Lesson 7: Configuring and Optimizing Storage

MOAC 70-412: Configuring Advanced Windows Server 2012 Services

Overview

- Objective 2.3 – Configure and optimize storage.
    - Configure iSCSI target and initiator
    - Configure Internet Storage Name server (iSNS)
    - Implement thin provisioning and trim
    - Manage server free space using Features on Demand

Understanding Shared Storage

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Understanding Shared Storage

- To provide services and resources, many of the servers used in an organization require large amounts of disk space.

- *Shared storage* devices have many hard drives to provide huge amounts of disk space.

- There are two network storage solutions used in networking:

  o *Network attached storage (NAS)*: A NAS is a file-level data storage device that is connected to the server over a computer network to provide shared drives or folders usually using Server Message Block (SMB) or Network File System (NFS).

  o *Storage area networks (SANs)*: A SAN is a type of storage architecture that allows systems to attach to the storage in the SAN and that presents the drives to the server just as if attached locally.

Understanding Shared Storage

- Most SANs use the SCSI protocol for communication between servers and disk drive devices.

- By using SCSI protocol, you can attach disks to a server using copper Ethernet cables or fiber optic cables.

- The two standards used in SANs include:
  - Fibre Channel
  - iSCSI

Logical Unit Number (LUN)

- A **Logical Unit Number (LUN)** is a logical reference to a portion of a storage subsystem.

- The LUN can be a disk, part of a disk, an entire disk array, or part of the disk array.

- When configuring servers to attach to a SAN, you usually configure the SAN to assign a LUN to a specific server.

- The LUN allows the administrator to break the SAN storage into manageable pieces.

- If the LUN is not mapped to a specific server, the server cannot see or access the LUN.

Using ISCSI

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ISCSI

- iSCSI is an Internet Protocol-based storage network standard that allows servers and other devices to connect to a data storage device or devices.

- As the name indicates, it carries SCSI commands over IP networks.

- Unlike standard local SCSI drives, iSCSI allows data transfers over intranets and can be used over long distances.

- iSCSI allows clients, called **iSCSI initiators**, to send SCSI commands to iSCSI storage devices, which are known as **iSCSI targets**.

iSCSI Qualified Name (IQN)

- *iSCSI Qualified Name (IQN)* is a unique identifier used to address initiators and targets on an iSCSI network.

- The IQN uses the following format:
  - Literal iqn
  - Date (yyyy-mm) that the naming authority took ownership of the domain
  - Reversed domain name of the authority
  - Optional ":" prefixing a storage target name specified by the naming authority

- An example of an IQN is:

  iqn.1991-05.com.contoso:storage01-target1-target

iSCSI Qualified Name (IQN)

- When you configure an iSCSI target, you define which iSCSI initiators can connect to an iSCSI LUN by the client's IQN.

- You can also specify which servers can connect to the iSCSI target based on MAC addresses, IP address, and DNS name.

- The iSCSI initiators use IQNs to connect to the iSCSI targets.

- If name resolution is possible, you can also use IP addresses to identify initiators and targets.
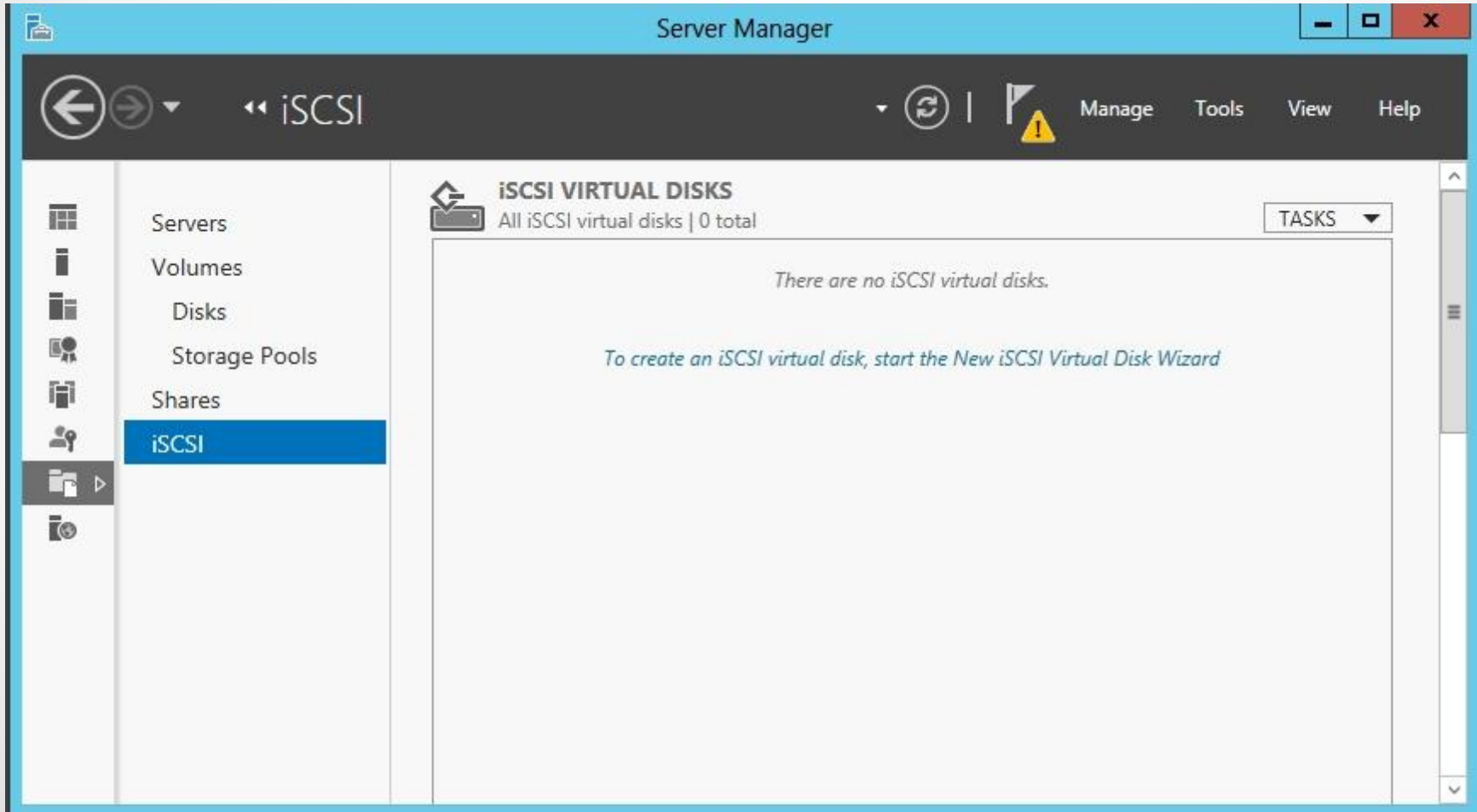
iSCSI Target

- In April 2011, the iSCSI target was available to Windows Server 2008 R2 as a free download.

- Starting with Windows Server 2012, you can install the iSCSI Target Server role, so that other Windows servers can provide iSCSI storage to other clients (including other Windows servers).

- After installing the iSCSI Target Server role, you use Server Manager to create the volumes that will be presented to clients and specify which servers can access the iSCSI LUNs.
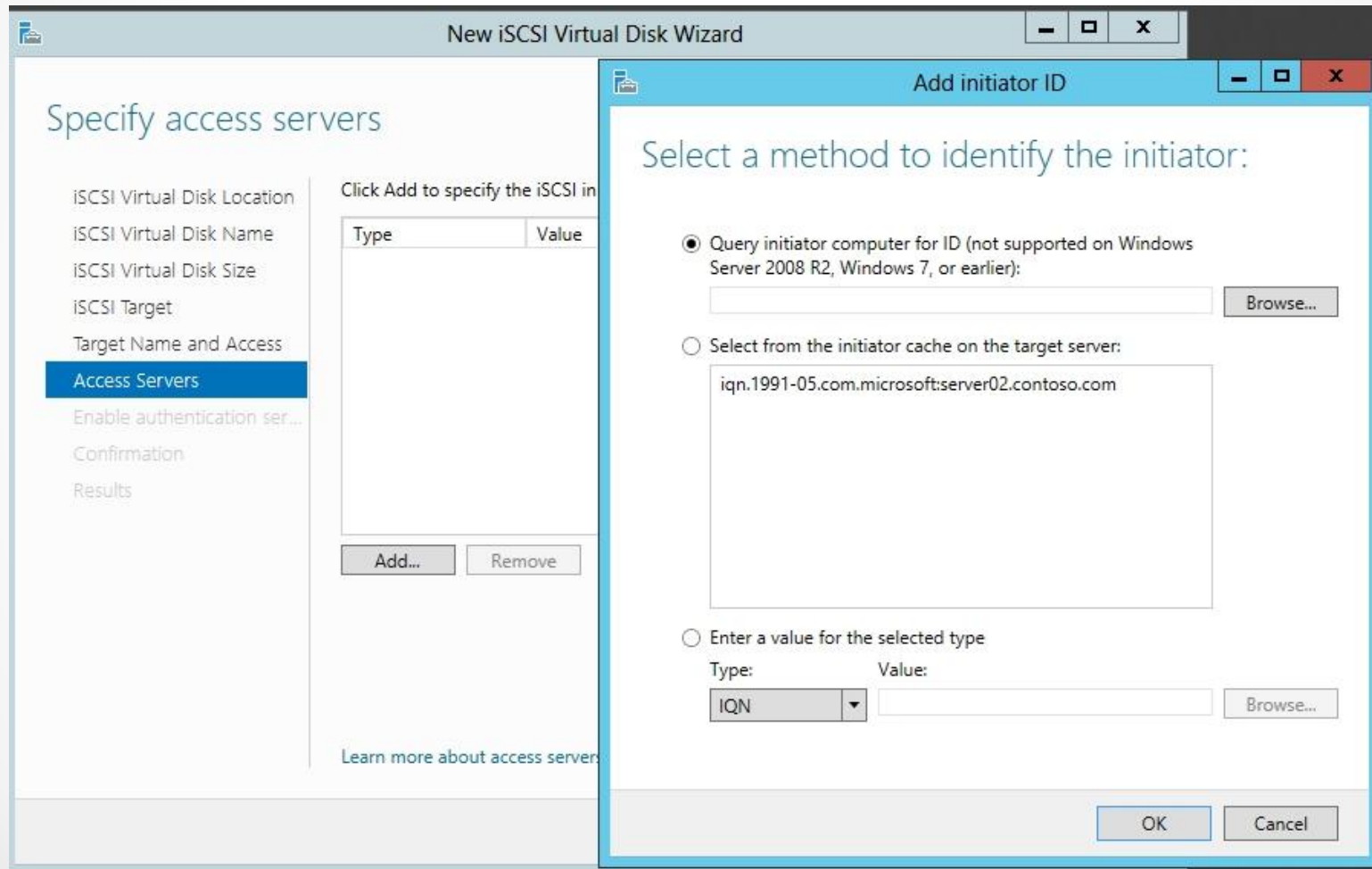
iSCSI Target

- When you install iSCSI Target Server, you should install the following two components:
  - o **iSCSI Target Server**: Provides tools to create and manage iSCSI targets and virtual disks. Enabling iSCSI Target Server can provide application block storage, consolidate remote storage, provide for diskless boots, and it can run in a failover cluster environment.
  - o **iSCSI Target Storage Provider**: Enables applications on a server connected to an iSCSI target to perform volume shadow copies of data on iSCSI virtual disks. It also enables you to manage iSCSI virtual disks by using older applications that require a Virtual Disk Service (VDS) hardware provider (e.g., using the DiskRAID command-line tool).
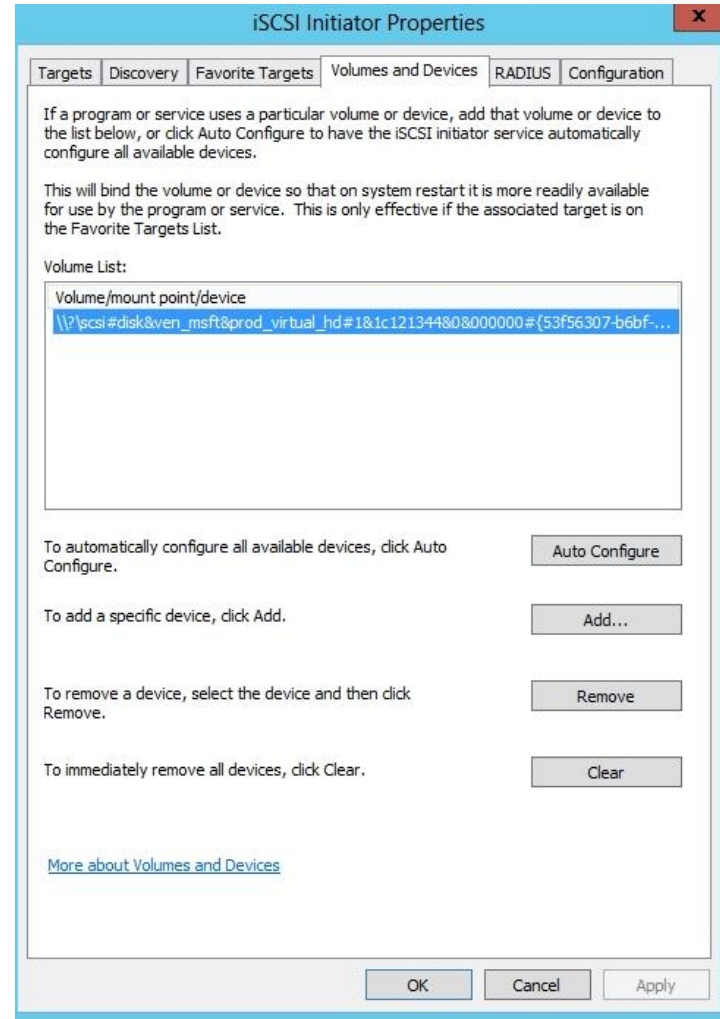
iSCSI Virtual Disk

Specifying the iSCSI Initiators

Showing Volume List

After the targets are configured and registered, open the iSCSI initiator to connect to an iSCSI target.

# Configuring iSCSI for High Availability

- A single connection to an iSCSI storage device makes the storage available; it does not make the storage highly available.

- If the network connection fails, or a switch fails, the server connecting to the iSCSI storage will lose access to its storage.

- Because many servers require high availability, you need to use high-availability technologies such as Multiple Connection Session (MCS) and Multipath I/O (MPIO).

Internet Storage Name Service (iSNS)

- The *Internet Storage Name Service (iSNS)* protocol is used to automatically discover, manage, and configure iSCSI devices on a TCP/IP network.
  - iSNS is used to emulate Fibre Channel fabric services to provide a consolidated configuration point for an entire storage network.
  - The iSNS provides a registration function to allow entities in a storage network to register a query in the iSNS database.
  - Both targets and initiators can register in the iSNS database.

Discovery Domain (DD)

- The **discovery domain (DD)** service allows the partitioning of storage nodes into management groupings (called *discovery domains*) for administrative and logon control purposes.

- You can create a new discovery domain by using the *Create* button and typing the name of the discovery domain.
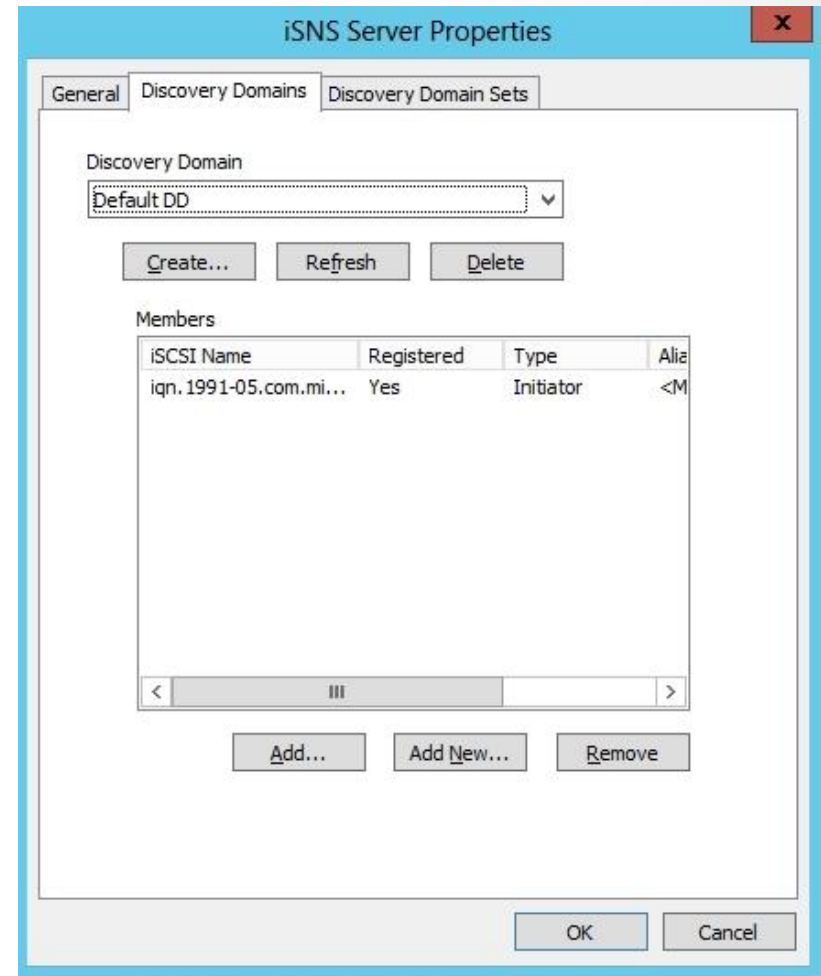
Thin Provisioning

- The advantages of running virtual machines are to share resources and to make use of wasted or idle resources on a computer.

- For example, although a physical server might have two processors, those processors are mostly idle as they wait for something to do.

- The same can be said for storage.

- Hyper-V introduces **thin provisioning** using **dynamically expanding disks** in Windows Server 2012.

Creating Disks in Hyper-V

- When you create a disk in Hyper-V, you can choose from these formats:
  - o Fixed size
  - o Dynamically expanding
  - o Differencing
- After a virtual disk is created, you can choose from these actions:
  - o Compact
  - o Convert
  - o Expand
  - o Shrink/Trim

Features on Demand

- Starting with Windows Server 2012, you can use **Features on Demand**, which allows administrators to

    o Completely remove the installation binaries for roles and features that are not needed for the server.

    o Save disk space and enhance security by removing binaries for features that will not be needed.

Features on Demand

- To view the available features for Windows, execute Windows PowerShell command:

  `Get-WindowsFeature`

  or type the following command at a command prompt:

  `dism /online /get-features /format:table`

- To remove the binaries of a feature, use the *Uninstall-WindowsFeature PowerShell* cmdlet with the –Remove parameter:

  `uninstall-WindowsFeature Bitlocker –Remove`

Lesson Summary

- A SAN is a type of storage architecture that allows systems to attach to the storage in the SAN and that presents the drives to the server just as if attached locally.

- Internet Small Computer System Interface (iSCSI) is a protocol that enables clients to send SCSI commands over a TCP/IP network using TCP port 3260.

- A Logical Unit Number (LUN) is a logical reference to a portion of a storage subsystem. The LUN can be a disk, part of a disk, an entire disk array, or part of the disk array.

- iSCSI allows clients, called *iSCSI initiators,* to send SCSI commands to SCSI storage devices, which are known as *iSCSI targets*.

Lesson Summary

- iSCSI Qualified Name (IQN) is a unique identifier used to address initiators and targets on an iSCSI network.

- Virtual disks or targets are created on an iSCSI disk storage subsystem that is not directly assigned to a server.

- Because many servers require high availability, you need to use high-availability technologies such as Multiple Connection Session (MCS), and Multipath I/O (MPIO) can be used with iSCSI.

- The Internet Storage Name Service (iSNS) protocol is used to automatically discover, manage, and configure iSCSI devices on a TCP/IP network.

Lesson Summary

- Dynamically expanding disks, rather than creating a file equivalent in size of the disk, create a small file that grows as data is written to it, up to the limitations set forth in the configured size of the disk.

- With Features on Demand, you save disk space and enhance security by removing binaries for features that are not needed.

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