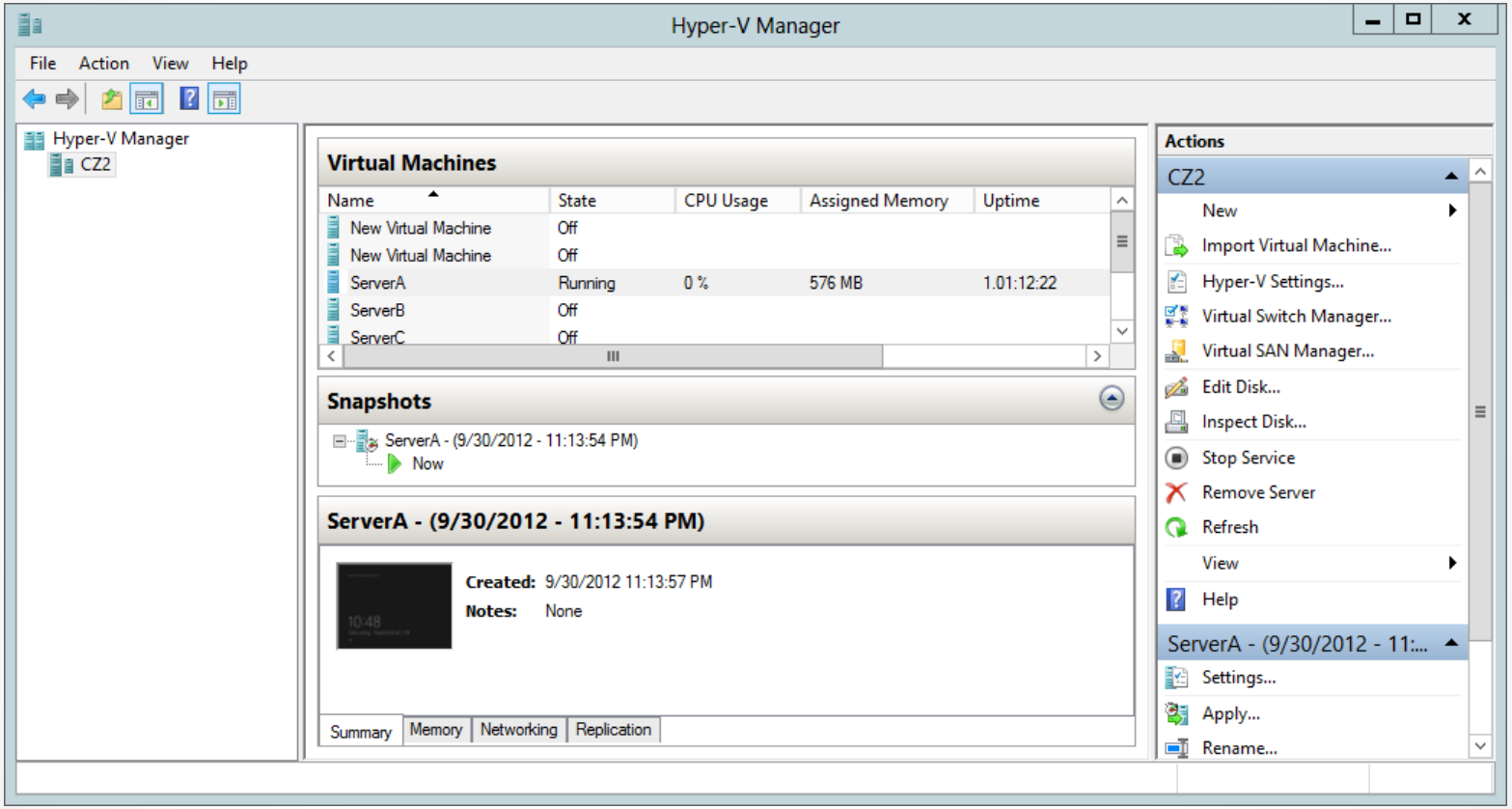


The Attach Virtual Hard Disk dialog box

Creating Snapshots

- A **snapshot** is a captured image of the state, data, and hardware configuration of a virtual machine at a particular moment in time.
- Offers a convenient way for administrators to revert a virtual machine to a previous state at will.
- Select **Snapshot** from the **Actions** pane.
- The system creates a snapshot file, with an **AVHD** or **AVHDX** extension in the same folder as the virtual hard disk file.

Creating Snapshots



A snapshot in Hyper-V Manager

Connecting to a SAN

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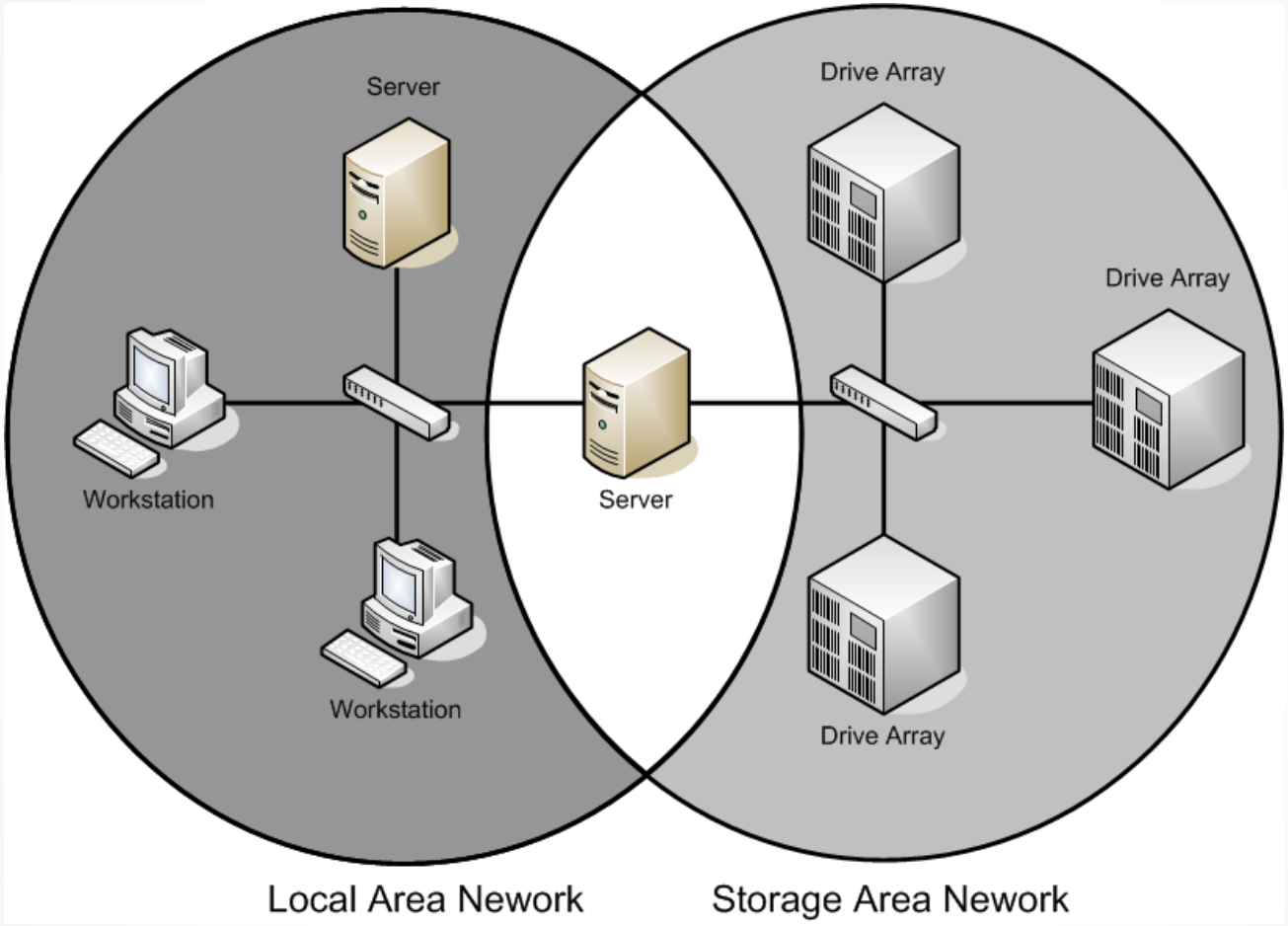
Connecting to a SAN

- A **storage area network (SAN)** is simply a network dedicated to high-speed connections between servers and storage devices.
- A SAN consists of one or more drive arrays equipped with network interface adapters, which you connect to your servers using standard twisted pair or fiber optic network cables.
- A SAN-connected server has a minimum of two network adapters—one for the standard LAN connection, and one for the SAN.

Connecting to a SAN



A server connected to a SAN

Advantages of SANs

- Avoid the limitations imposed by the maximum number of devices you can connect directly to a computer.
- Provide added flexibility in their communications capabilities.
- Can also greatly extend the distances between servers and storage devices.

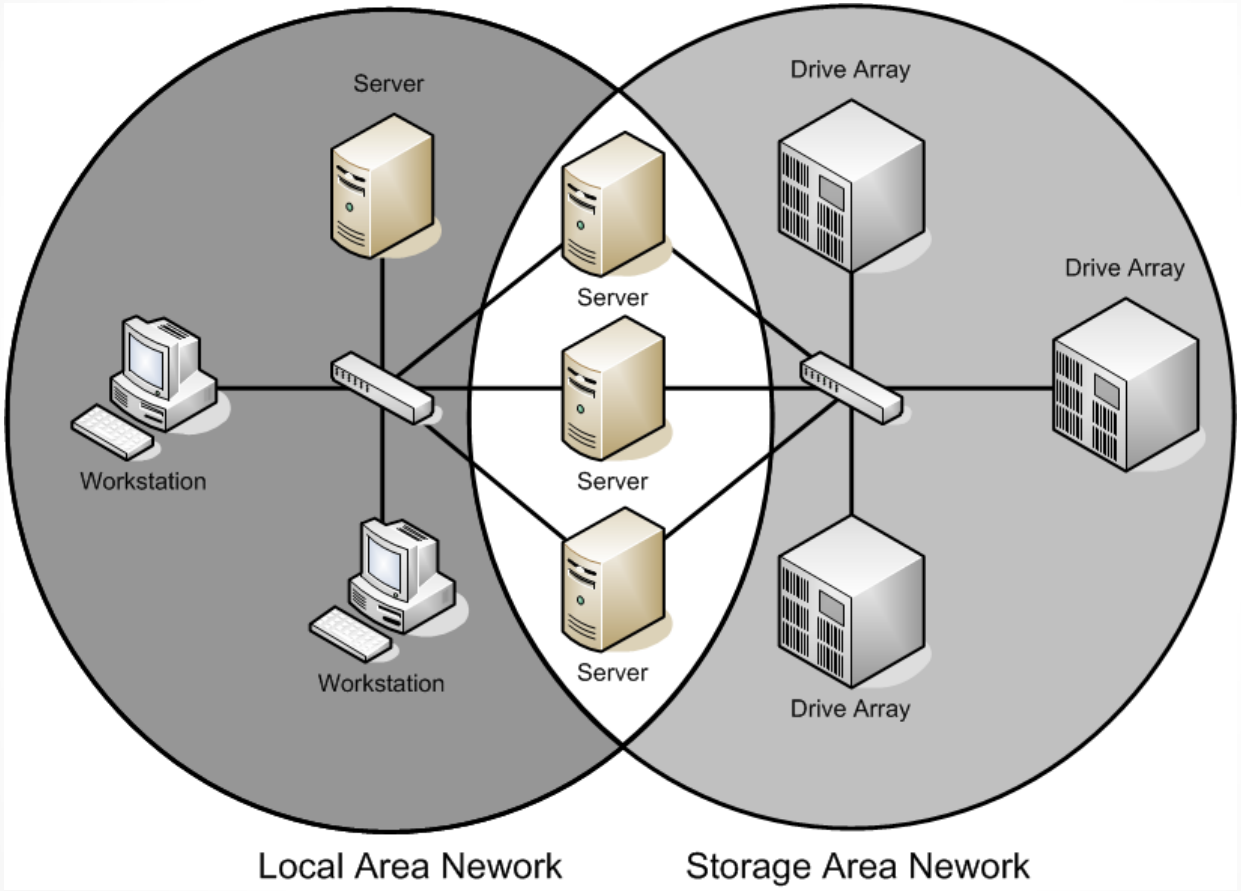
Clustering in a SAN

Because any device on a SAN can communicate with any other device on the same SAN, high-speed data transfers can occur in the following ways:

- **Server to storage:** Servers access storage devices over the SAN just as if they were connected directly to the computer.
- **Server to server:** Servers use the SAN to communicate directly with each other at high speeds to avoid flooding the LAN with traffic.
- **Storage to storage:** Storage devices communicate among themselves without server intervention (e.g., performing backups from one medium to another or to mirror drives on different arrays).

By connecting redundant servers to the same network, enabling them to access the same data storage devices, you create fault tolerance—clustering.

Clustering in a SAN



Multiple servers connected to a SAN

SAN Technologies

- Hard drive arrays directly connected to a server consist of multiple drives and a SCSI interface.
- Some include RAID controllers, while some are JBOD (Just a Bunch of Disks).
- Drive arrays for SANs are more complex because they also include support for networking and intelligent agents that provide advanced functions, like serverless backups.

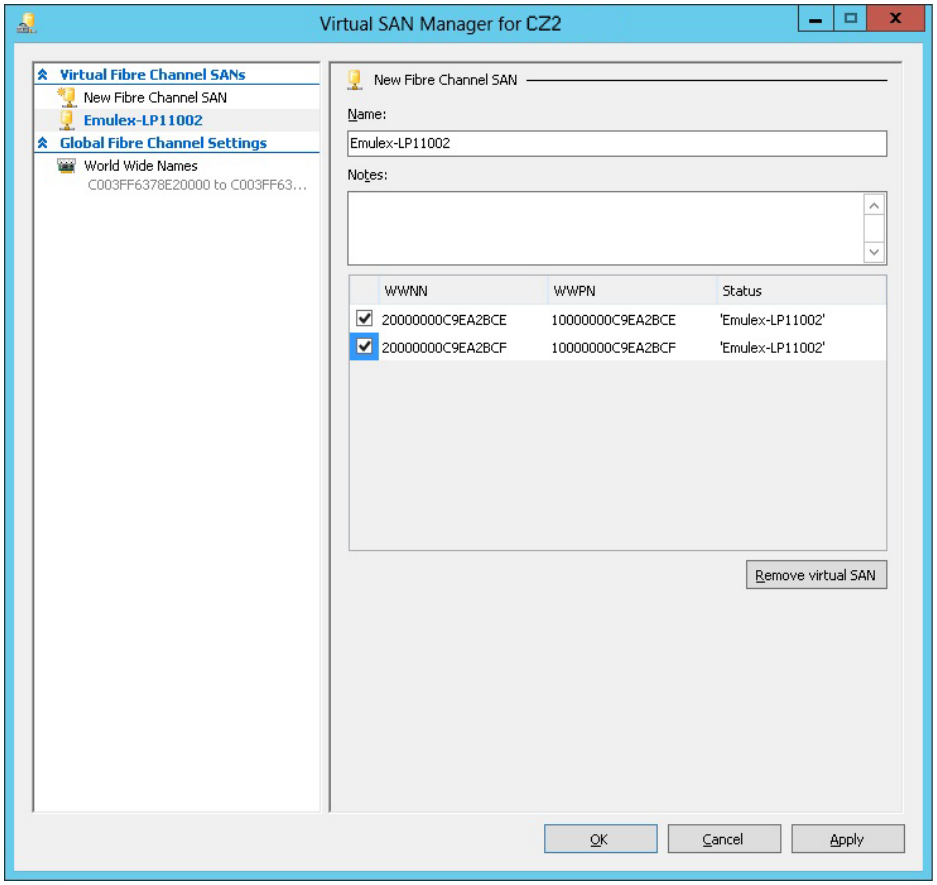
Using Fibre Channel

- **Fibre Channel** is a high-speed serial networking technology that was originally designed for use with supercomputers, but which is now associated primarily with storage area networking.
- Supports various network media, transmission speeds, topologies, and upper-level protocols
- Its primary disadvantage is that it requires specialized hardware that can be extremely expensive.

Connecting Virtual Machines to a SAN

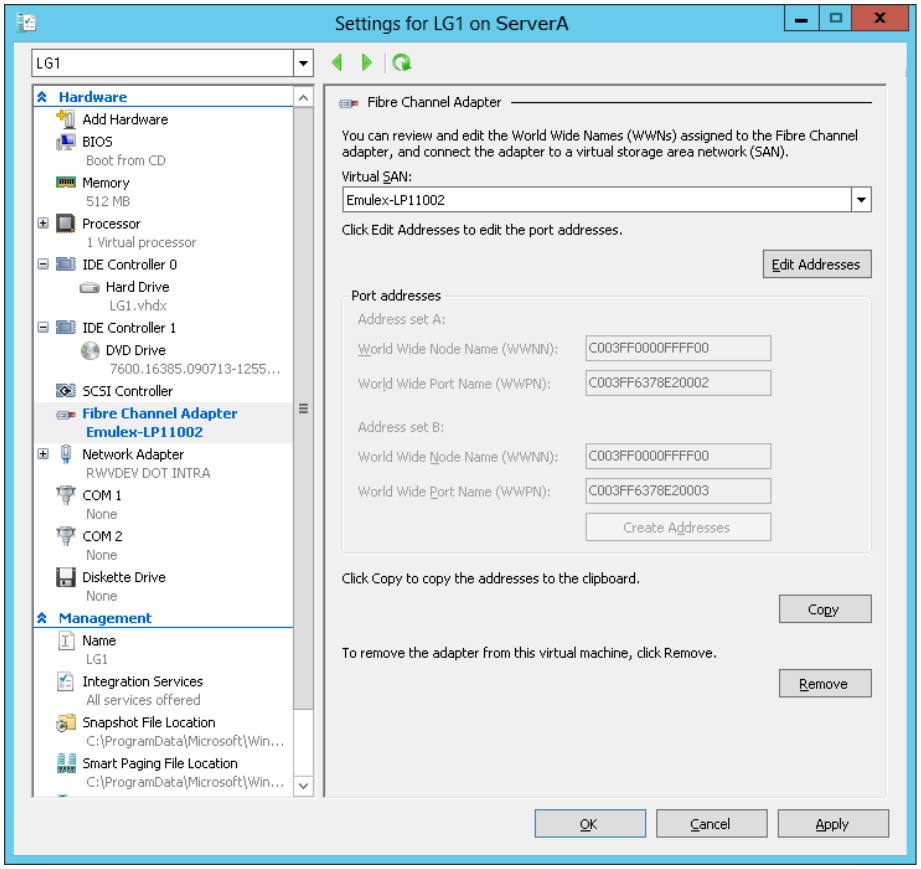
- Windows Server 2012 Hyper-V now supports the creation of virtual Fibre channel adapters.
- This is essentially a pass-through device that enables a virtual machine to access a physical Fibre Channel adapter installed in the computer, and through that, the external resources connected to the SAN.

Connecting Virtual Machines to a SAN



WWNNs and WWPNs in a virtual SAN

Connecting Virtual Machines to a SAN



A Fibre Channel adapter in a VM

Lesson Summary

- Hyper-V uses a specialized virtual hard disk (VHD) format to package part of the space on a physical disk and make it appear to the virtual machine as though it is physical hard disk drive.
- A dynamic hard disk image is an image file with a specified maximum size, which starts out small and expands as needed to accommodate the data the system writes to it.
- A differencing hard disk image is a child image file associated with a specific parent image. The system writes all changes made to the data on the parent image file to the child image, to facilitate a rollback at a later time.

Lesson Summary

- VHDX image files in Windows Server 2012 can be as large as 64 TB, and they also support 4 KB logical sector sizes, to provide compatibility with new 4 KB native drives.
- A pass-through disk is a type of virtual disk that points not to an area of space on a physical disk, but to a physical disk drive itself, installed on the host computer.
- In Hyper-V, a snapshot is a captured image of the state, data, and hardware configuration of a virtual machine at a particular moment in time.
- The specialized networking technologies used to build Fibre Channel SANs have, in the past, made it difficult to use them with virtualized servers. However, Windows Server 2012 Hyper-V now supports the creation of virtual Fibre channel adapters.