



Application Note
Apr. 2018

Using QNAP Enterprise-class ES NAS with Microsoft Windows Server and Hyper-V



Notices

This user manual provides detailed instructions of using the QNAP Enterprise Storage NAS. Please read carefully and start to enjoy the powerful functions of the Enterprise Storage NAS.

- The QNAP Enterprise Storage NAS is hereafter referred to as the ES NAS or the NAS.
- This manual provides the description of all the functions of the ES NAS. The product you purchased may not support certain functions dedicated to specific models.

Legal Notices

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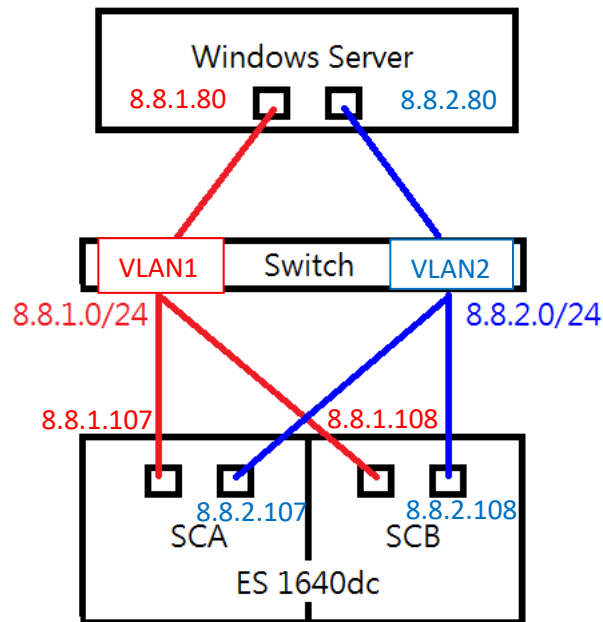
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Use storage through iSCSI.....	錯誤! 尚未定義書籤。
Some updates are recommended. See “I. Optimize network performance	錯誤! 尚未定義書籤。
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Overview

This application note aims for guiding users to mount the iSCSI LUN on ES NAS to Windows Server and Hyper-V, as well as the MPIO(Multi-Path I/O) settings. As for how to create a iSCSI LUN on ES NAS, refer to “[Network and Storage Settings of ES NAS High-Availability Network Storage Services](#)” instead.

Infrastructure diagram

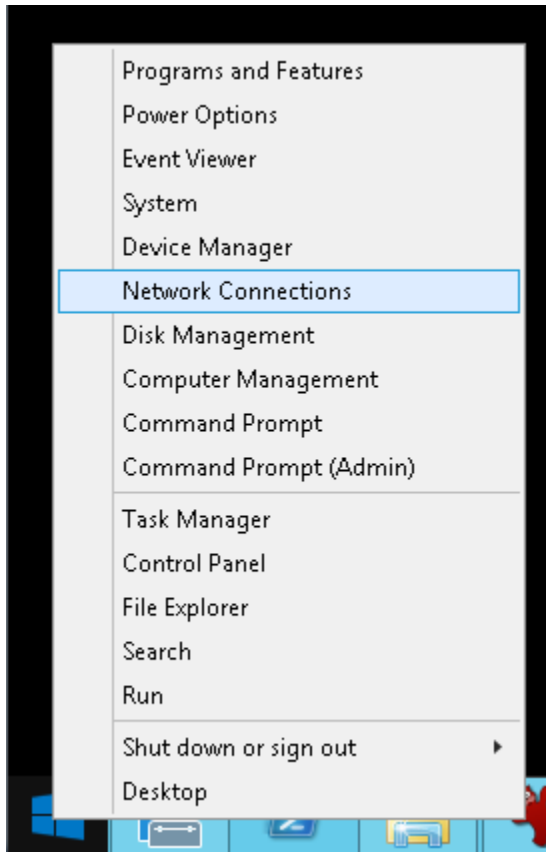


Pre-configure table

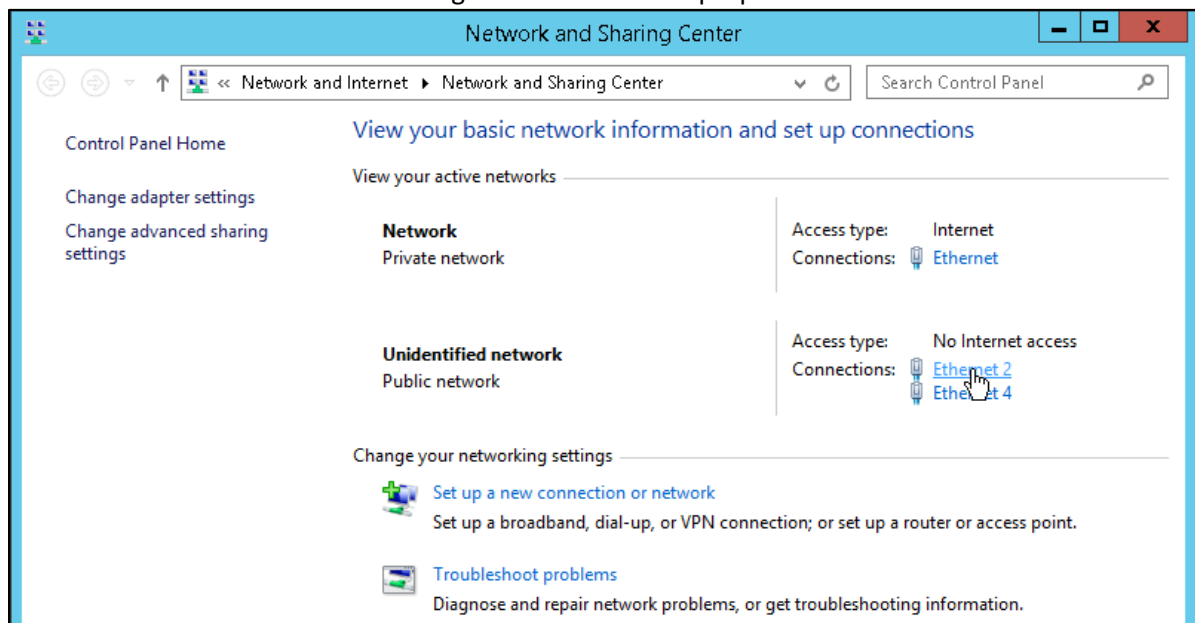
	Windows Server	ES 1640dc v2	
		SCA	SCB
Data Port 1	8.8.1.80	8.8.1.107	8.8.1.108
Data Port 2	8.8.2.80	8.8.2.107	8.8.2.108

Server data ports configuration

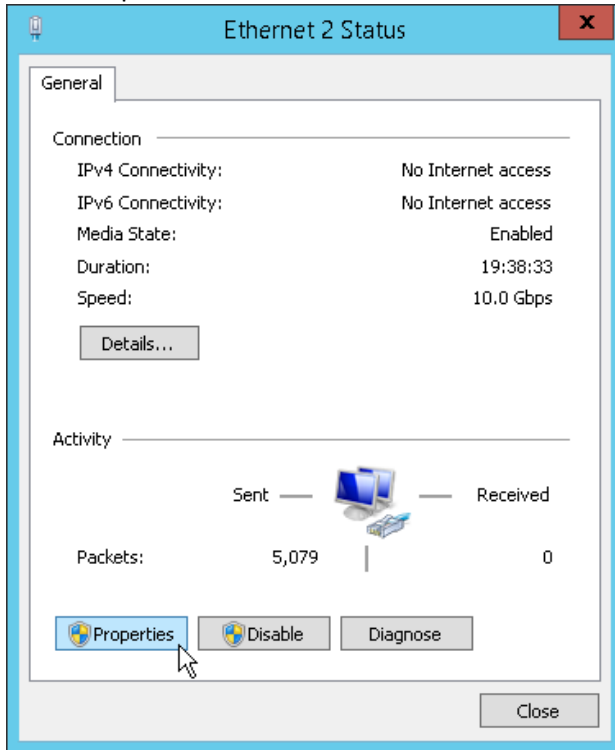
1. Take Windows Server as example, use “Windows Key + X” on the keyboard and click “Network Connections”.



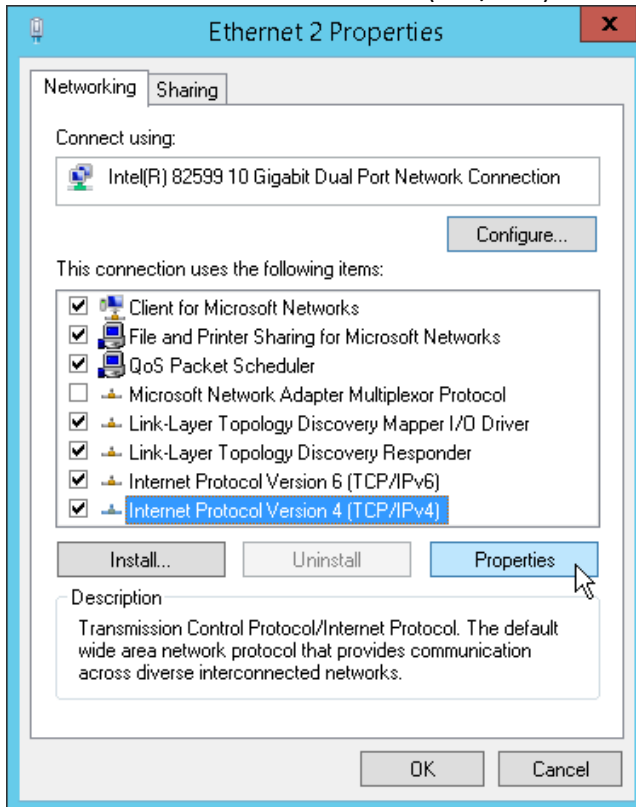
2. Click the desired connections to configure the connection properties.



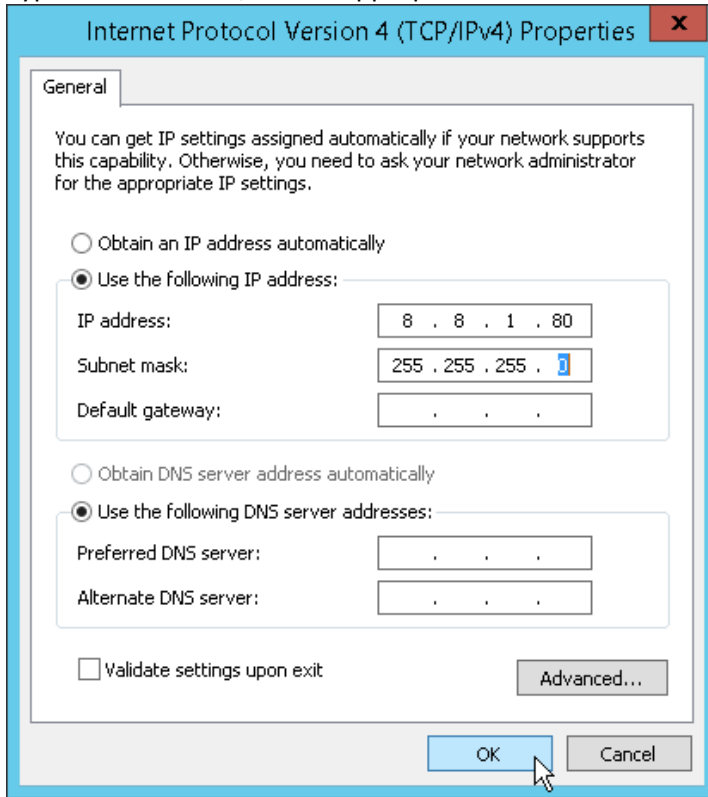
- Click "Properties".



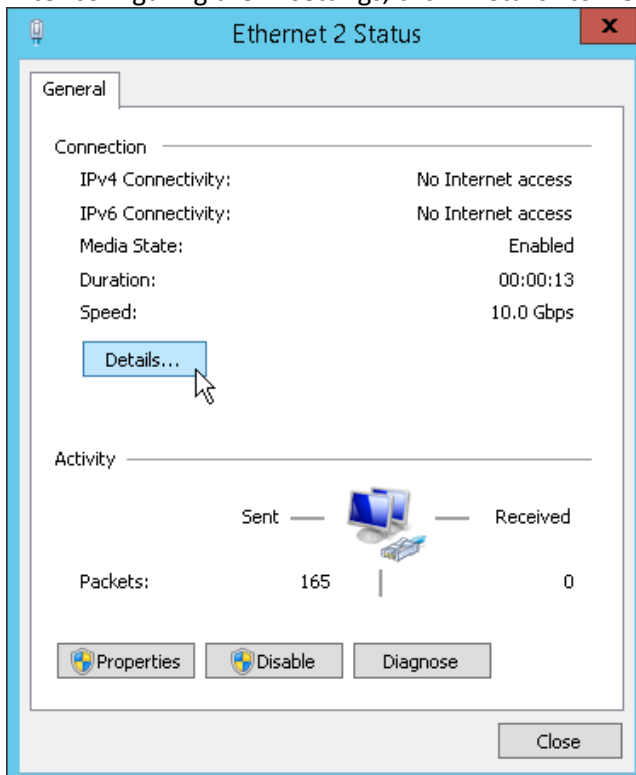
- Select "Internet Protocol Version 4 (TCP/IPv4)" and click "Properties".



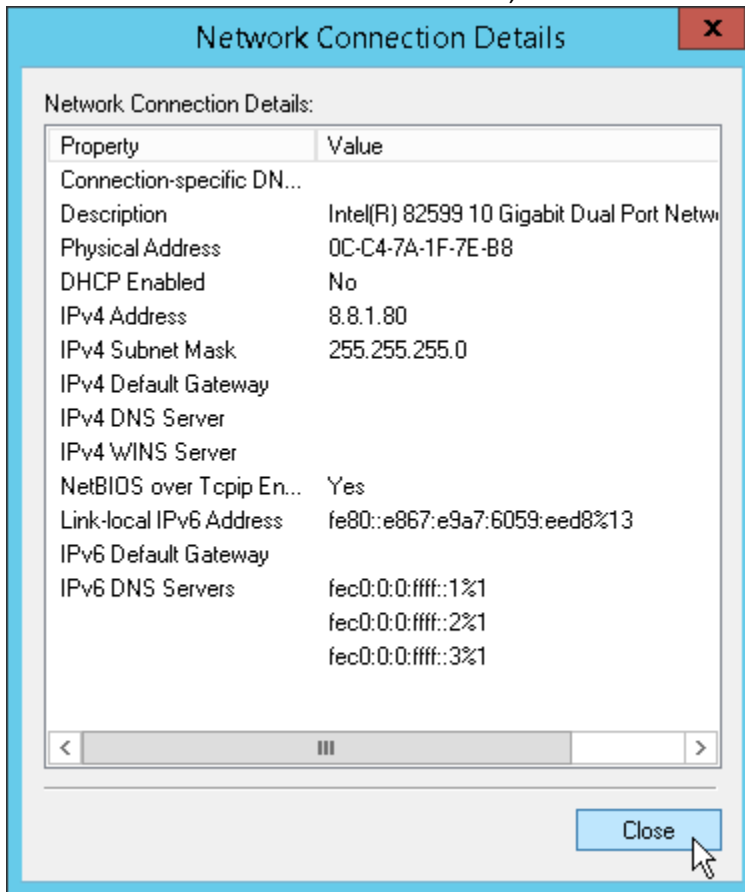
5. Type the IP address, and an appropriate subnet mask. User can skip default gateway and DNS Server.



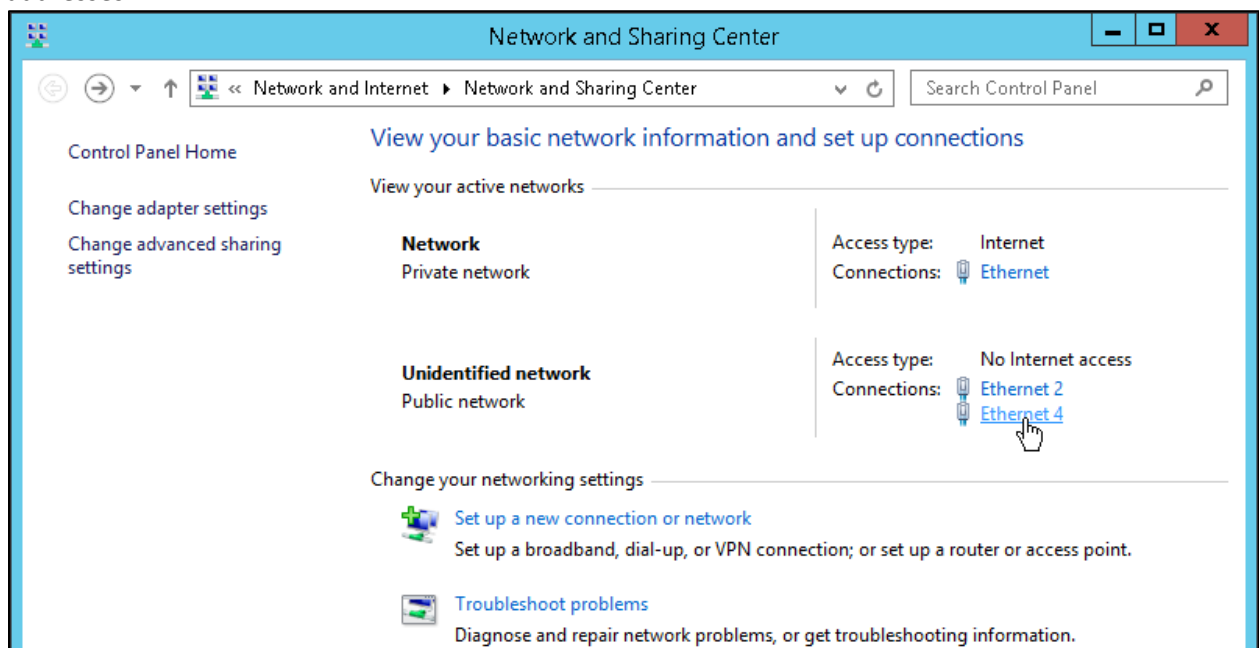
6. After configuring the IP settings, click "Details" to view the configured network settings.



7. Check out the IP address and subnet mask, and click "Close".



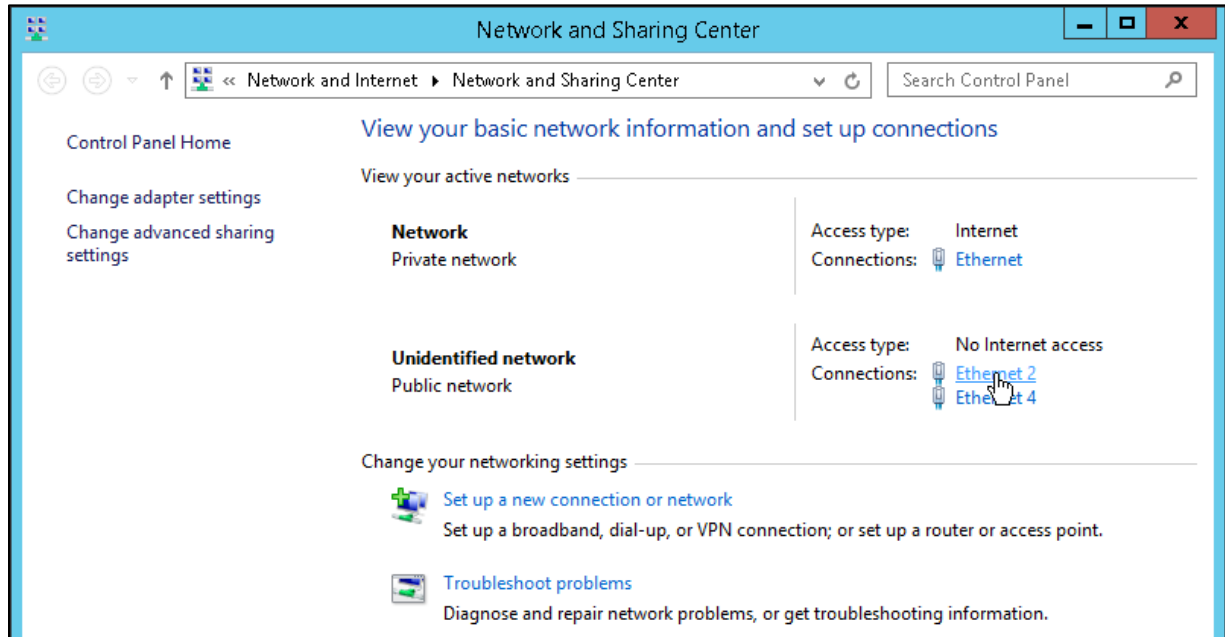
8. Follow the steps above, complete configuration of all the other data ports, obtaining their own IP addresses.



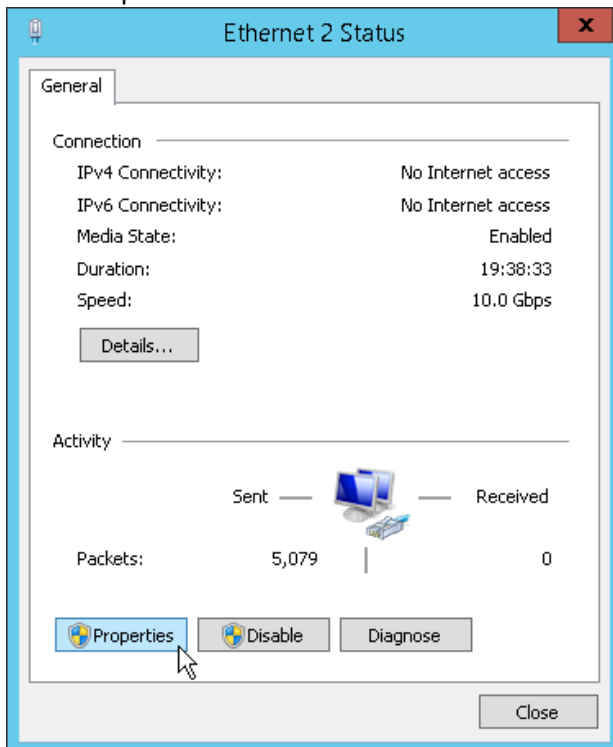
Enable Jumbo Frame in Windows Server (optional)

Each link in the network path, including servers and endpoints, should be configured to enable jumbo frames at the same MTU if jumbo frames function is needed. Otherwise, performance may actually decrease as incompatible devices drop frames.

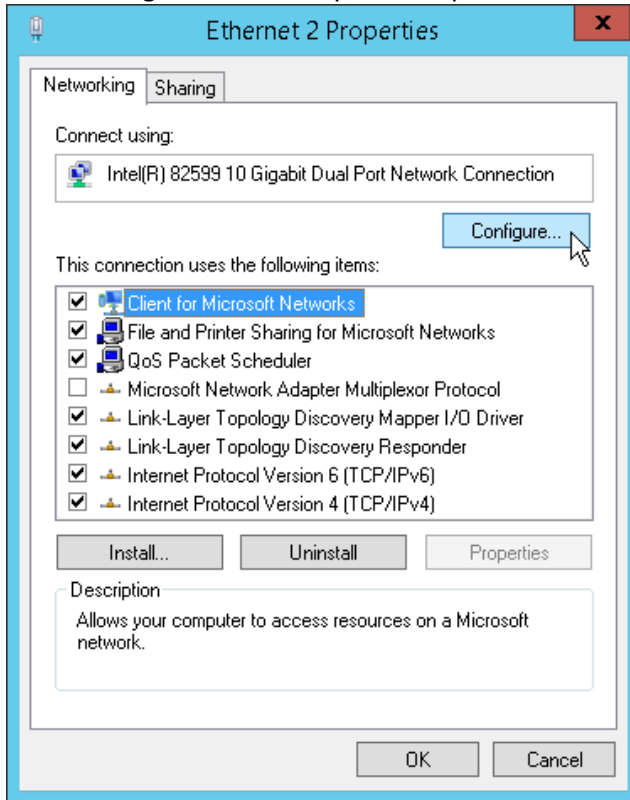
1. Choose one data port at Network and Sharing Center.



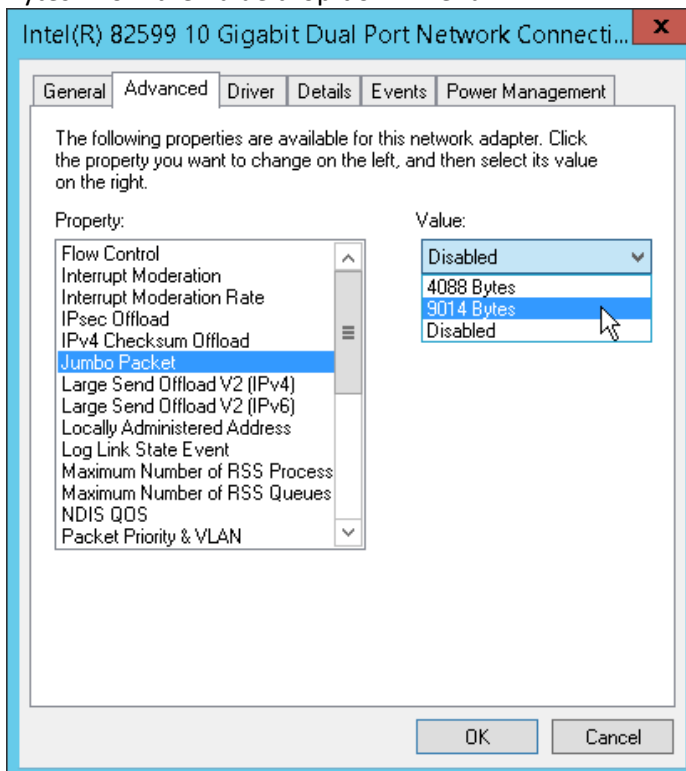
2. Click "Properties".



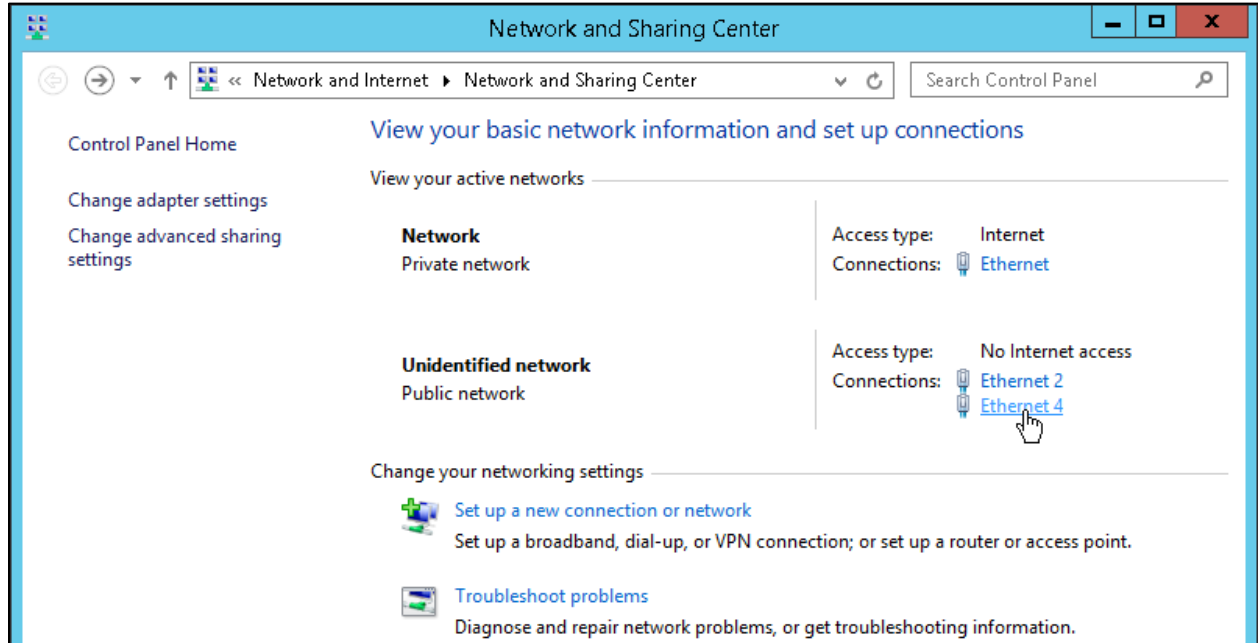
- Click “Configure” in the adaptor’s Properties window.



- Select the “Advanced” tab. Then select “Jumbo Packet” in the “property” list and choose “9014 Bytes” from the Value drop-down menu.



5. Follow the steps above to complete all other data port, and enable Jumbo Frame.

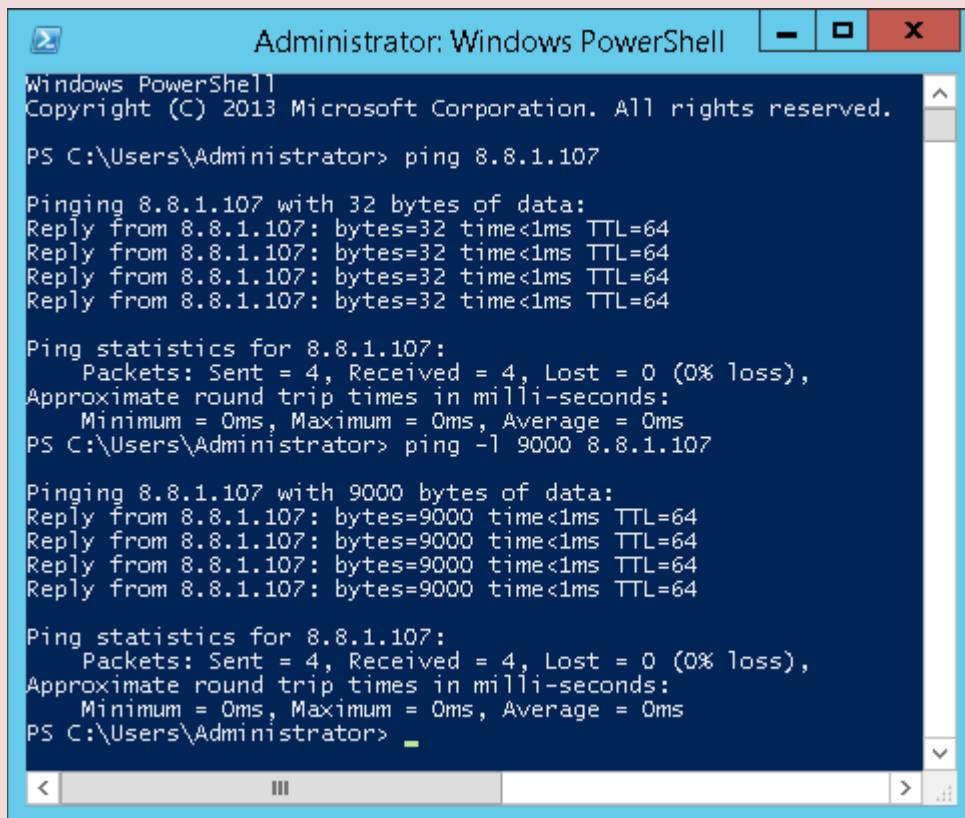


TIPS : Use Windows command line to confirm whether the network supports Jumbo Frame

When the interfaces of NAS and server both enable function of Jumbo Frame, user can use simple commands to verify Jumbo Frame transmission.

Open up Windows command line or Windows PowerShell, and type "ping -l 9000 <NAS IP>."

For example, "ping -l 9000 8.8.1.107"



```
Administrator: Windows PowerShell
Windows PowerShell
Copyright (C) 2013 Microsoft Corporation. All rights reserved.

PS C:\Users\Administrator> ping 8.8.1.107

Pinging 8.8.1.107 with 32 bytes of data:
Reply from 8.8.1.107: bytes=32 time<1ms TTL=64
Reply from 8.8.1.107: bytes=32 time<1ms TTL=64
Reply from 8.8.1.107: bytes=32 time<1ms TTL=64
Reply from 8.8.1.107: bytes=32 time<1ms TTL=64

Ping statistics for 8.8.1.107:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
PS C:\Users\Administrator> ping -l 9000 8.8.1.107

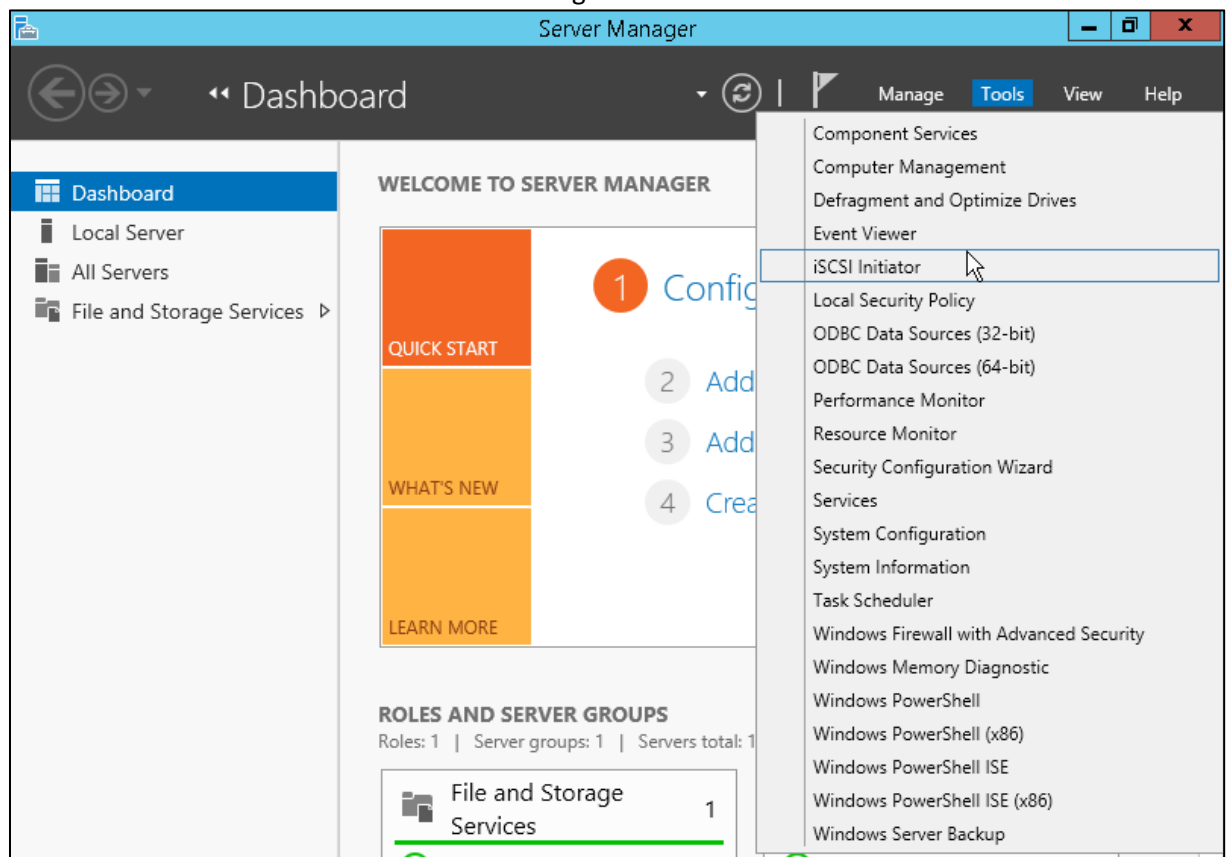
Pinging 8.8.1.107 with 9000 bytes of data:
Reply from 8.8.1.107: bytes=9000 time<1ms TTL=64
Reply from 8.8.1.107: bytes=9000 time<1ms TTL=64
Reply from 8.8.1.107: bytes=9000 time<1ms TTL=64
Reply from 8.8.1.107: bytes=9000 time<1ms TTL=64

Ping statistics for 8.8.1.107:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
PS C:\Users\Administrator>
```

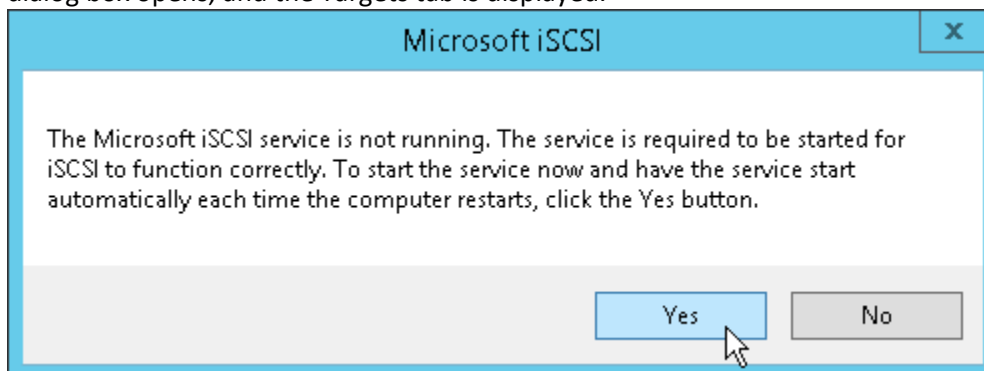
To optimize the network performance, see "Optimize network performance" in Appendix I.

Connect to iSCSI targets using Microsoft iSCSI initiator

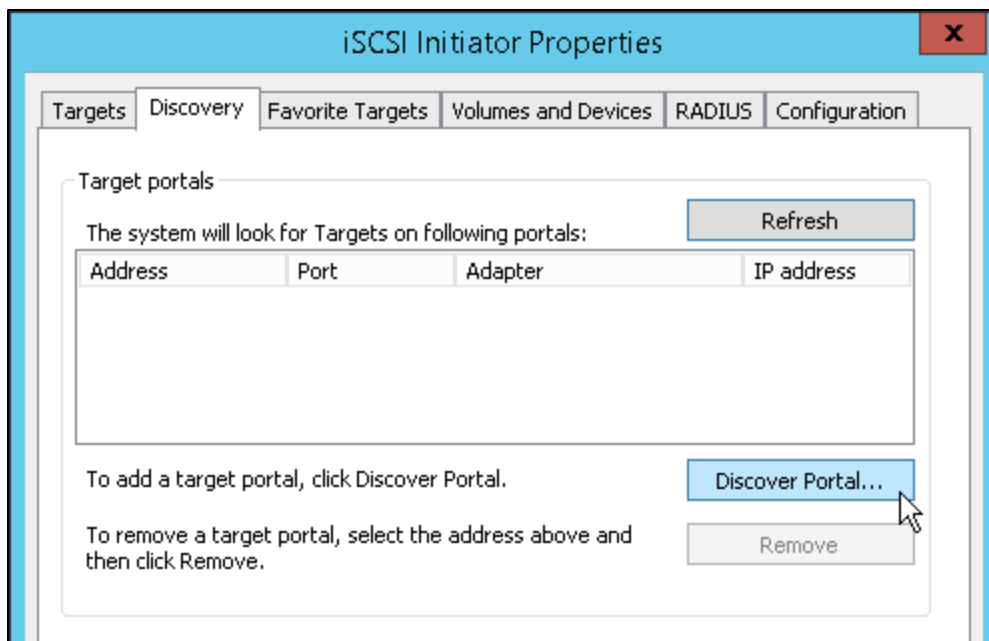
1. Select "Tools" > "iSCSI Initiator" in Server Manager.



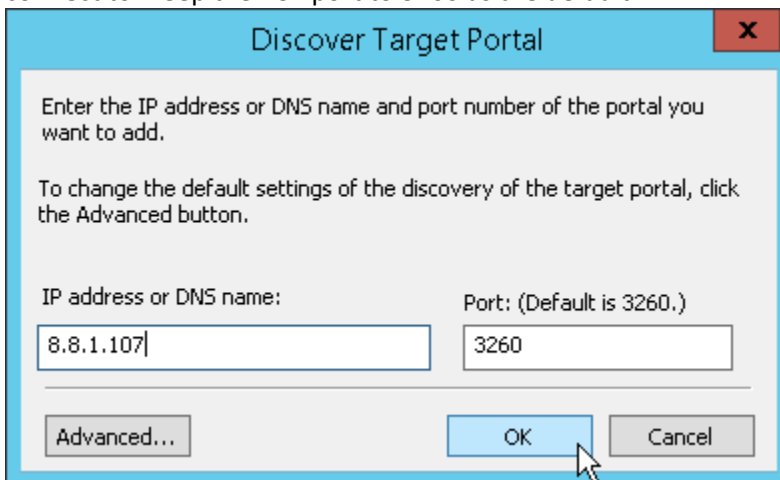
2. If this is the first time that you have launched Microsoft iSCSI Initiator, you receive a prompt that says the Microsoft iSCSI service is not running. You must start the service for Microsoft iSCSI Initiator to run correctly. Click "Yes" to start the service. The Microsoft iSCSI Initiator Properties dialog box opens, and the Targets tab is displayed.



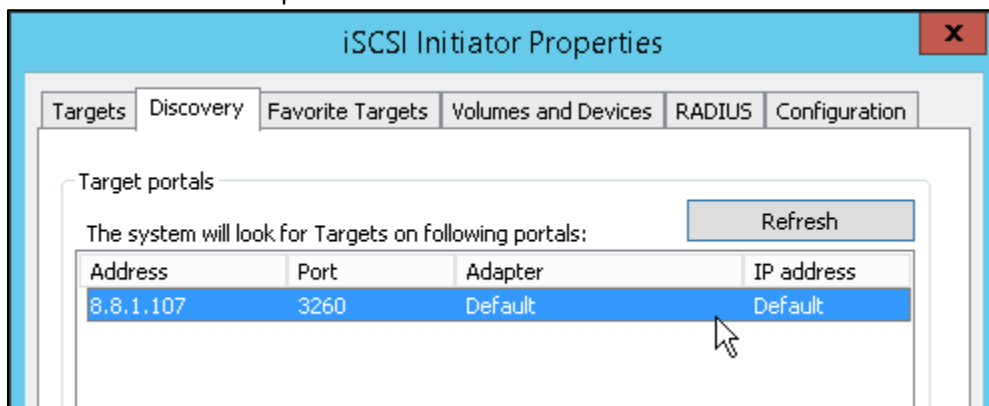
3. Click the "Discovery" tab. To add the target portal, click "Discover Portal".



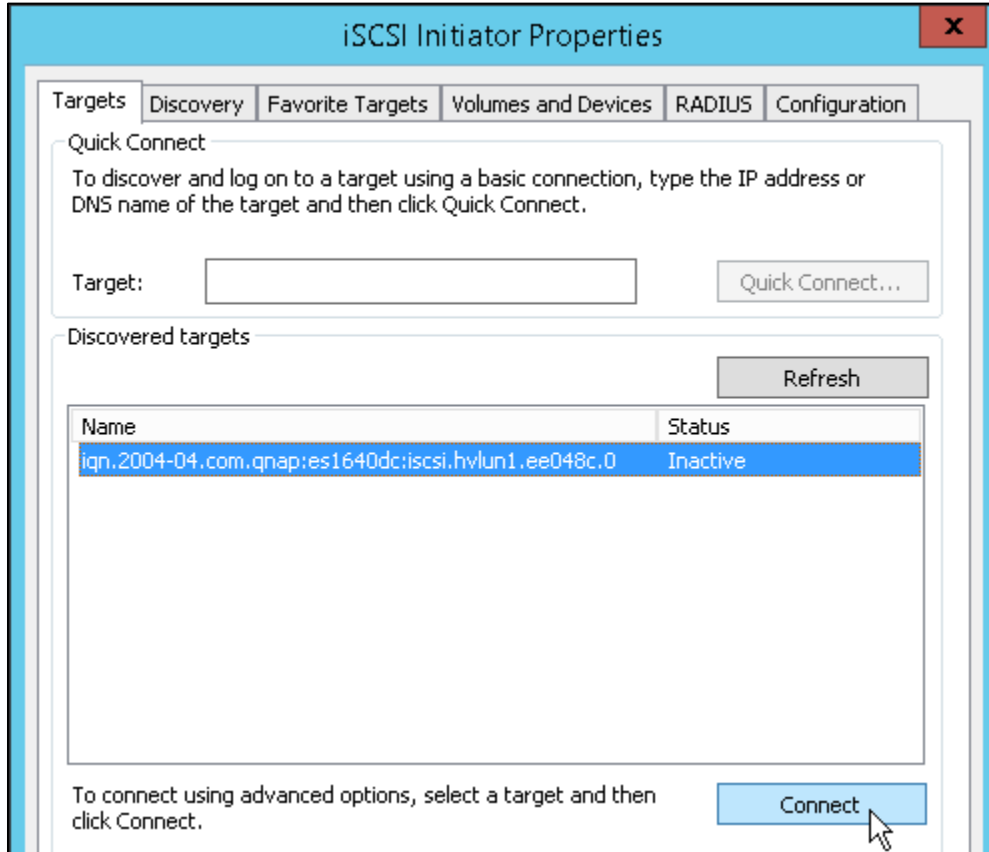
4. In the "Discover Target Portal" dialog box, type the IP address or name of the target portal to connect to. Keep the TCP port to 3260 as the default.



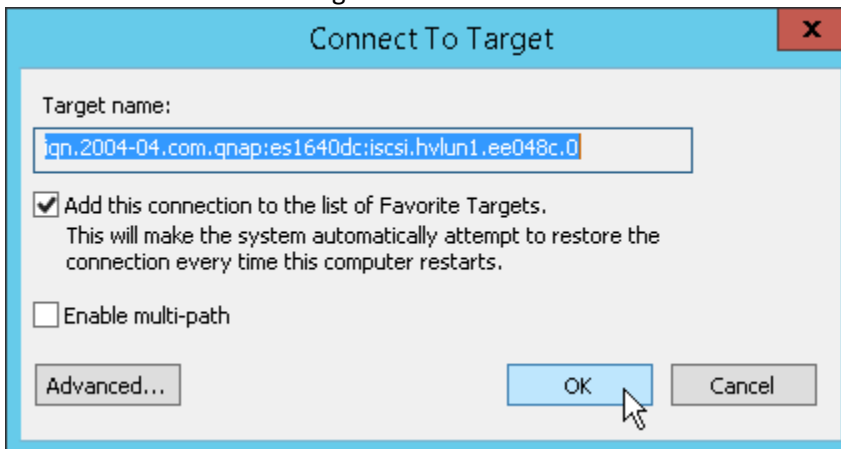
5. IP address of NAS data port is added in the list.



- The available iSCSI targets and their status will then be shown under the "Targets" tab. Select the target you wish to connect to and click "Connect".



- Click "OK" to connect to target.



- The status of the target should now display "Connected".

iSCSI Initiator Properties

Targets | Discovery | Favorite Targets | Volumes and Devices | RADIUS | Configuration

Quick Connect
To discover and log on to a target using a basic connection, type the IP address or DNS name of the target and then click Quick Connect.

Target: Quick Connect...

Discovered targets Refresh

Name	Status
iqn.2004-04.com.qnap:es1640dc:iscsi.hvln1.ee048c.0	Connected

To connect using advanced options, select a target and then click Connect.

To completely disconnect a target, select the target and then click Disconnect.

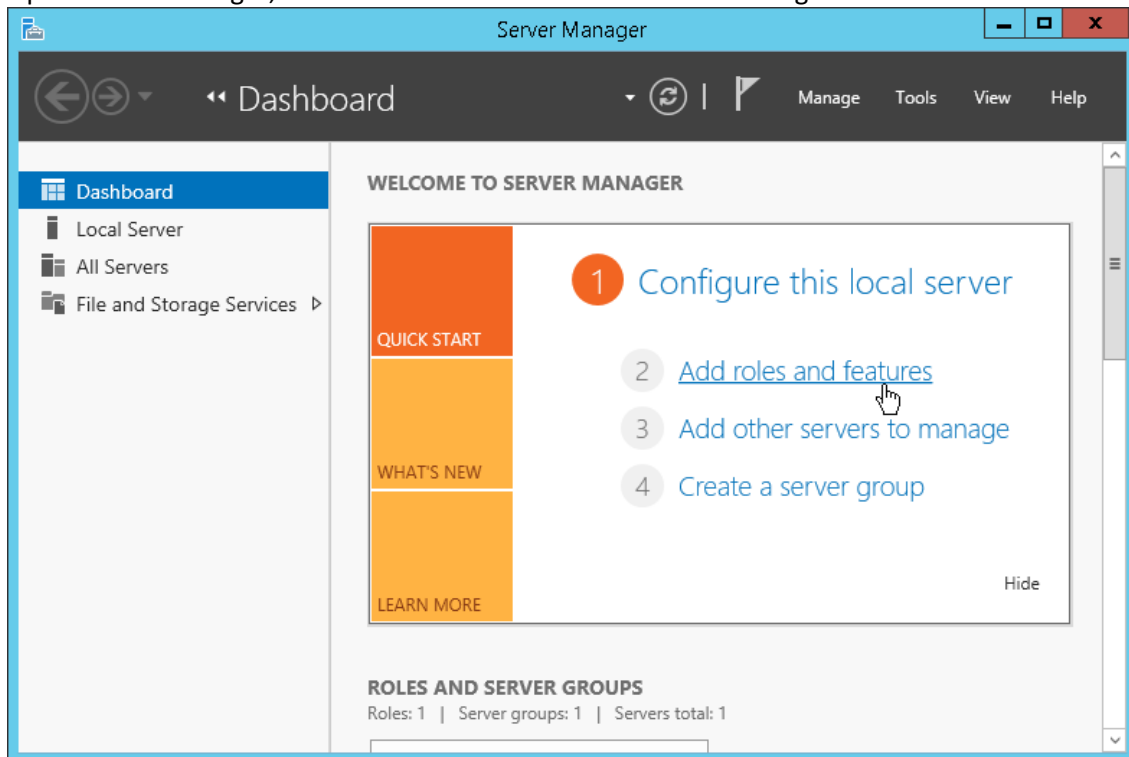
For target properties, including configuration of sessions, select the target and click Properties...

For configuration of devices associated with a target, select the target and then click Devices...

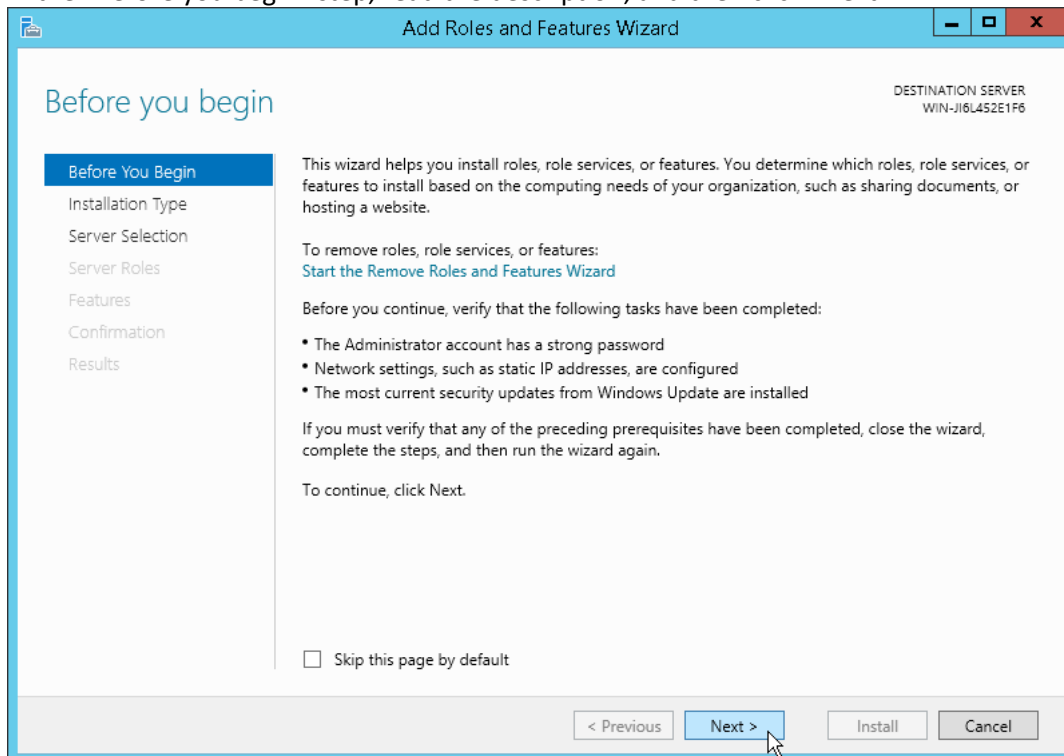
OK Cancel Apply

Install the MPIO Service in Windows Server

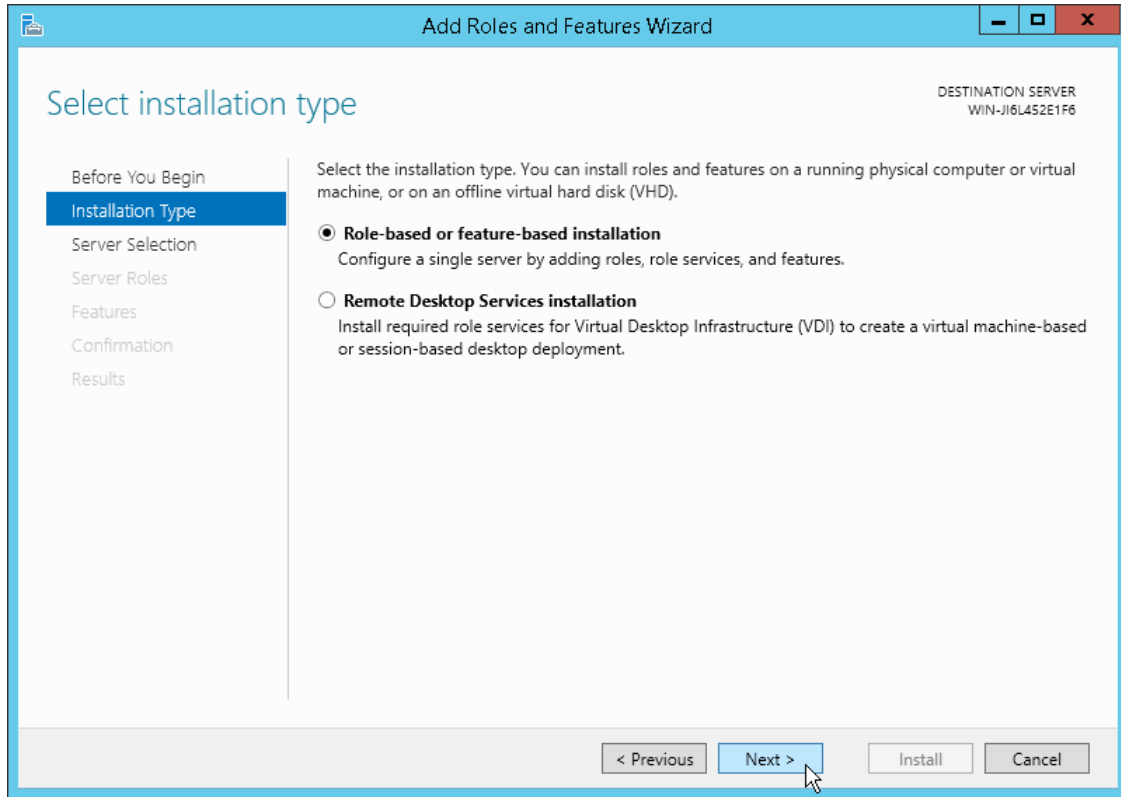
1. Open Server Manager, click “Add roles and features” under “Configure this local server”.



2. In the “Before you begin” step, read the description, and then click “Next”.

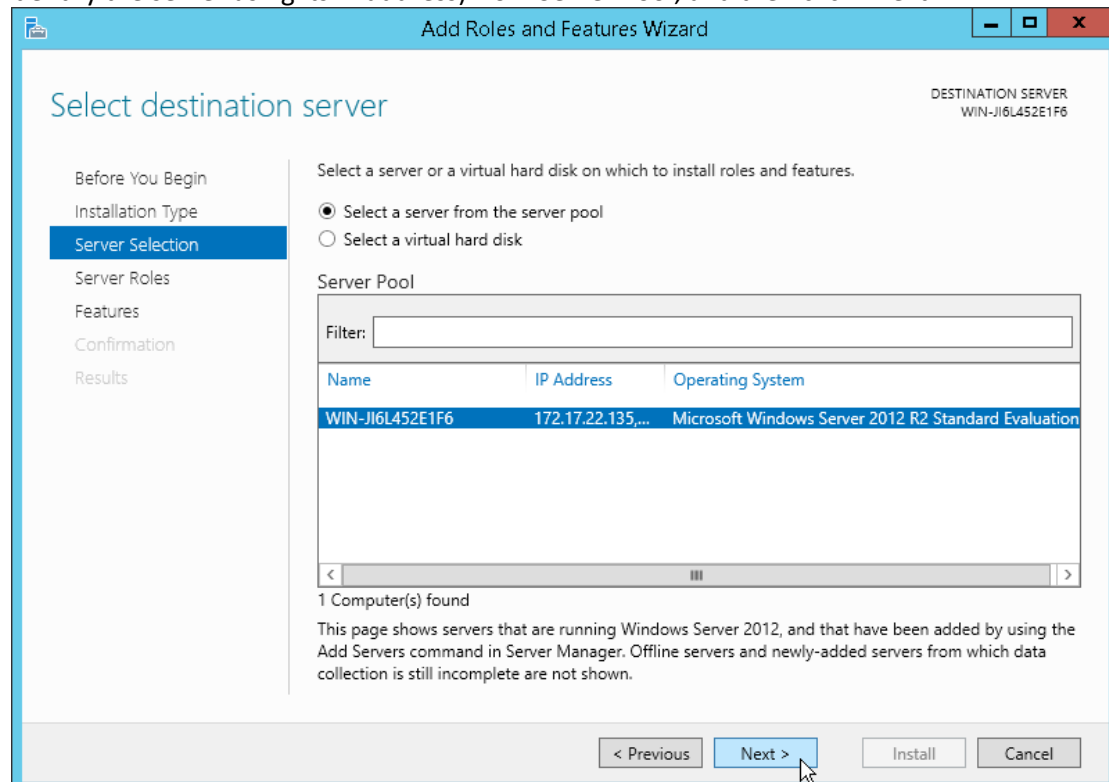


3. In the “Select installation type” step, select “Role-based or feature-based installation”, and then click “Next”.



The screenshot shows the 'Add Roles and Features Wizard' window. The title bar says 'Add Roles and Features Wizard'. The main heading is 'Select installation type'. On the right, it says 'DESTINATION SERVER WIN-J16L452E1F6'. On the left, there is a navigation pane with 'Before You Begin', 'Installation Type' (selected), 'Server Selection', 'Server Roles', 'Features', 'Confirmation', and 'Results'. The main area contains the following text: 'Select the installation type. You can install roles and features on a running physical computer or virtual machine, or on an offline virtual hard disk (VHD).' There are two radio buttons: 'Role-based or feature-based installation' (selected) and 'Remote Desktop Services installation'. Below the first radio button is the text: 'Configure a single server by adding roles, role services, and features.' Below the second radio button is the text: 'Install required role services for Virtual Desktop Infrastructure (VDI) to create a virtual machine-based or session-based desktop deployment.' At the bottom, there are four buttons: '< Previous', 'Next >' (with a mouse cursor over it), 'Install', and 'Cancel'.

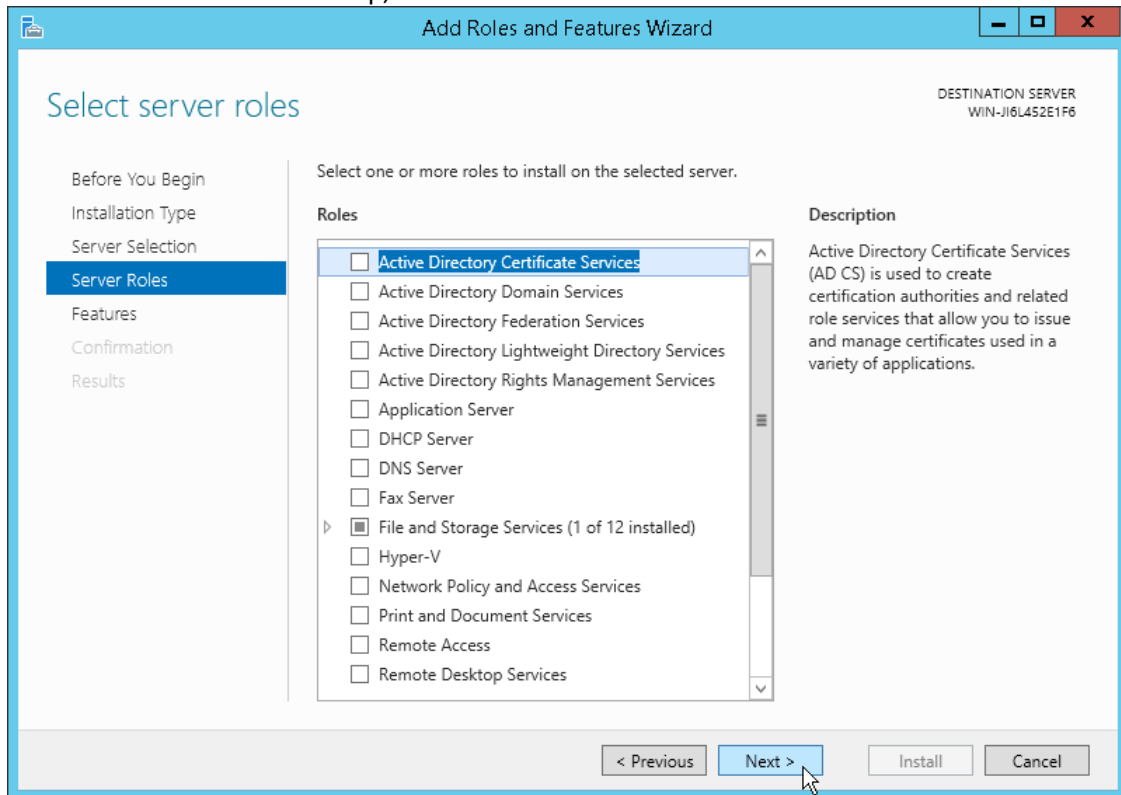
4. Choose “Select a server from the server pool”, select the Windows Server 2012 R2 (you can identify the server using its IP address) from Server Pool, and then click “Next>”.



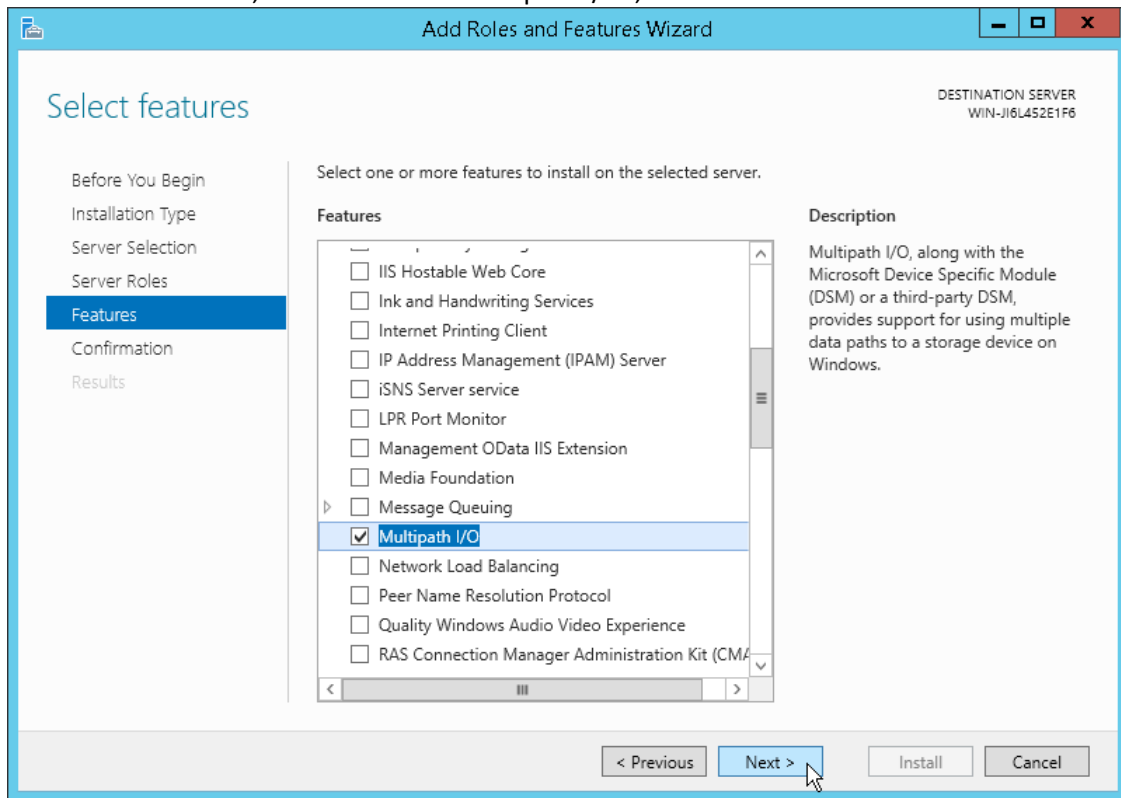
The screenshot shows the 'Add Roles and Features Wizard' window. The title bar says 'Add Roles and Features Wizard'. The main heading is 'Select destination server'. On the right, it says 'DESTINATION SERVER WIN-J16L452E1F6'. On the left, there is a navigation pane with 'Before You Begin', 'Installation Type', 'Server Selection' (selected), 'Server Roles', 'Features', 'Confirmation', and 'Results'. The main area contains the following text: 'Select a server or a virtual hard disk on which to install roles and features.' There are two radio buttons: 'Select a server from the server pool' (selected) and 'Select a virtual hard disk'. Below the first radio button is the text: 'Server Pool'. Below the second radio button is the text: 'Filter:'. There is a table with the following columns: 'Name', 'IP Address', and 'Operating System'. The table has one row: 'WIN-J16L452E1F6', '172.17.22.135,...', and 'Microsoft Windows Server 2012 R2 Standard Evaluation'. Below the table is a scroll bar. At the bottom, there are four buttons: '< Previous', 'Next >' (with a mouse cursor over it), 'Install', and 'Cancel'.

Name	IP Address	Operating System
WIN-J16L452E1F6	172.17.22.135,...	Microsoft Windows Server 2012 R2 Standard Evaluation

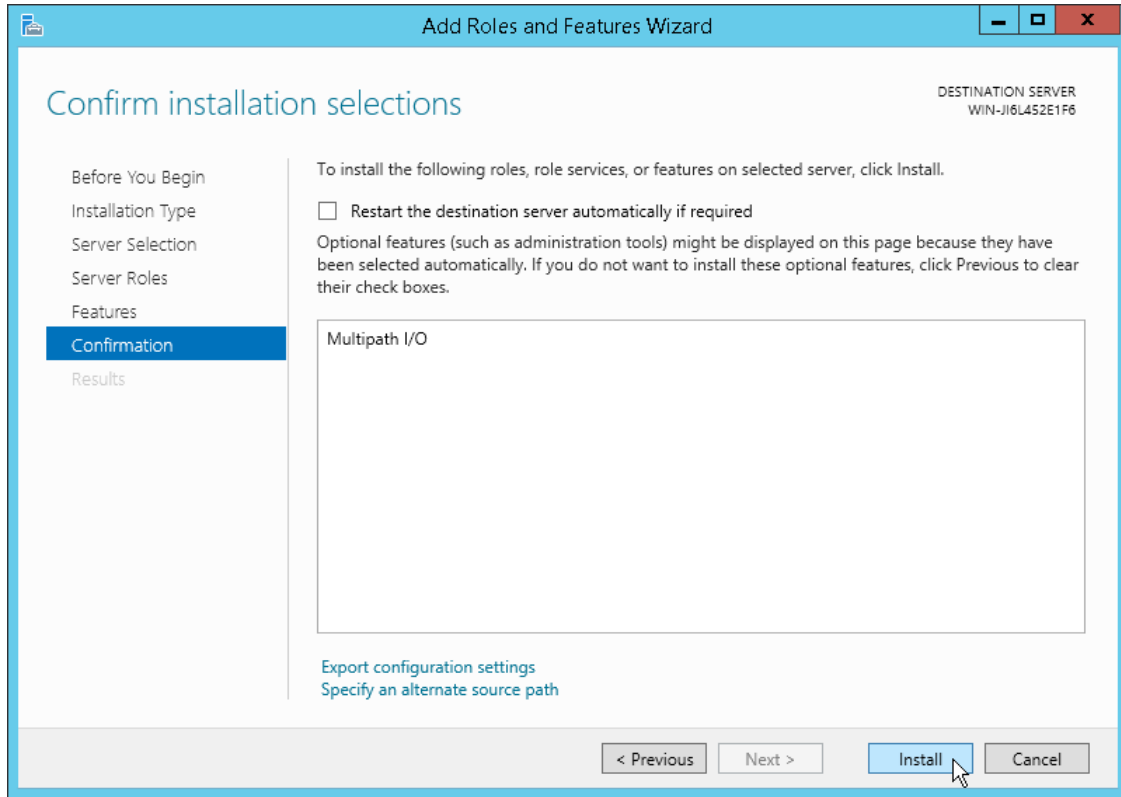
5. In the “Select server roles” step, click “Next”.



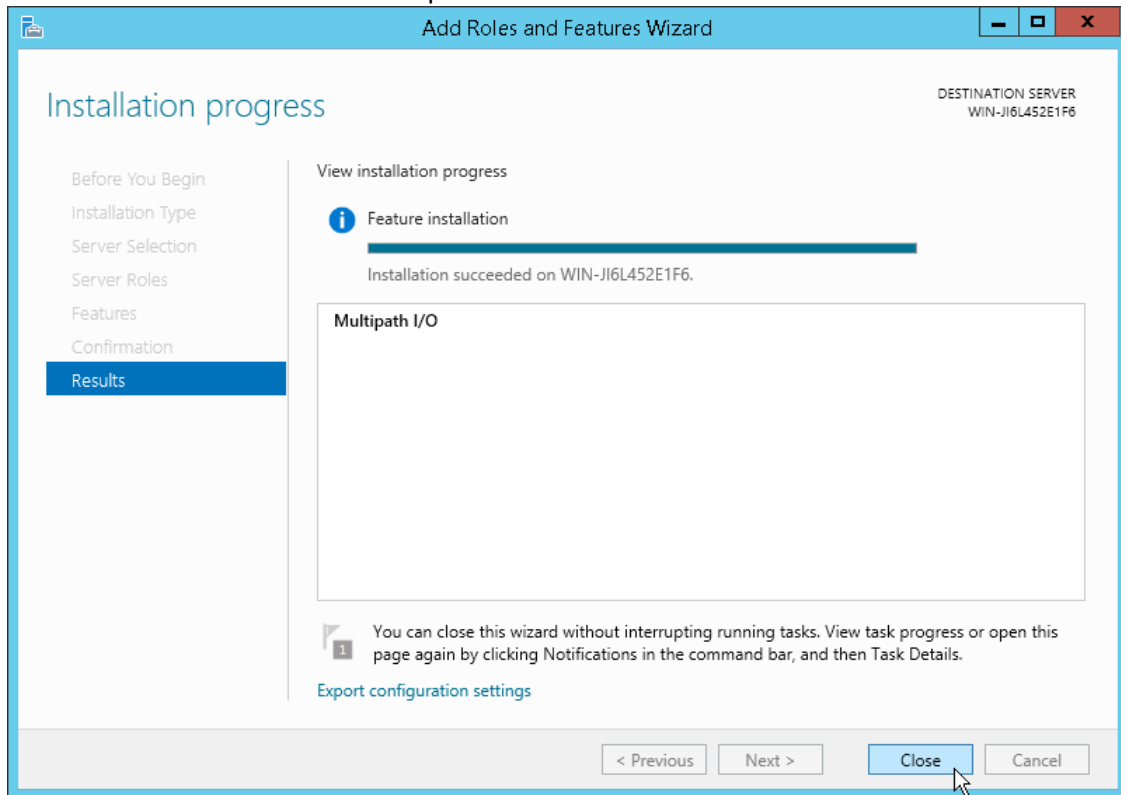
6. In the “Features” list, find and select “Multipath I/O”, and click “Next”.



- On the “Confirm installation selections” window, click “Install”. Then click “Close” when it is finished.

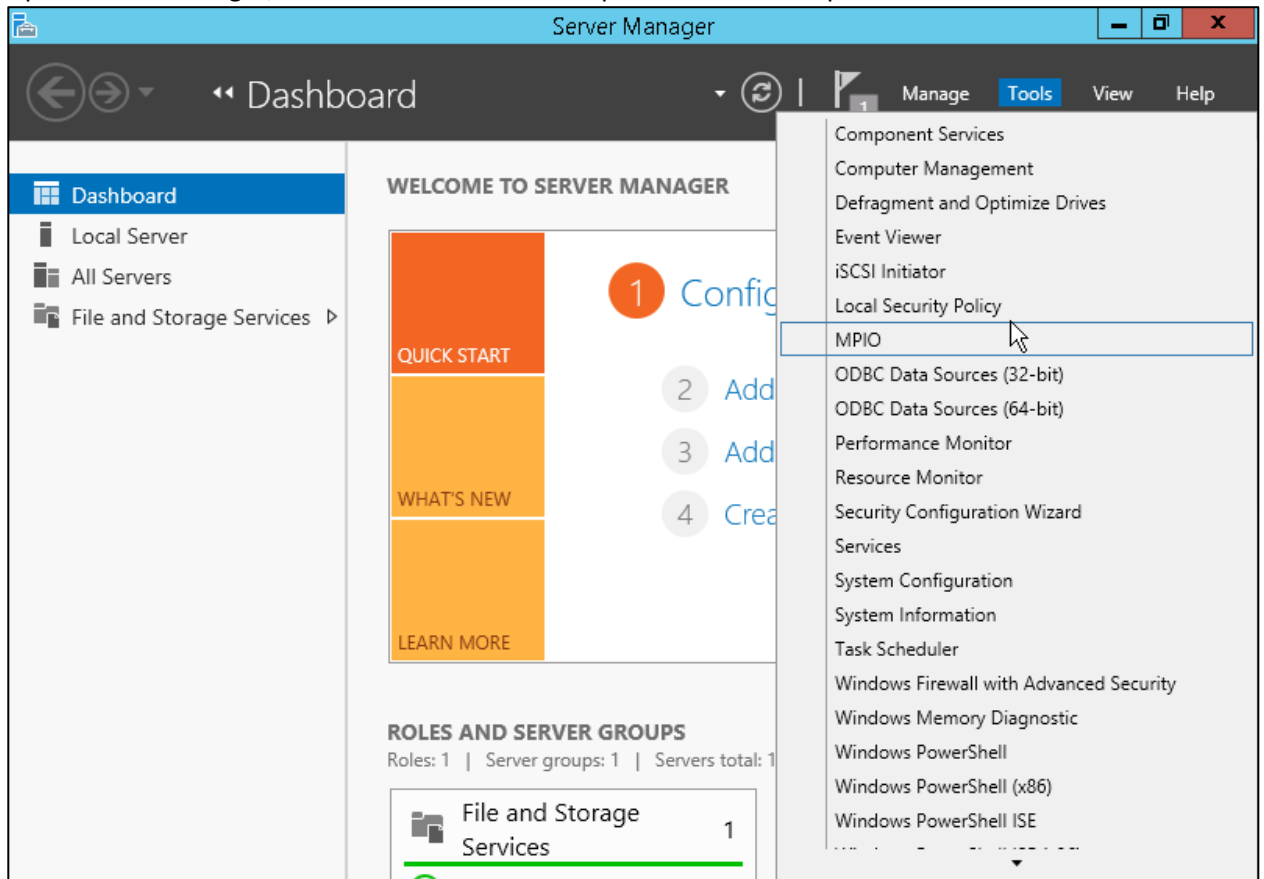


- Click “Close” when installation completes.

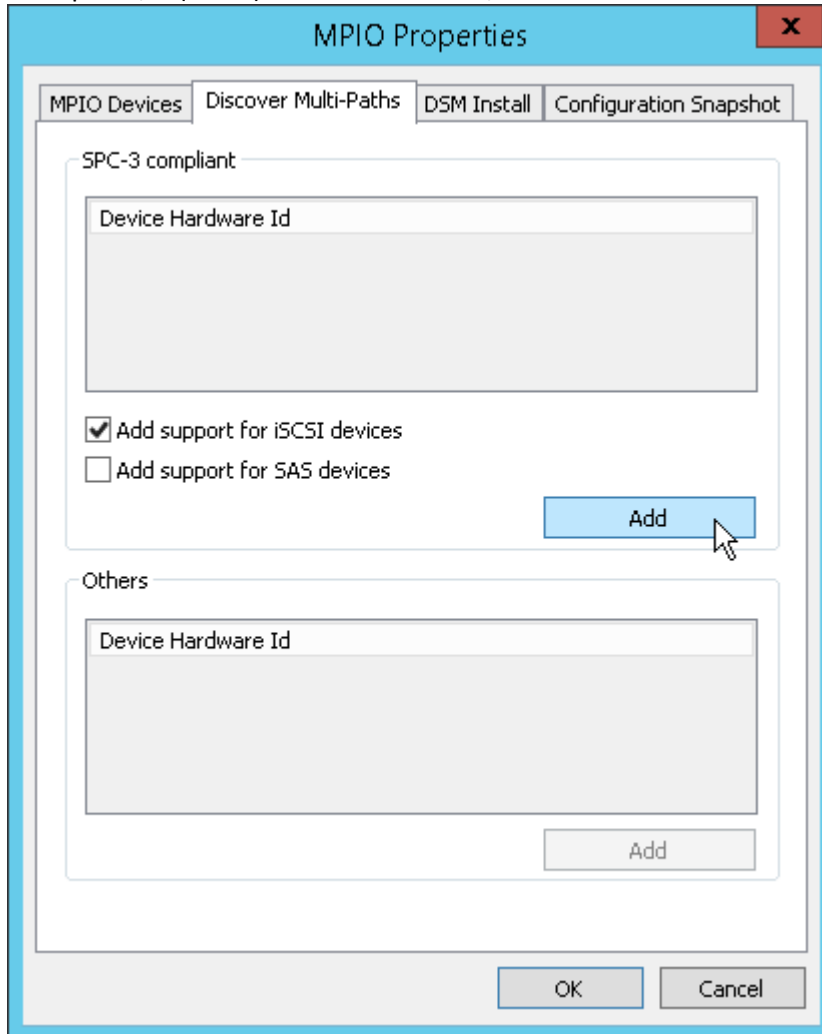


Configure the MPIO Service in Windows Server

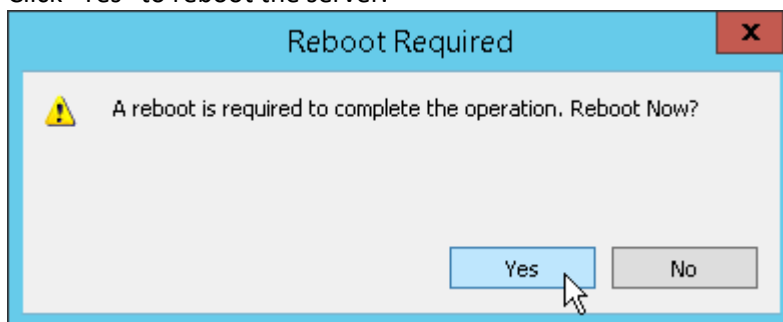
1. Open Server Manager, click “Tools” > “MPIO” to open the “MPIO Properties” window.



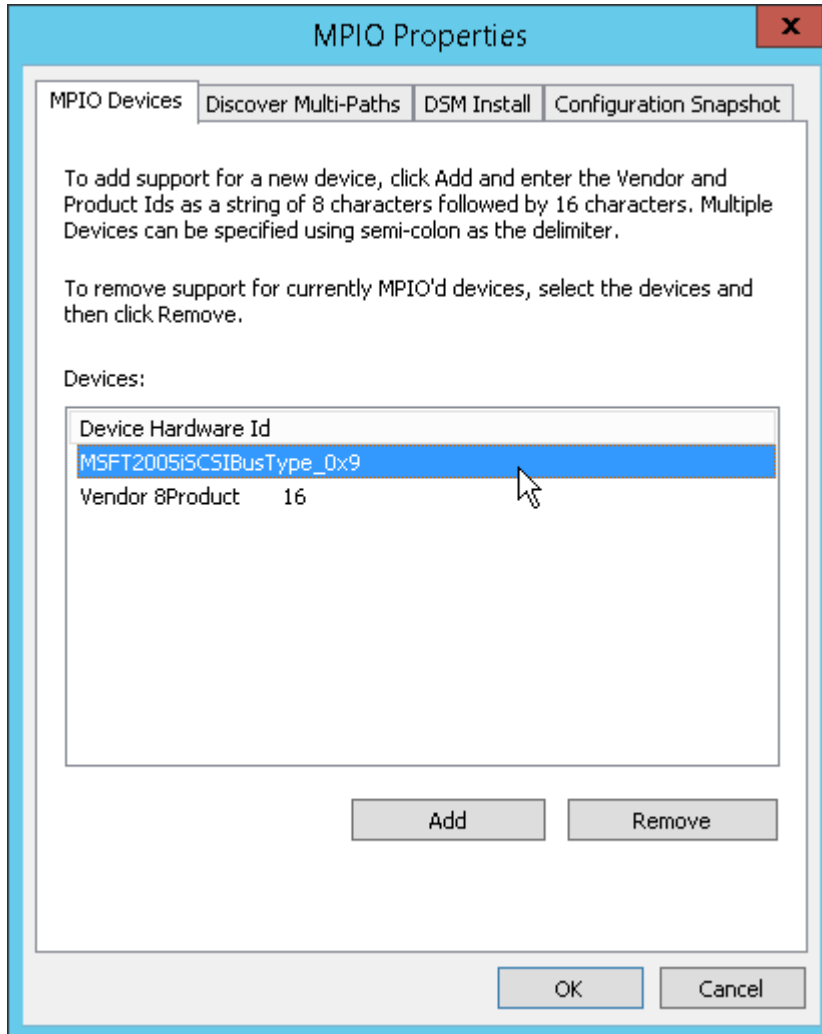
2. Switch to the “Discover Multi-Paths” tab, select “Add support for iSCSI devices” to use Microsoft Multipath I/O (MPIO) with iSCSI Initiator, and then click “Add”.



3. Click “Yes” to reboot the server.

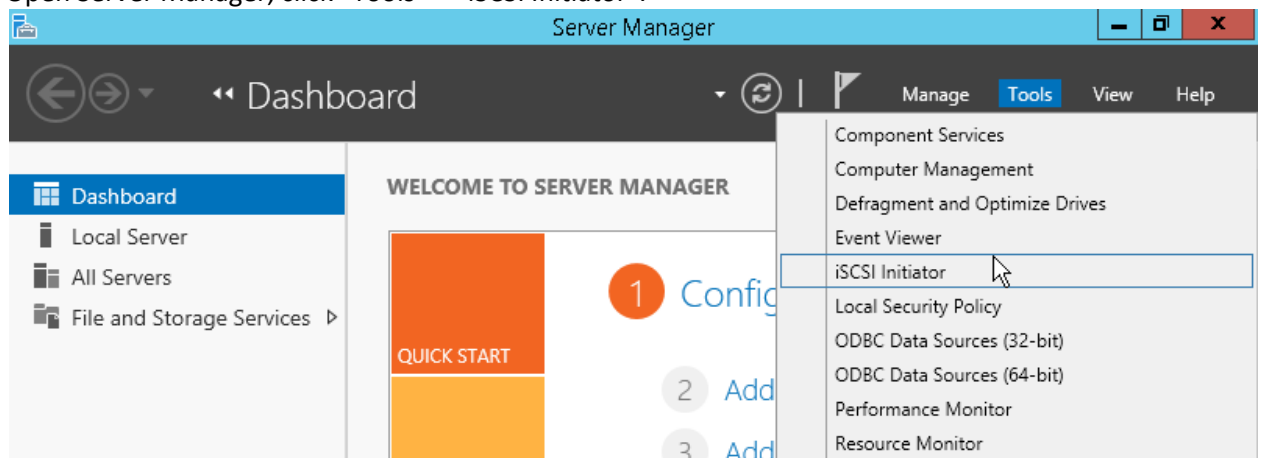


4. After restarting the computer, log in as a domain administrator and then launch MPIO again. You should see a iSCSI device added into the list.

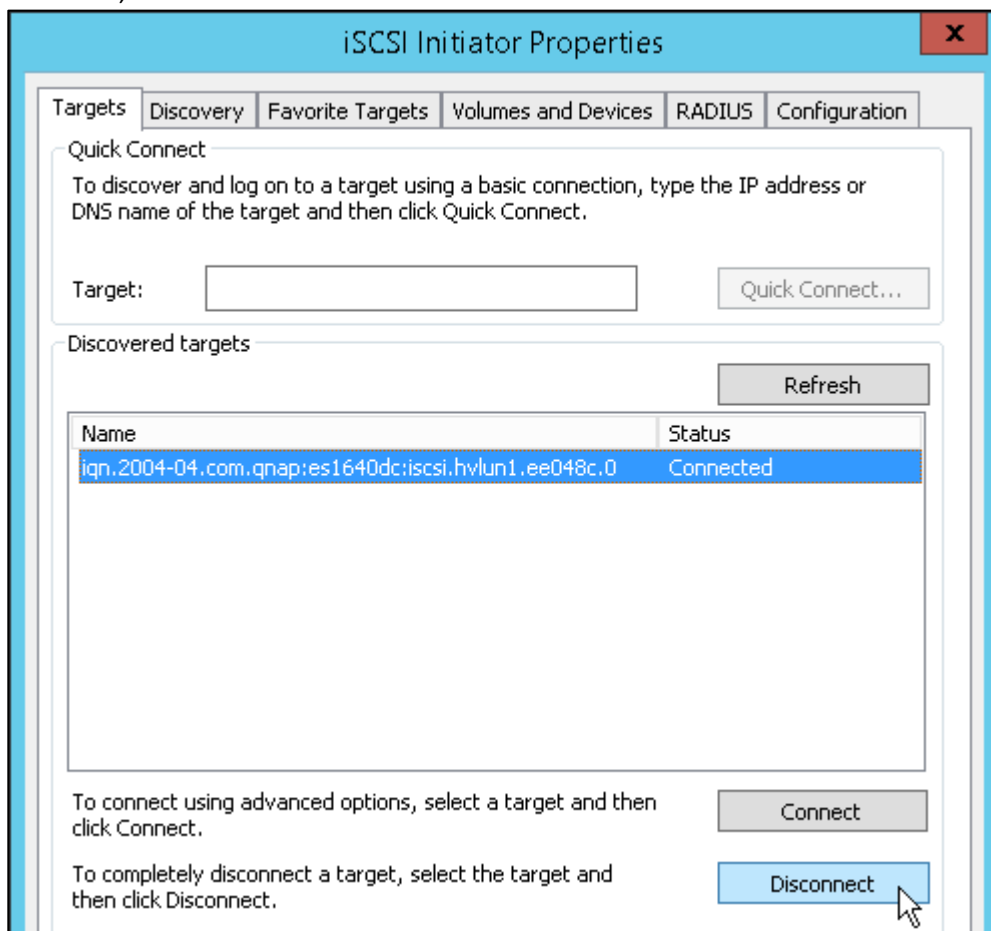


Configure and start iSCSI initiator

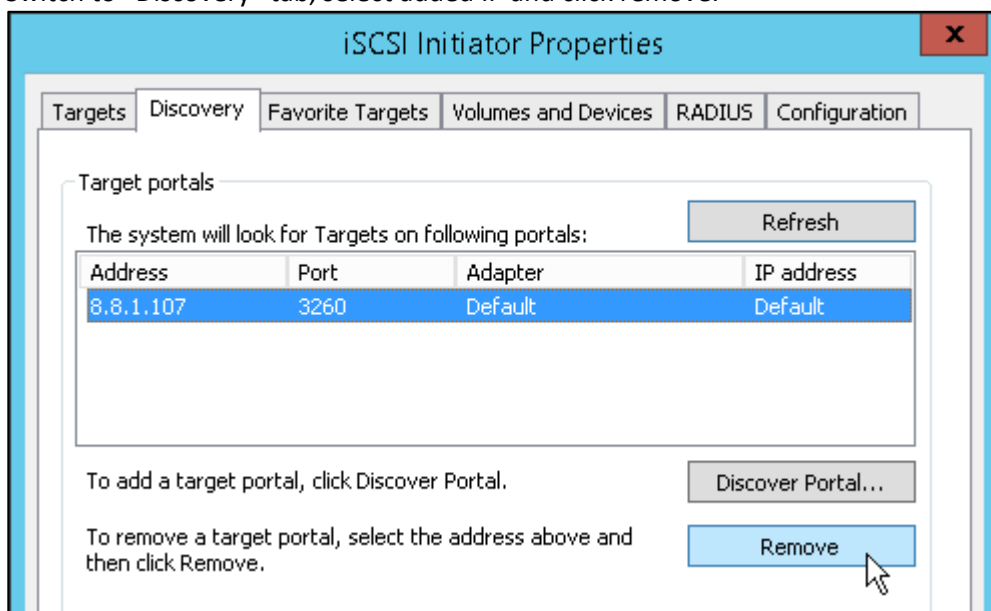
1. Open Server Manager, click “Tools” > “iSCSI Initiator”.



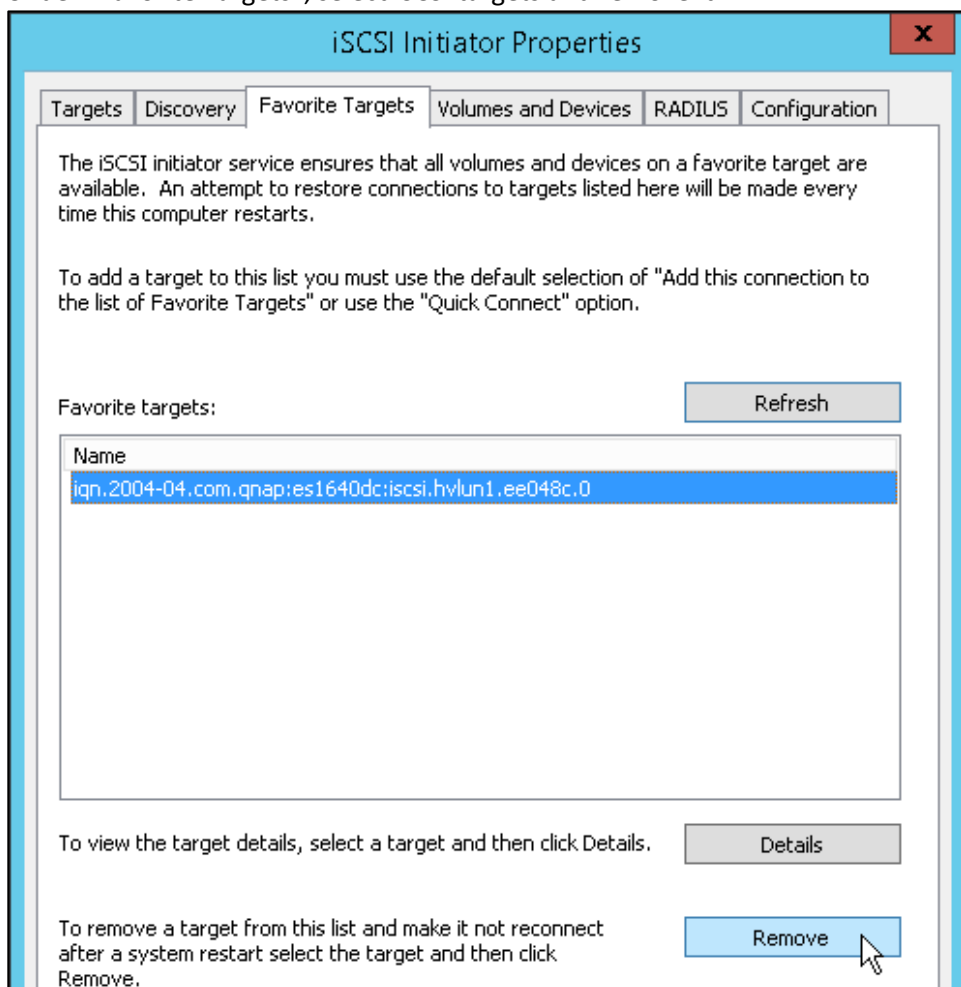
2. To avoid some possible problems resulted from iSCSI connection, user should remove the former connection used for installing MPIO, and reconnect it with MPIO enabled. Select the connected iSCSI LUN, click “Disconnect”.



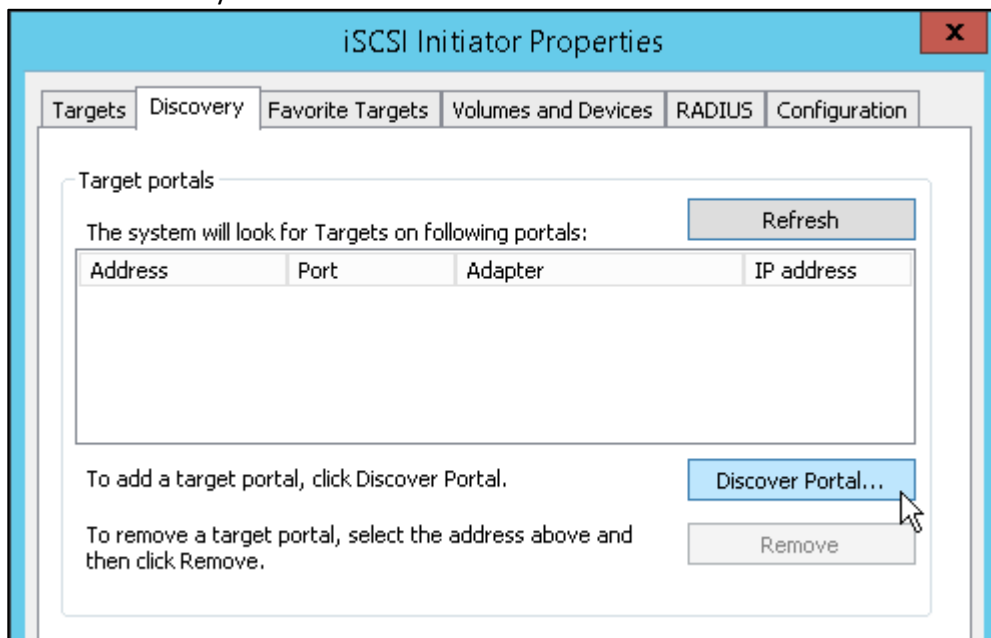
3. Switch to "Discovery" tab, select added IP and click remove.



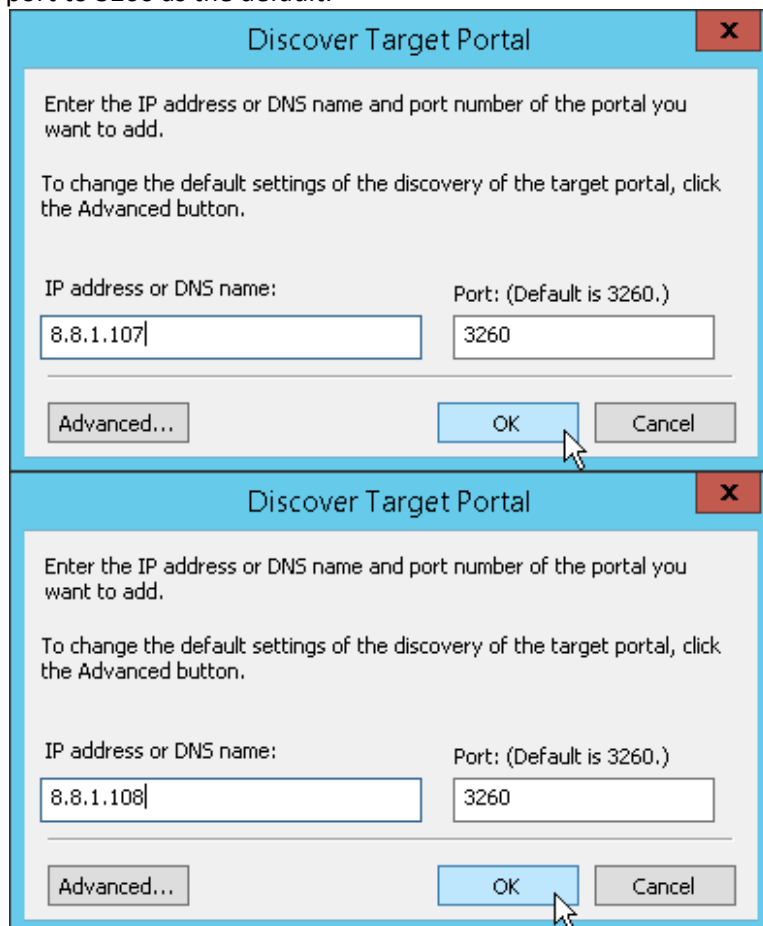
4. Under "Favorite Targets", select iSCSI targets and remove it.



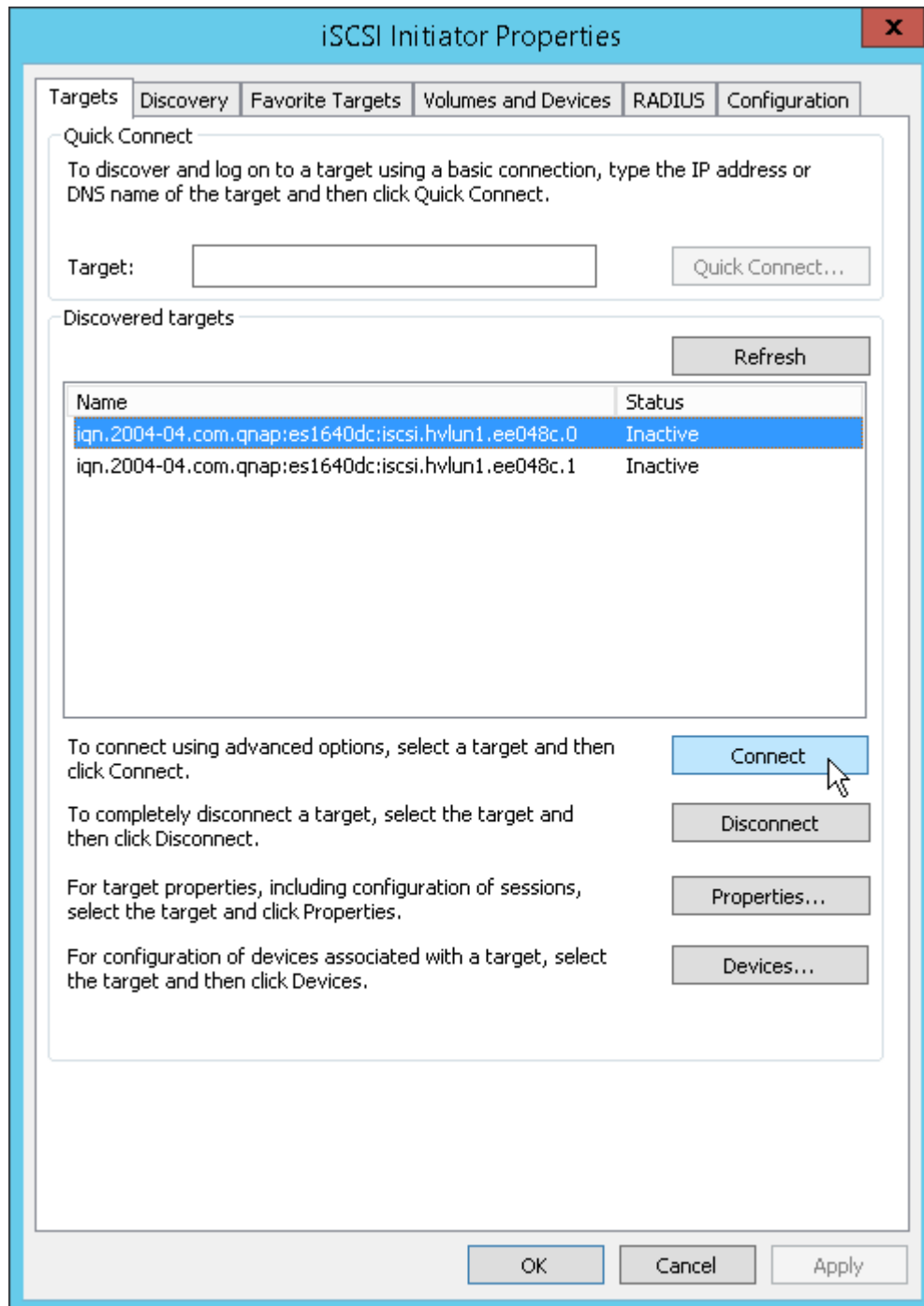
5. Back to "Discovery" tab and click "Discover Portal".



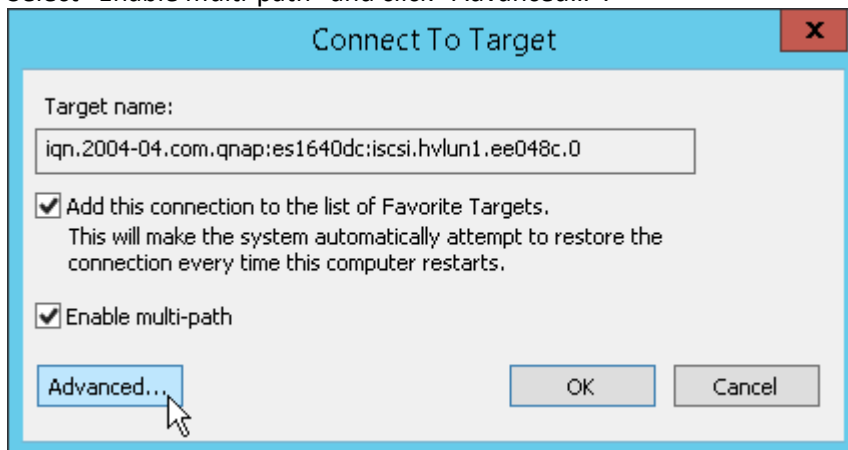
6. In the "Discover Target Portal" dialog box, type the IP address of data ports in NAS. Keep the TCP port to 3260 as the default.



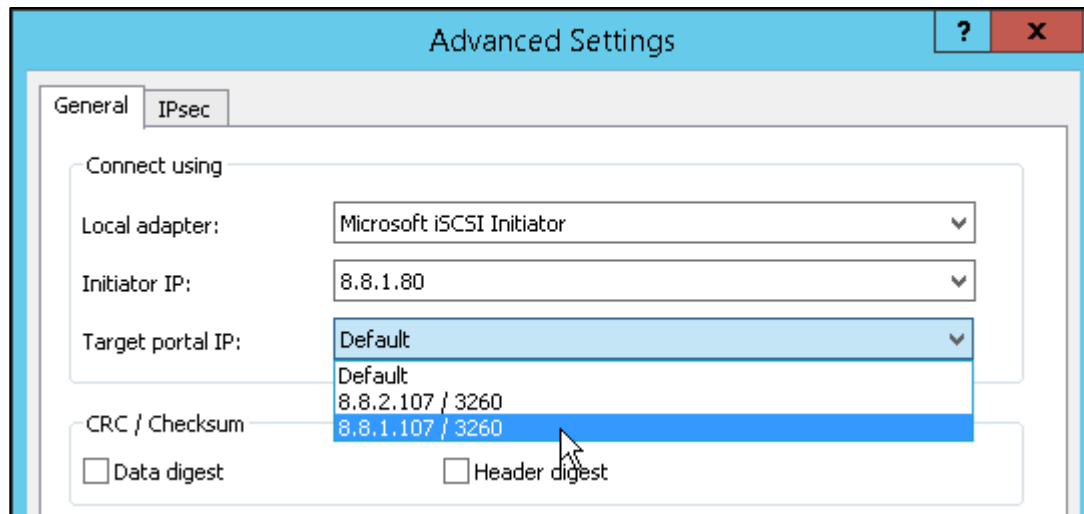
7. The available iSCSI targets and their status will then be shown under the "Targets" tab. The two targets shown here are owned by each of the two controllers. Select the target you wish to connect to and click "Connect".



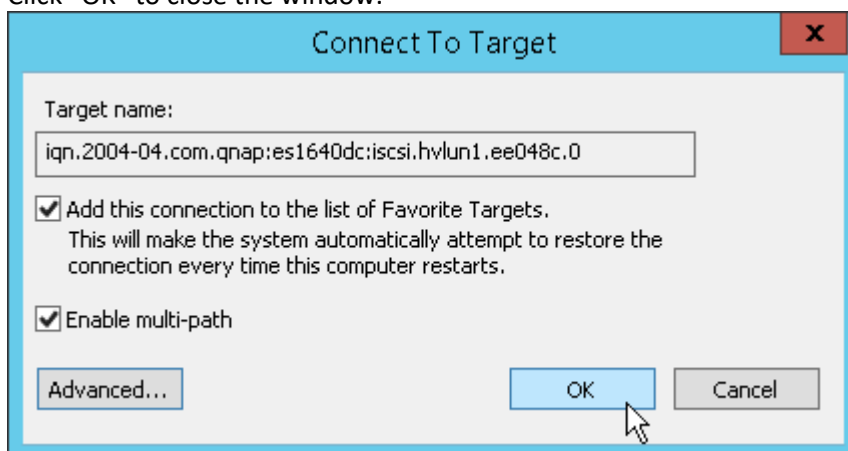
8. Select "Enable multi-path" and click "Advanced...".



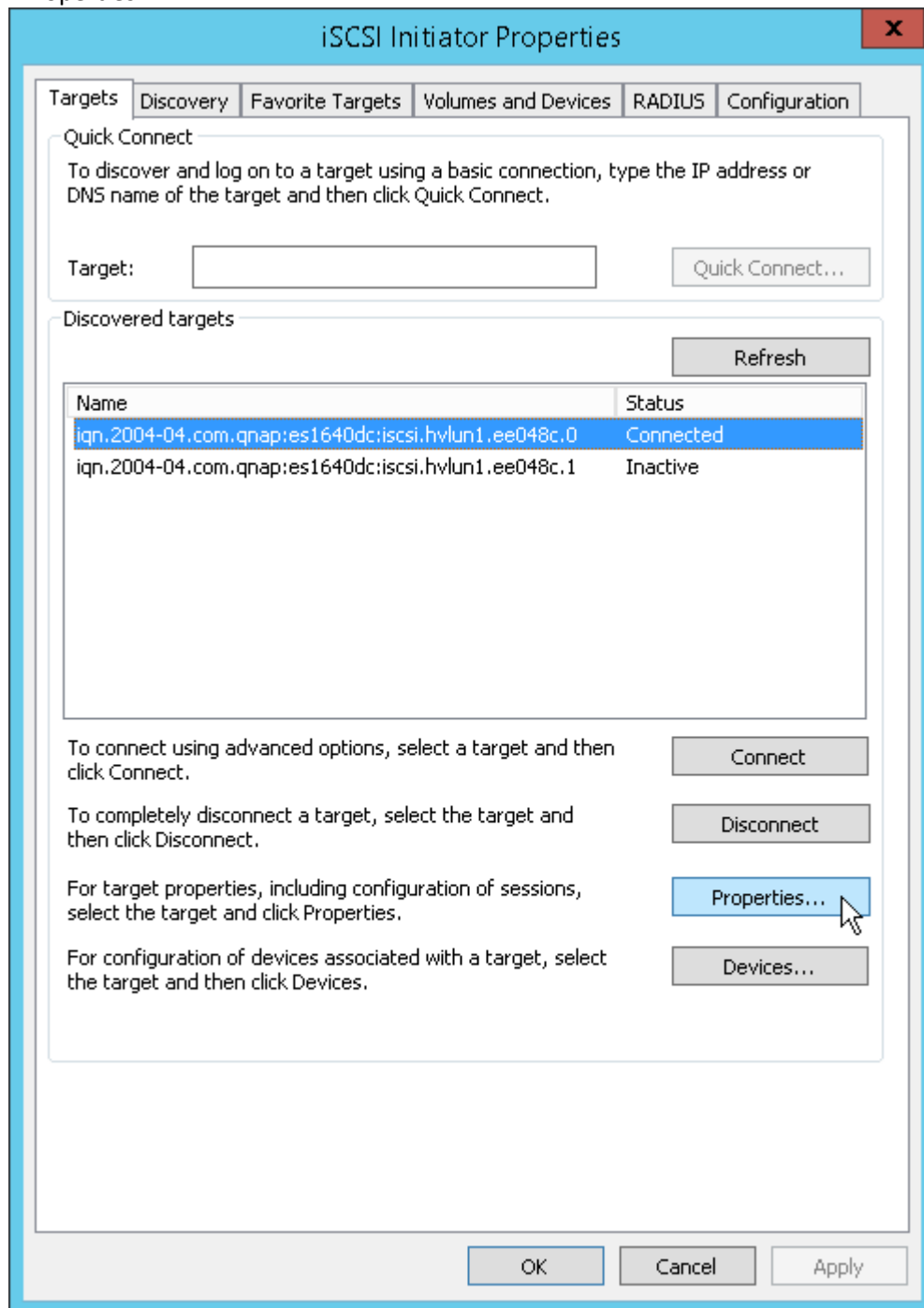
9. On the "Advanced Settings" window, select "Microsoft iSCSI Initiator" from the "Local adapter" drop-down menu. Then select an IP address from "Initiator IP" drop-down list and "Target portal IP" drop-down list respectively. Please ensure the Initiator IP and Target portal IP are in the same subnet.



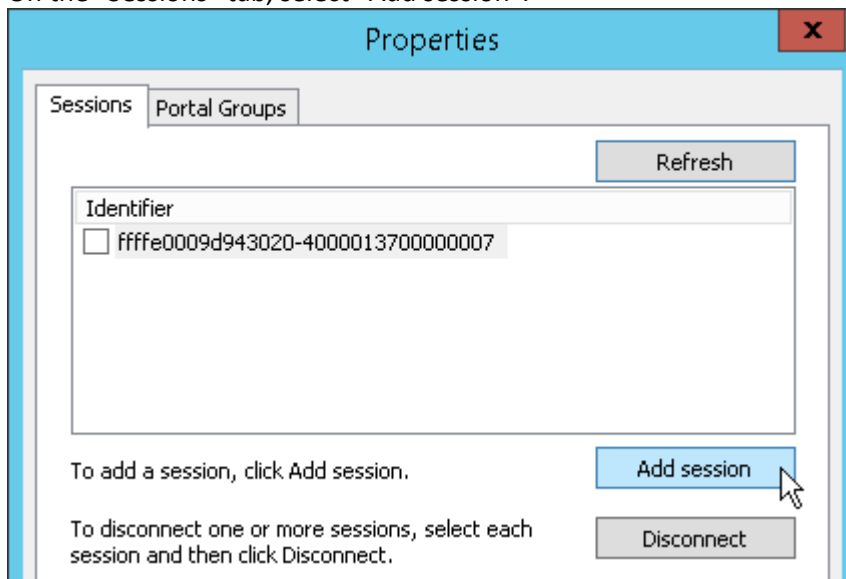
10. Click "OK" to close the window.



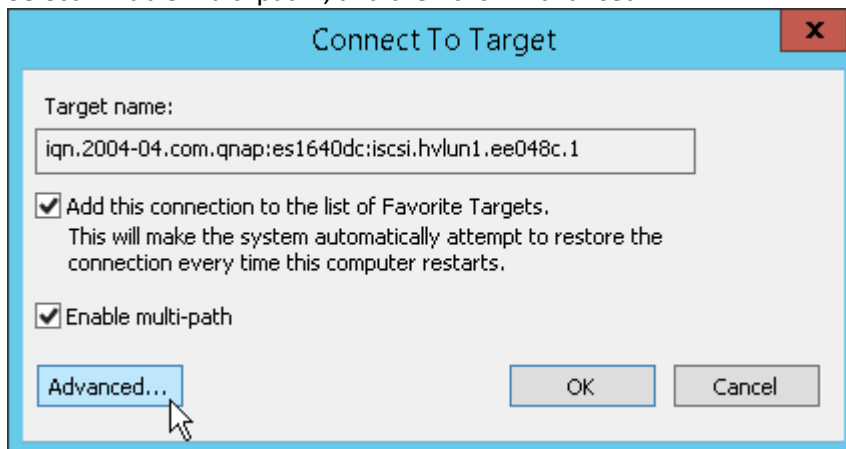
11. It shows that one of these iSCSI targets is successfully connected. Select this target and then click “Properties”.



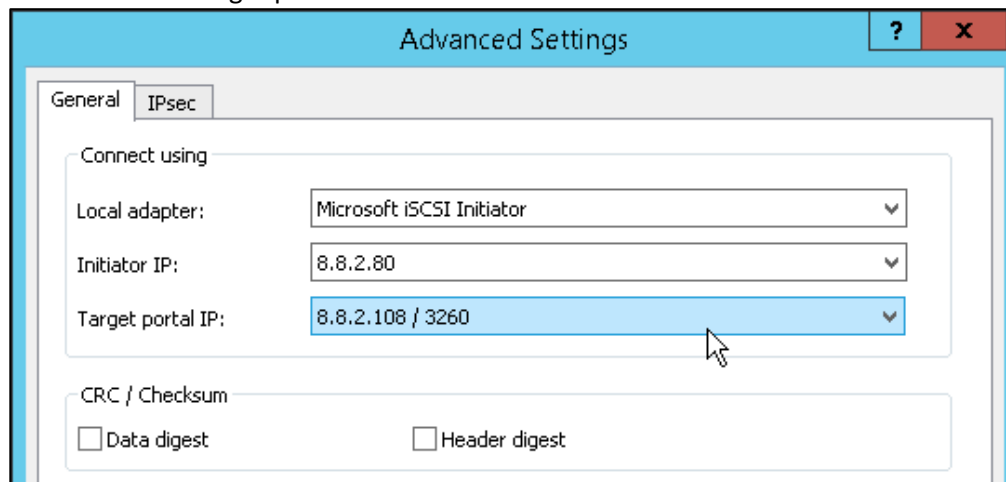
12. On the “Sessions” tab, select “Add session”.



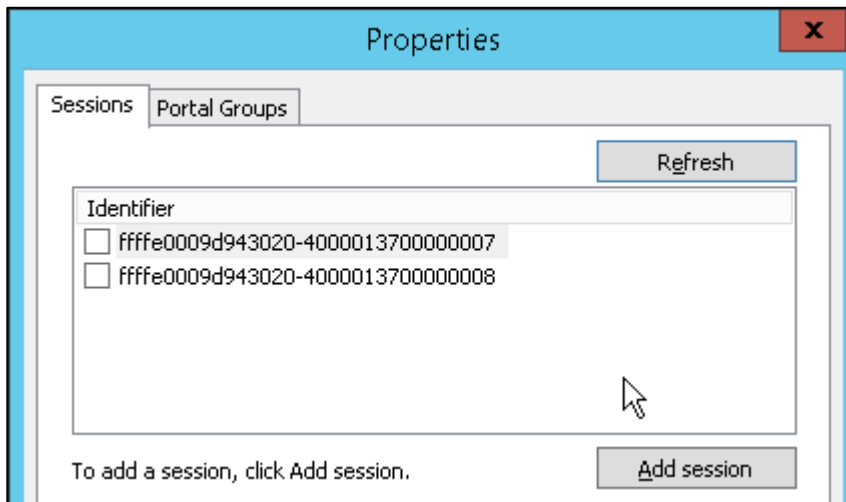
13. Select “Enable multi-path”, and then click “Advanced...”.



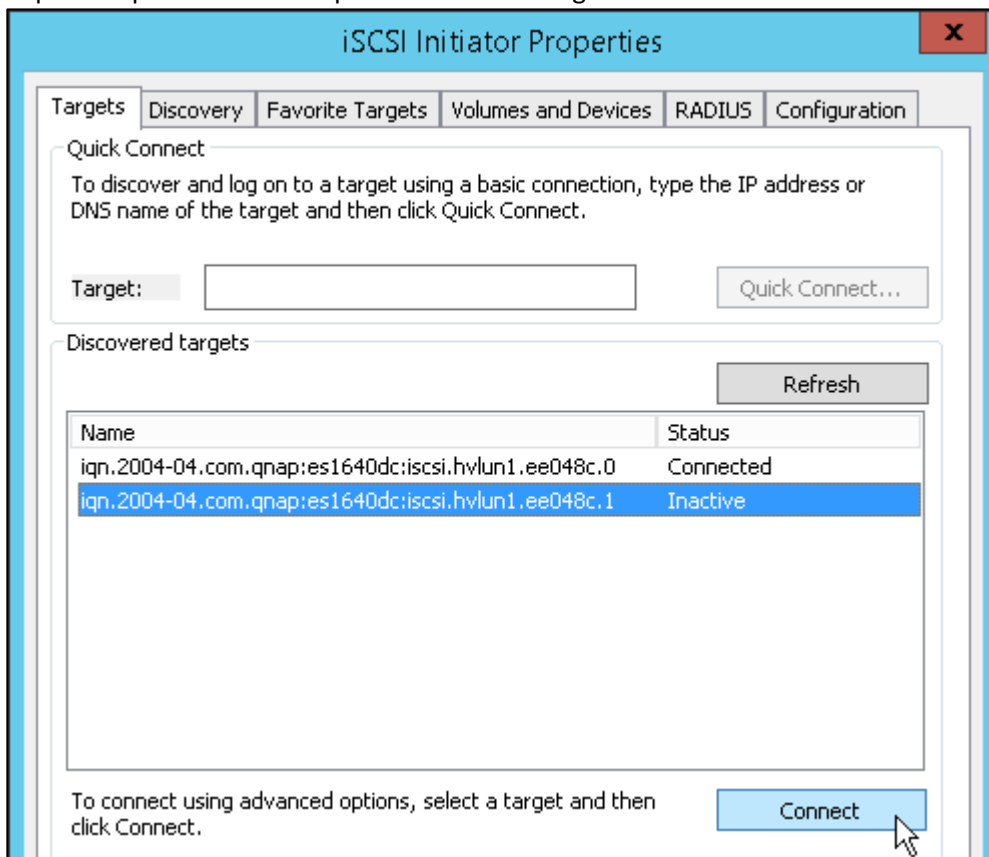
14. Add the IP address of the other data port that belongs to a different subnet. Please ensure the Initiator IP and Target portal IP are in the same subnet. Click “OK” to close the window.



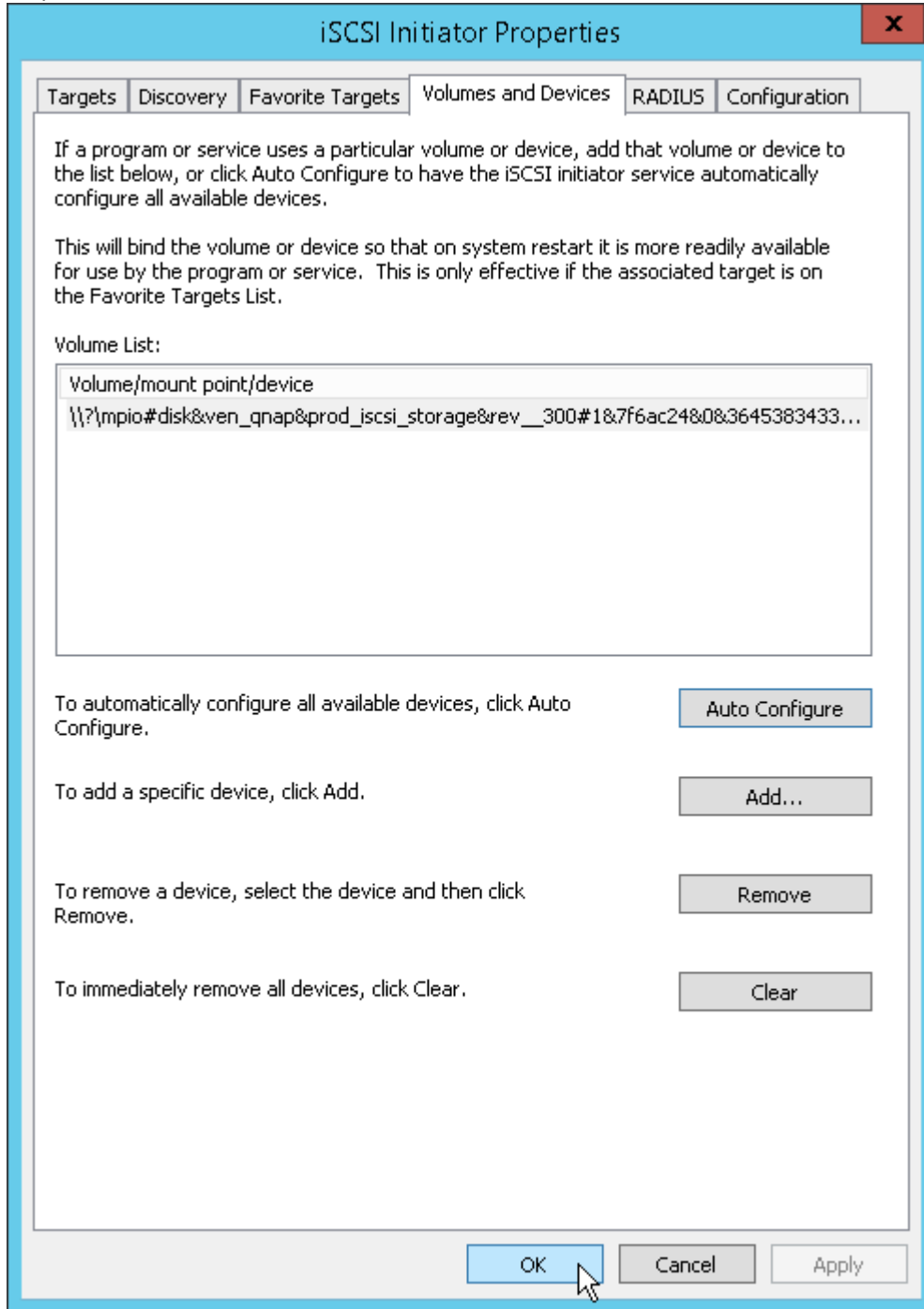
15. You should see another session added into the list. Click "OK" to close the window.



16. Repeat steps above to set up the other iSCSI target with MPIO.

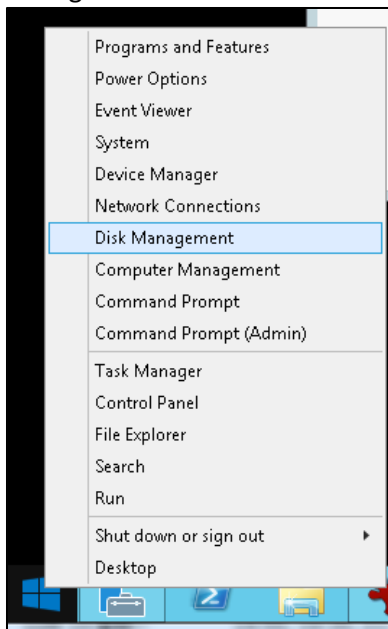


- After configuring both targets with MPIO, add the iSCSI volume and/or device to be persistently bound to the iSCSI service. It ensures that the iSCSI Initiator service will not complete initialization until all persistently bound volumes and devices are available to the computer. Select "Volumes and Devices" tab on the iSCSI Initiator Properties window, and then click "Auto Configure" to automatically configure all available devices. You should see a new volume named as "mpio#disk....." in the Volume list. Click "OK" to close the window.

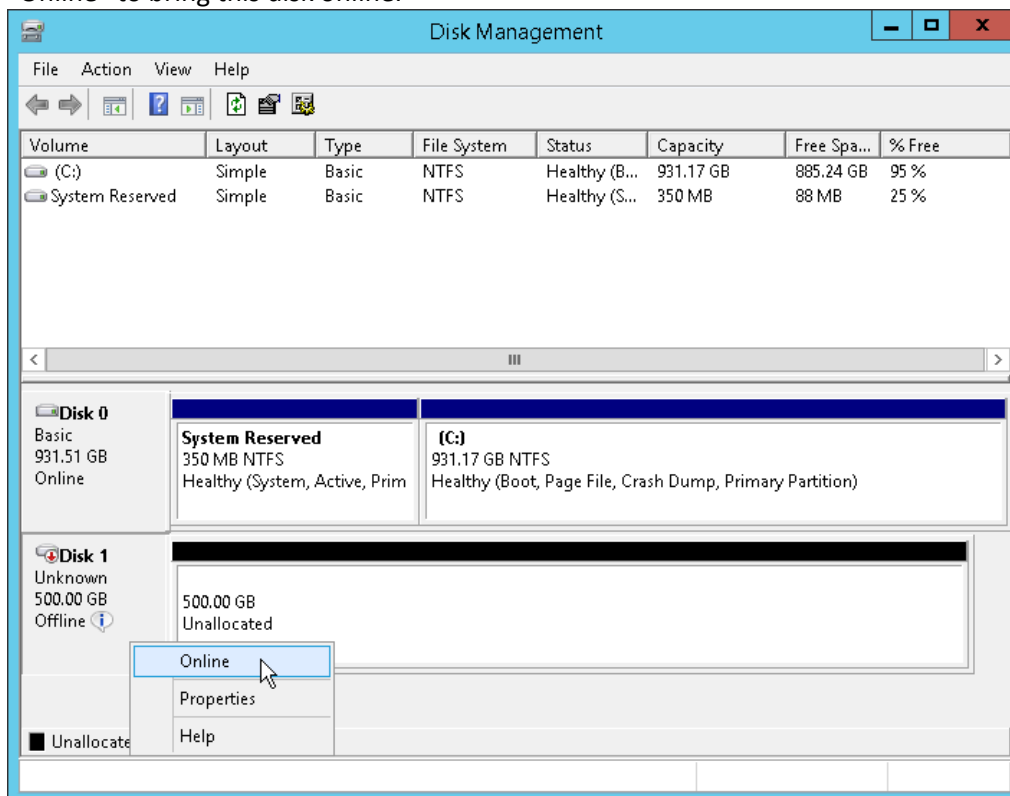


Mount iSCSI virtual disks

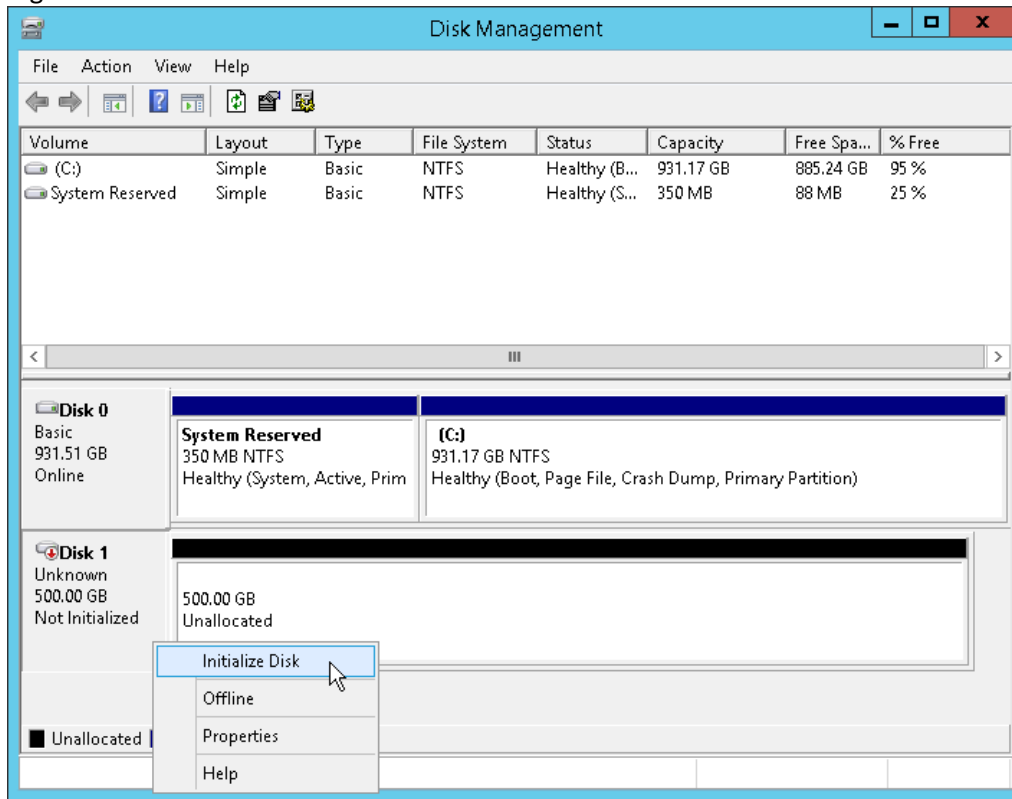
1. In Windows Server 2012 or the later versions, use “Windows Key + X” to select “Disk Management”.



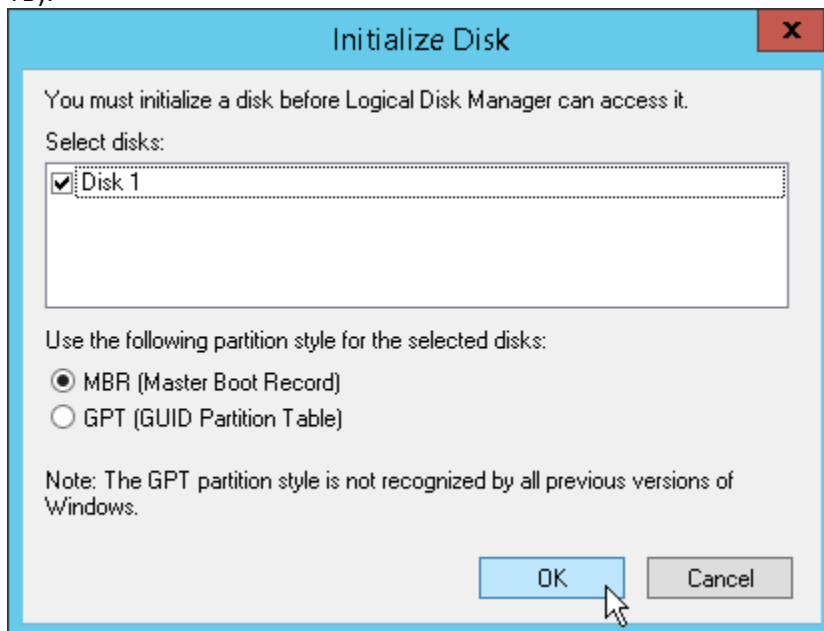
2. User should see a new disk appears as “Offline” in the bottom panel. Click “Offline” and select “Online” to bring this disk online.



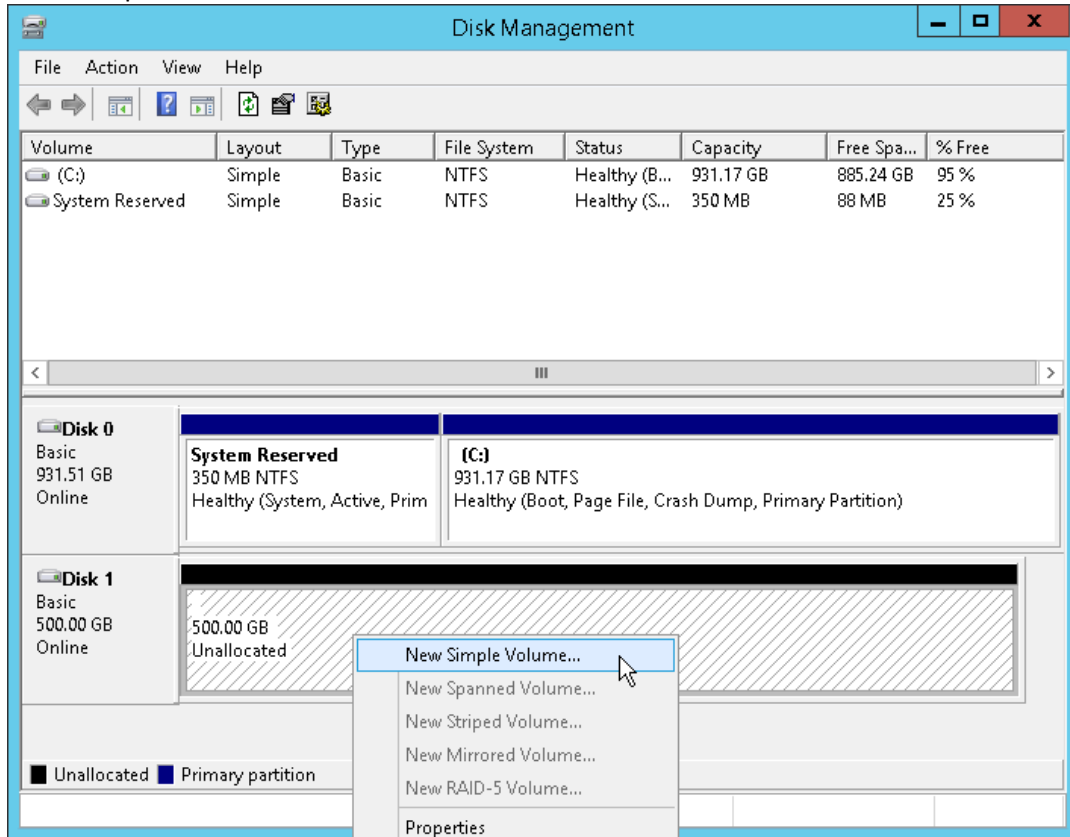
- The disk status becomes “Not Initialized”. Before you can use a disk, you must first initialize it. Right click on “Not Initialized” and select “Initialize Disk”.



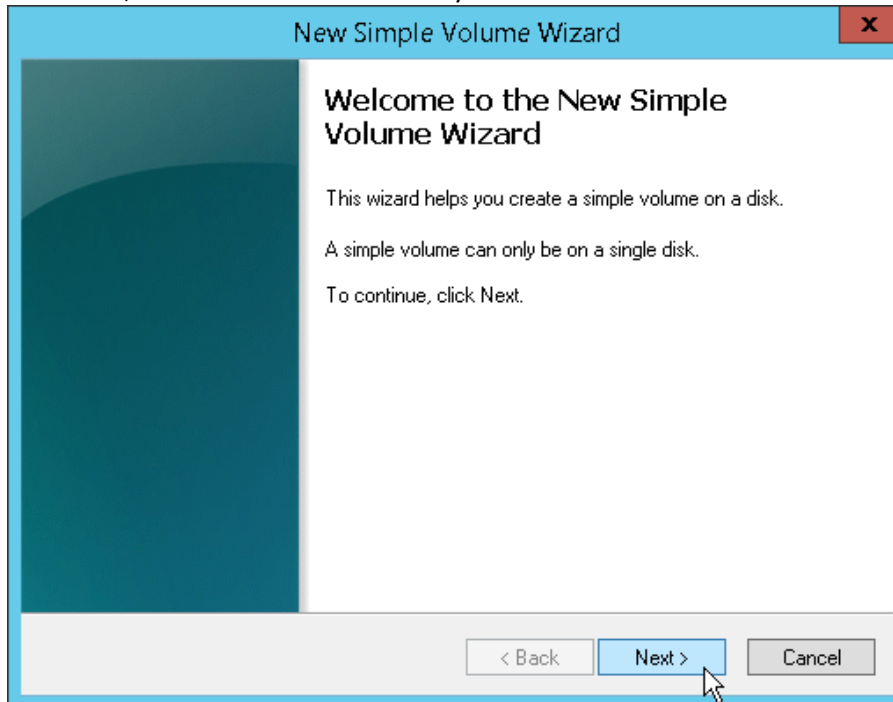
- Select the disk that is to be initialized, and select MBR as default. (GPT is for disks larger than 2 TB).



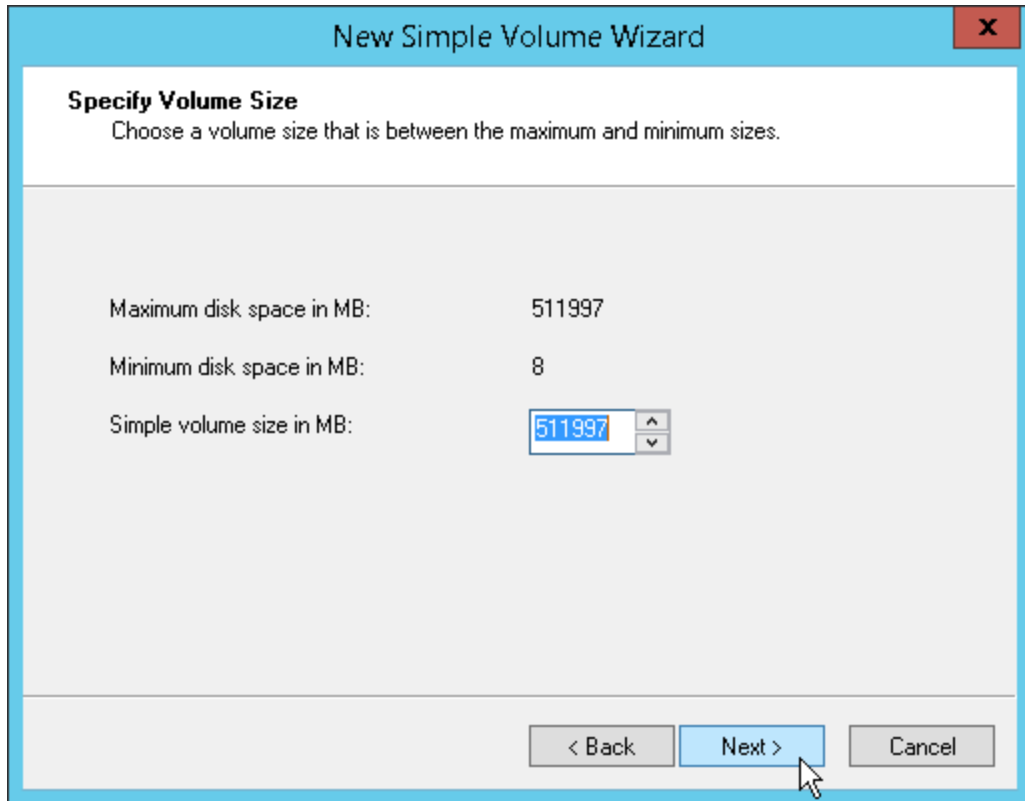
- The disk is now initialized. You can now create a volume on it. Right click on the disk and select “New Simple Volume”.



- Follow the on-screen instruction of the “New Simple Volume Wizard”. After the volume is formatted, a new drive is attached to your PC.



- Specify volume size, set maximum disk space as default.



New Simple Volume Wizard [X]

Specify Volume Size
Choose a volume size that is between the maximum and minimum sizes.

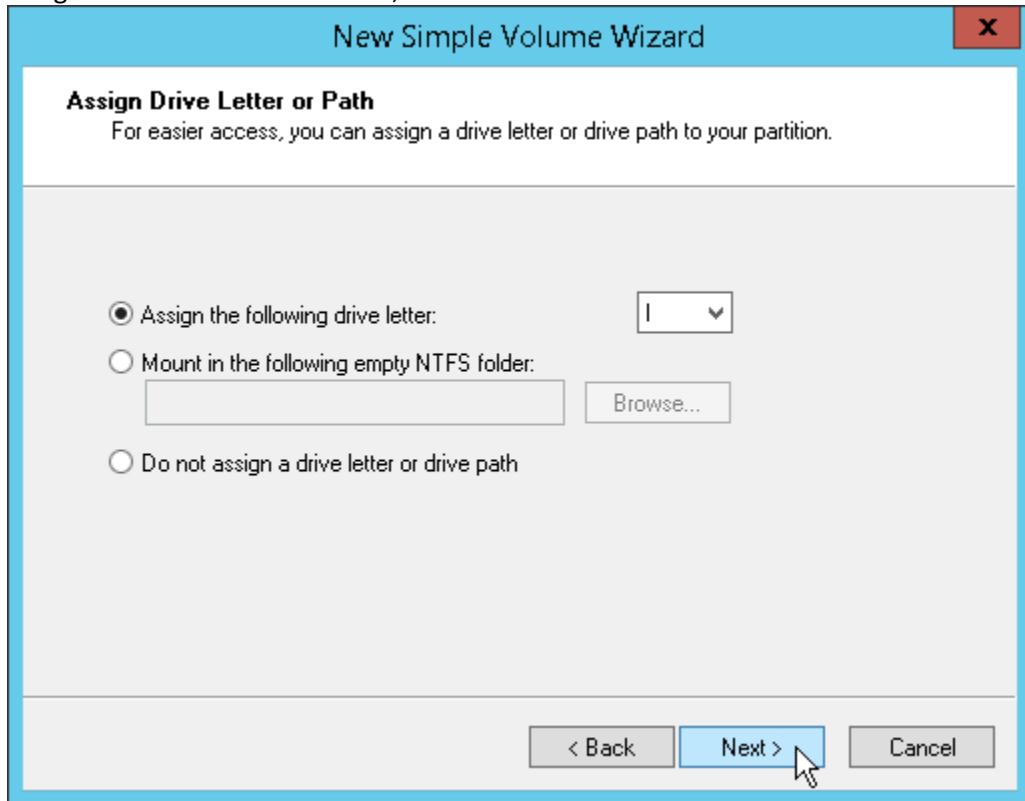
Maximum disk space in MB: 511997

Minimum disk space in MB: 8

Simple volume size in MB:

< Back **Next >** Cancel

8. Assign drive letter as user desire, then click “Next”.



New Simple Volume Wizard [X]

Assign Drive Letter or Path
For easier access, you can assign a drive letter or drive path to your partition.

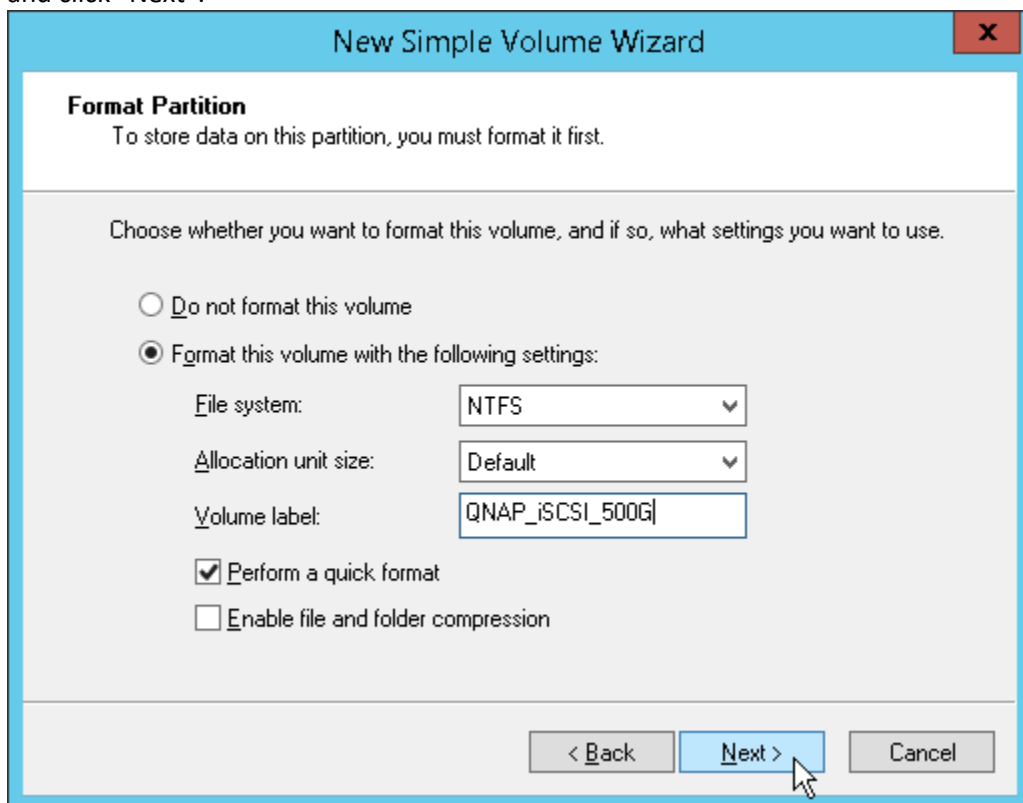
☒ Assign the following drive letter:

☐ Mount in the following empty NTFS folder:

☐ Do not assign a drive letter or drive path

< Back **Next >** Cancel

9. Specify partition name and file system, select “Perform a quick format” to accelerate format, and click “Next”.



New Simple Volume Wizard

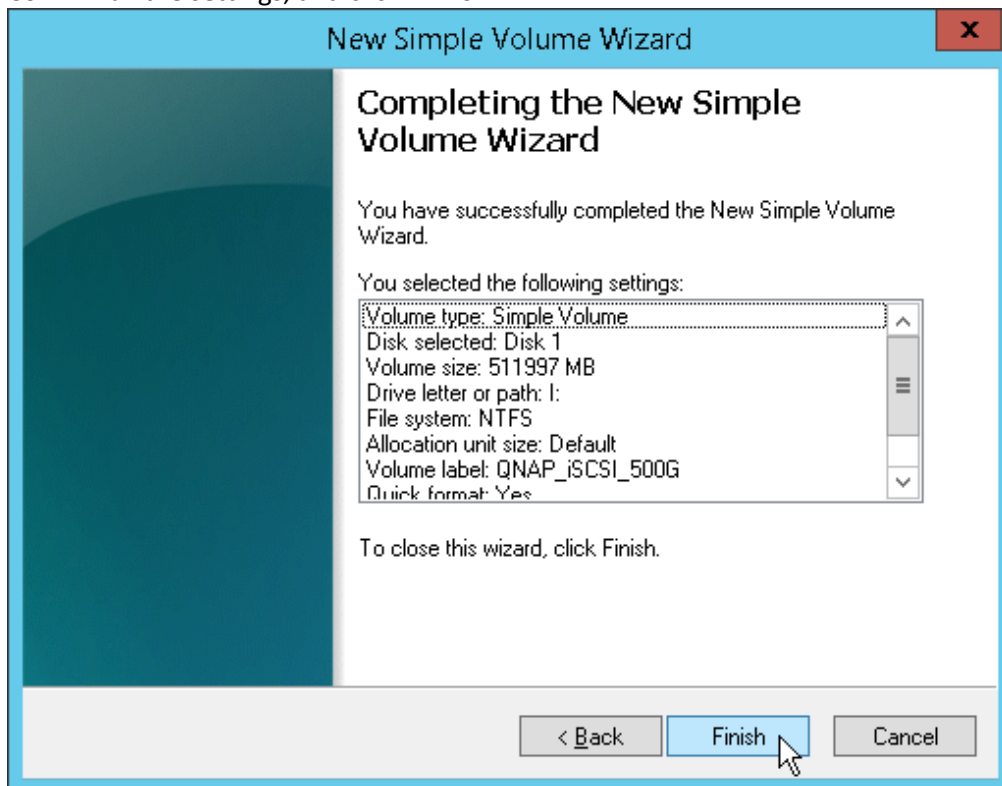
Format Partition
To store data on this partition, you must format it first.

Choose whether you want to format this volume, and if so, what settings you want to use.

☐ Do not format this volume
☒ Format this volume with the following settings:

File system:
 Allocation unit size:
 Volume label:
☒ Perform a quick format
☐ Enable file and folder compression

10. Confirm all the settings, and click “Finish”.



New Simple Volume Wizard

Completing the New Simple Volume Wizard

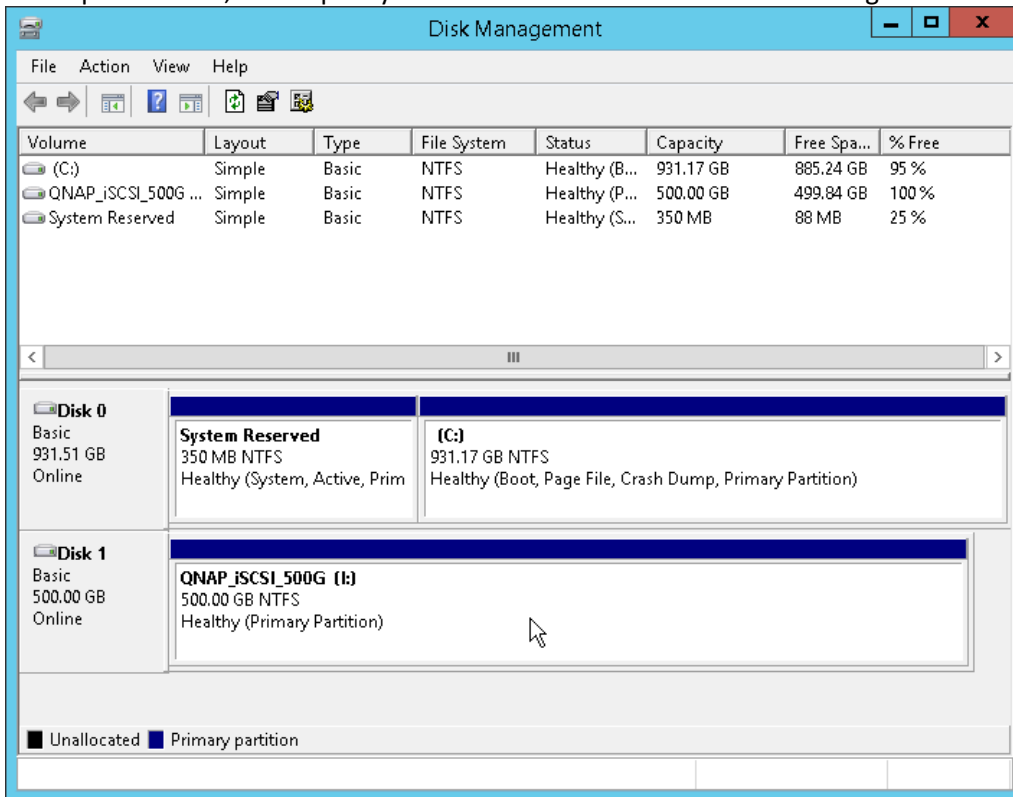
You have successfully completed the New Simple Volume Wizard.

You selected the following settings:

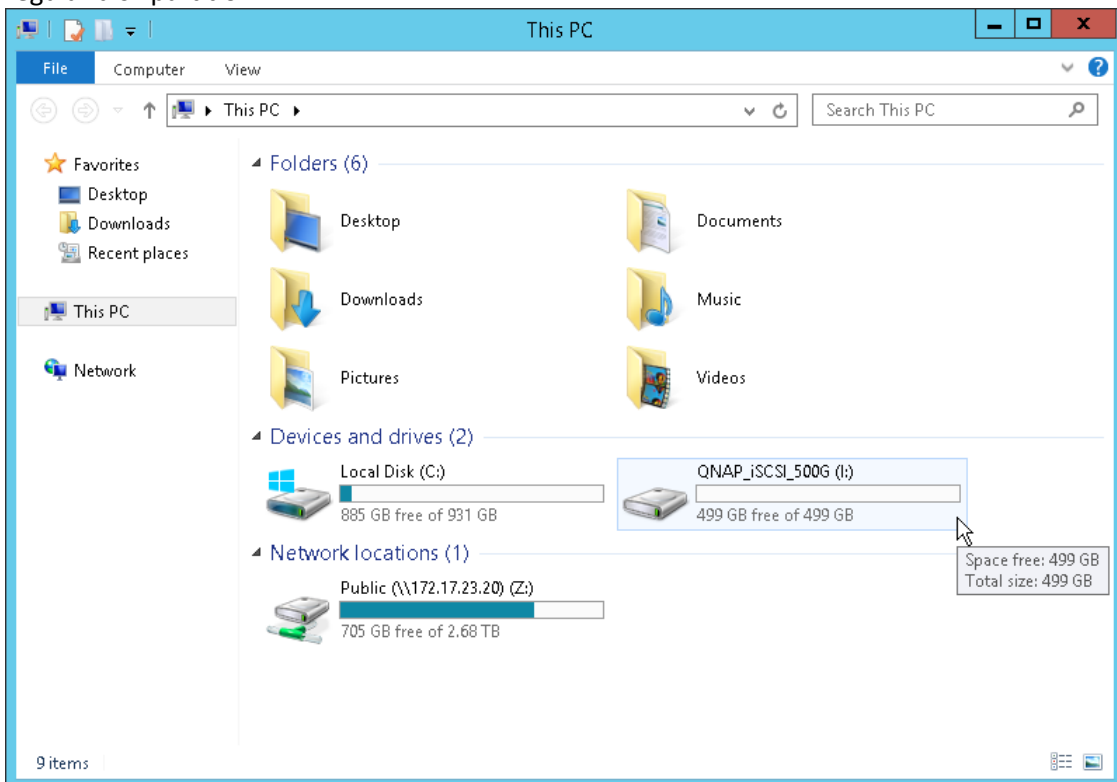
Volume type: Simple Volume
Disk selected: Disk 1
Volume size: 511997 MB
Drive letter or path: I:
File system: NTFS
Allocation unit size: Default
Volume label: QNAP_iSCSI_500G
Quick format: Yes

To close this wizard, click Finish.

11. After quick format, it will specify disk name and letter as shown in the figure.

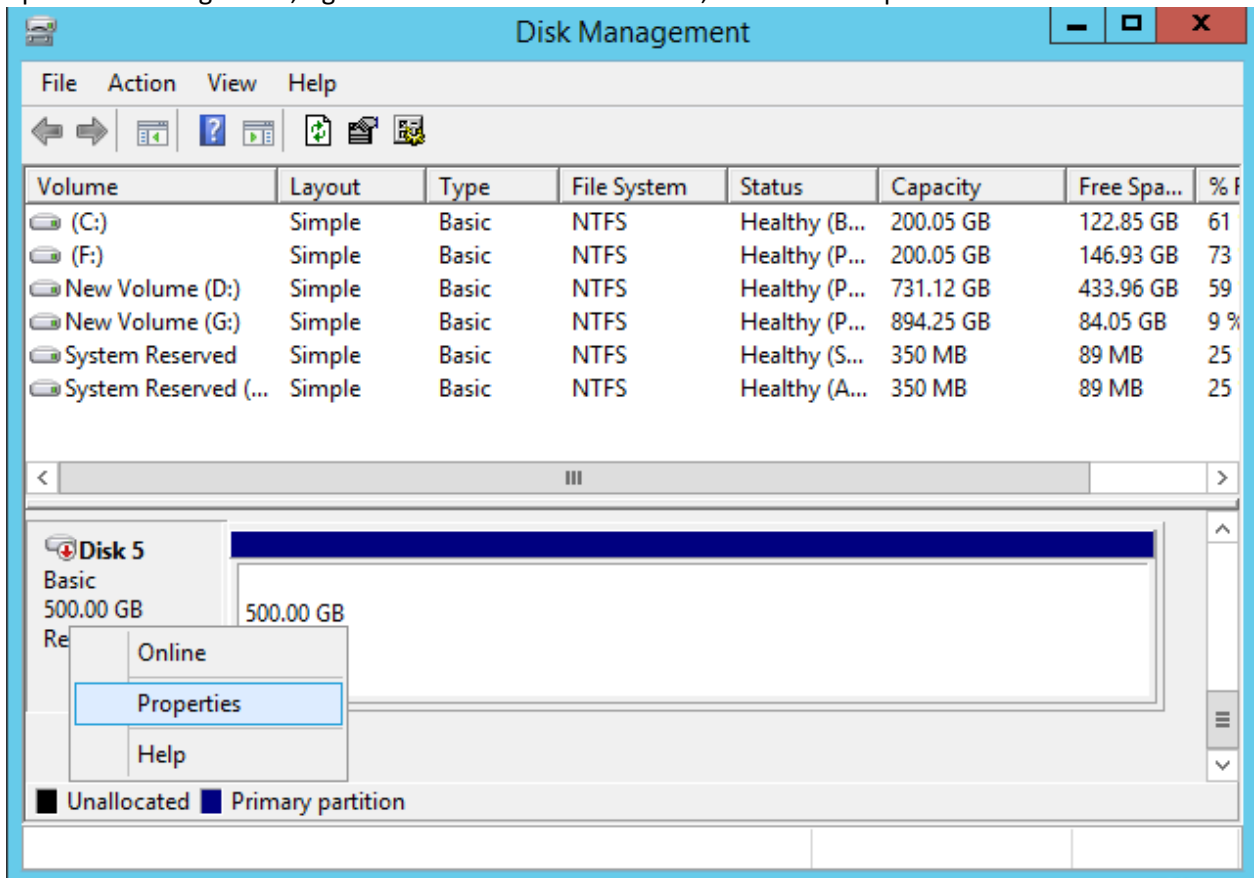


12. Start Windows Explorer. Then click "This PC" and you can now use this iSCSI LUN as a regular disk partition.

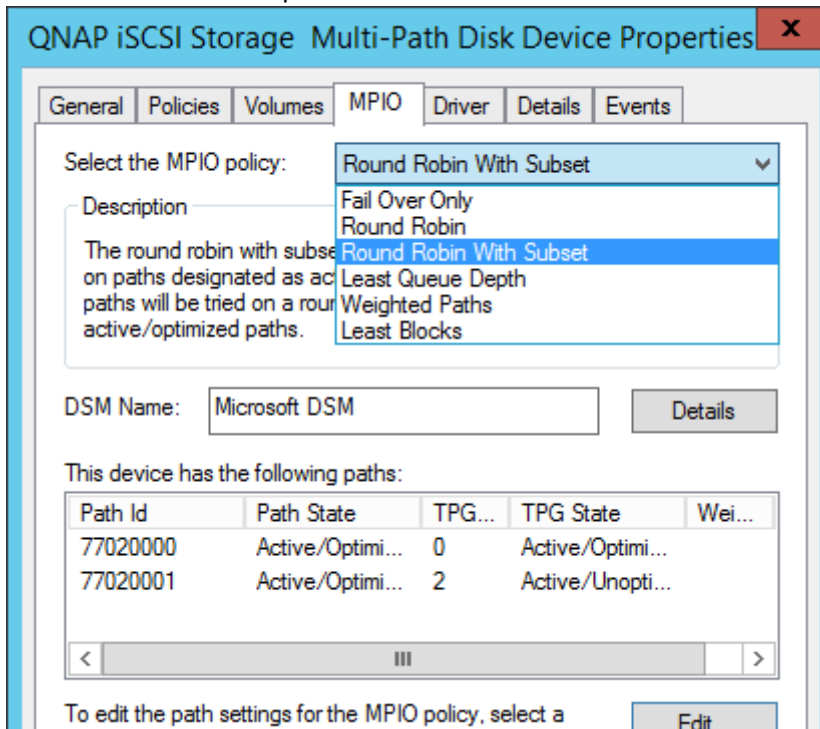


Optimize MPIO policies and performance

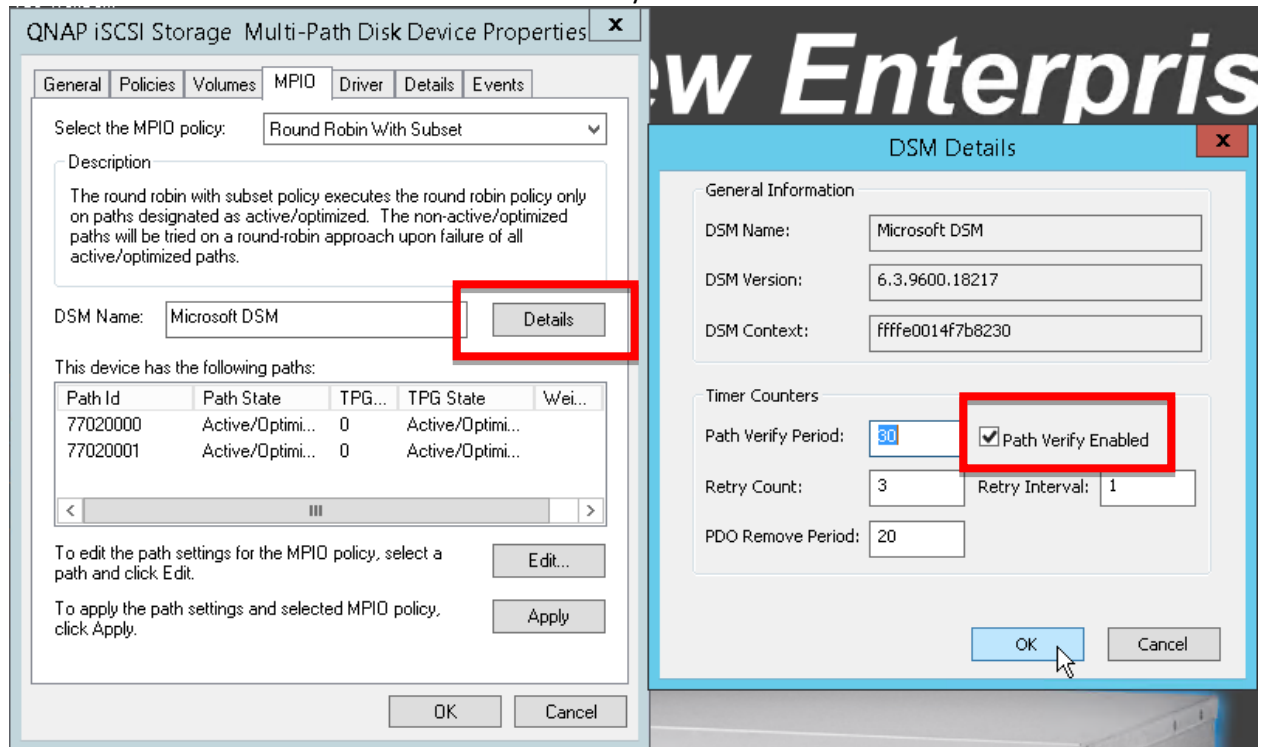
1. Open Disk Management, right-click the mounted iSCSI disk, and select Properties.



- Click on the "MPIO" tab and select the "Round Robin with Subset" in "Select the MPIO policy" field. Round Robin with Subset allows the data to be transmitted only on path close to the controller, thus improves transmission efficiency. To test performance, it is recommended to select "Least Queue Depth" instead.



- Click the "Details" button to confirm that "Path Verify Enabled" is checked in DSM Details.



TIPS : MPIO Policy Description

Fail Over Only: Policy that does not perform load balancing. This policy uses a single active path, and the rest of the paths are standby paths. The active path is used for sending all I/O. If the active path fails, then one of the standby paths is used. When the path that failed is reactivated or reconnected, the standby path that was activated returns to standby.

Round Robin: Load balancing policy that allows the Device Specific Module (DSM) to use all available paths for MPIO in a balanced way. This is the default policy that is chosen when the storage controller follows the active-active model and the management application does not specifically choose a load-balancing policy. (Windows default)

Round Robin with subset: Load balancing policy that allows the application to specify a set of paths to be used in a round robin fashion, and with a set of standby paths. The DSM uses paths from a primary pool of paths for processing requests as long as at least one of the paths is available. The DSM uses a standby path only when all the primary paths fail. For example, given 4 paths: A, B, C, and D, paths A, B, and C are listed as primary paths and D is the standby path. The DSM chooses a path from A, B, and C in round robin fashion as long as at least one of them is available. If all three paths fail, the DSM uses D, the standby path. If paths A, B, or C become available, the DSM stops using path D and switches to the available paths among A, B, and C. (QNAP recommend)

Least Queue Depth: Load balancing policy that sends I/O down the path with the fewest currently outstanding I/O requests. For example, consider that there is one I/O that is sent to LUN 1 on Path 1, and the other I/O is sent to LUN 2 on Path 1. The cumulative outstanding I/O on Path 1 is 2, and on Path 2, it is 0. Therefore, the next I/O for either LUN will process on Path 2.

Weighted Paths: Load balancing policy that assigns a weight to each path. The weight indicates the relative priority of a given path. The larger the number, the lower ranked the priority. The DSM chooses the least-weighted path from among the available paths.

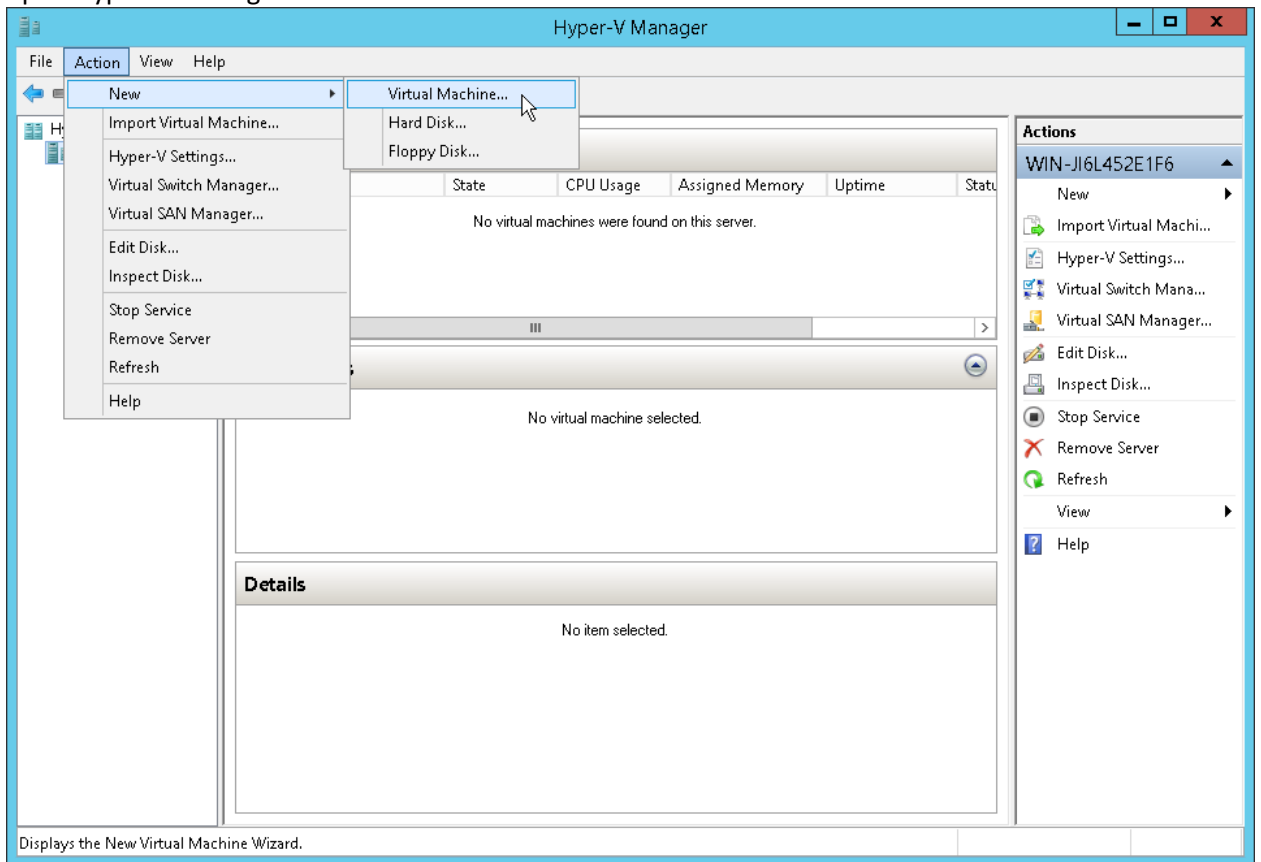
Least Blocks: Load balancing policy that sends I/O down the path with the least number of data blocks currently being processed. For example, consider that there are two I/Os: one is 10 bytes and the other is 20 bytes. Both are in process on Path 1, and both have completed Path 2. The cumulative outstanding amount of I/O on Path 1 is 30 bytes. On Path 2, it is 0. Therefore, the next I/O will process on Path 2.

Reference: [https://technet.microsoft.com/en-us/library/dd851699\(v=ws.11\).aspx](https://technet.microsoft.com/en-us/library/dd851699(v=ws.11).aspx)

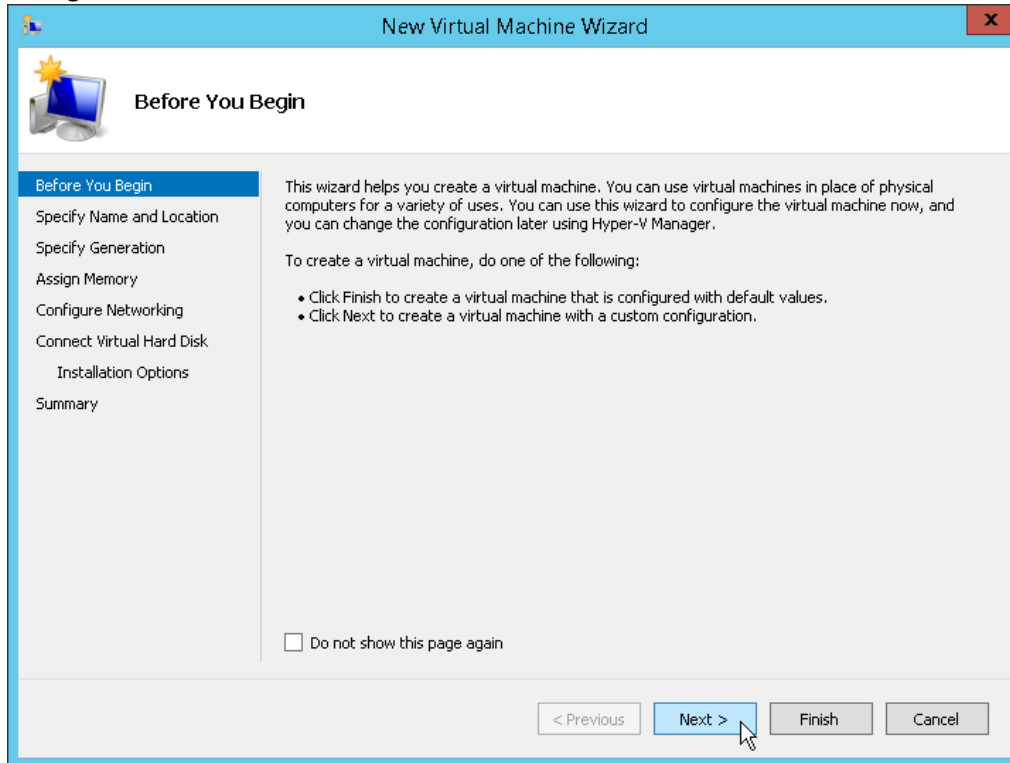
To optimize fault tolerance timer, see “III. Optimize MPIO high availability fault tolerance timer” in Appendix III.

Use iSCSI LUN to store Hyper-V virtual machines

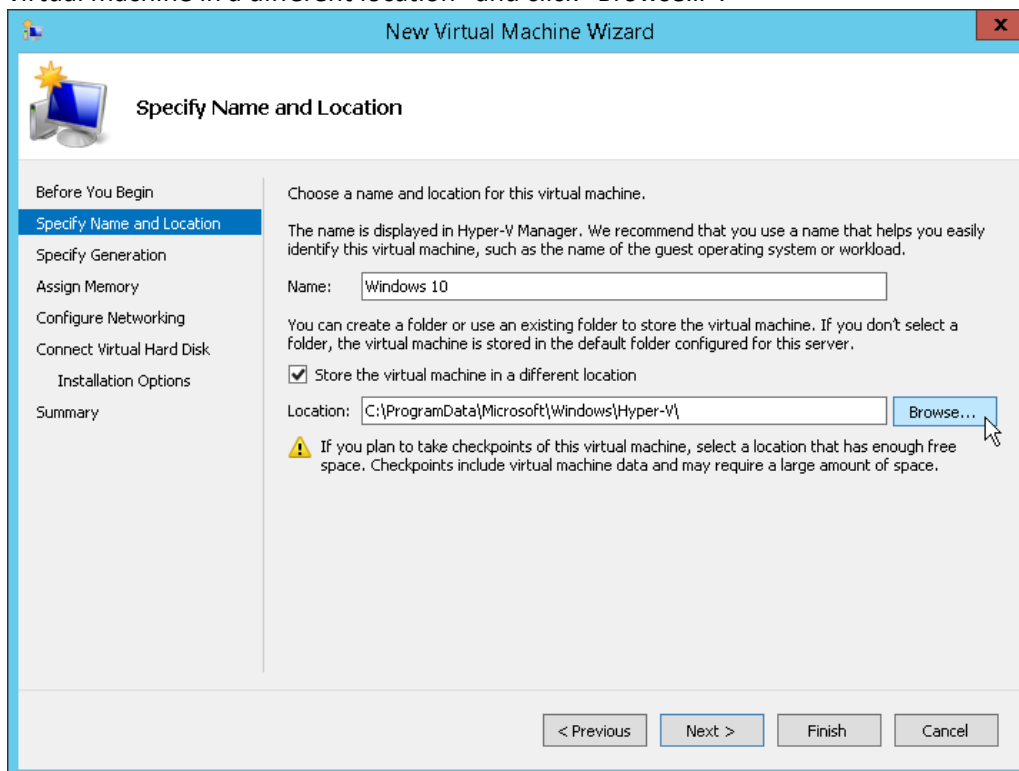
1. Open Hyper-V Manager. Select "Action" > "New" > "Virtual Machine..."



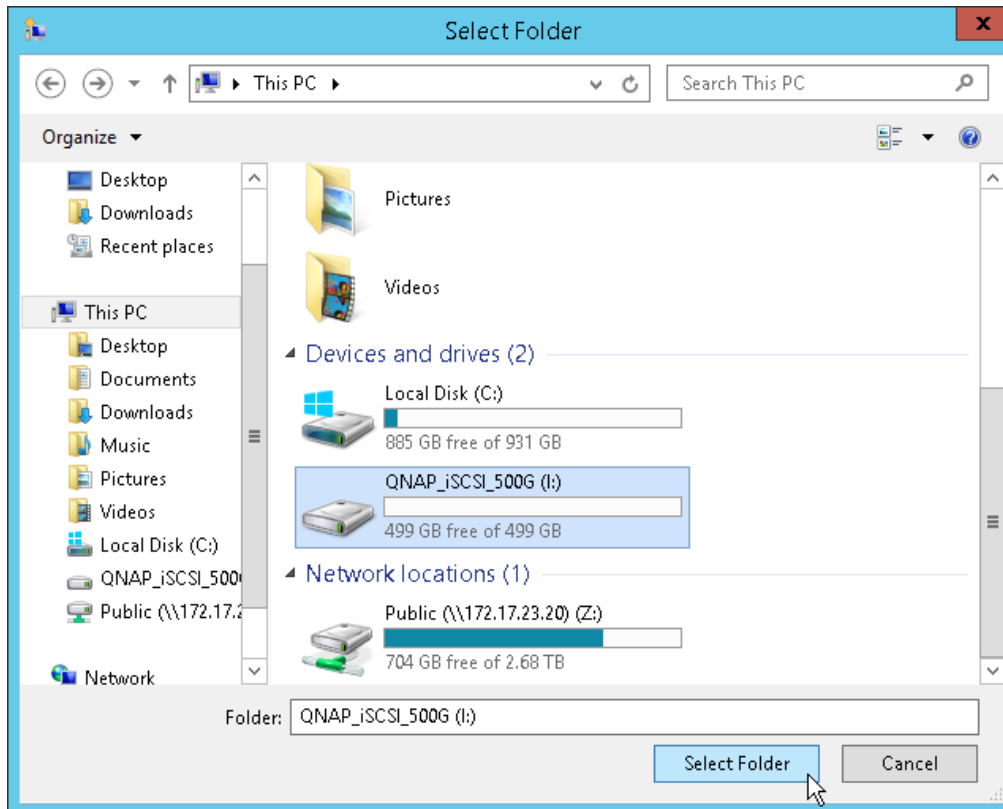
2. The New Virtual Machine wizard opens. Click “Next” to create a virtual machine with a custom configuration.



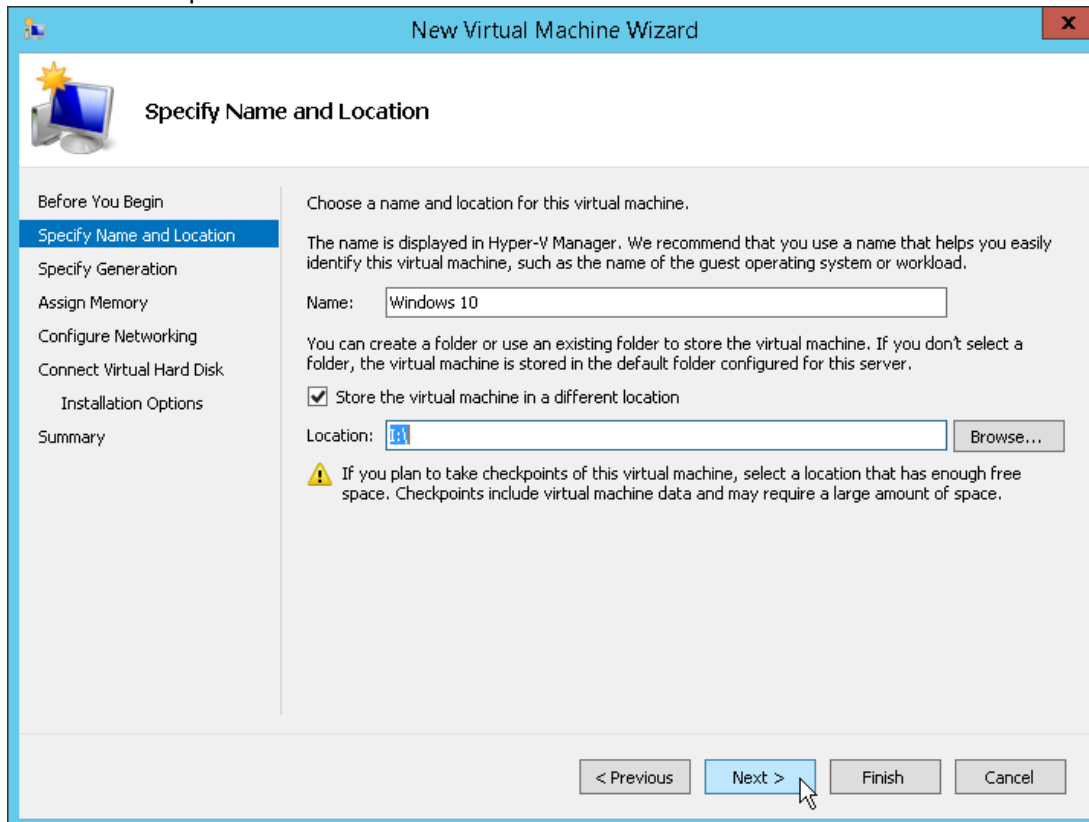
3. On the “Specify Name and Location” page, type an appropriate name. Then select “Store the virtual machine in a different location” and click “Browse...”.



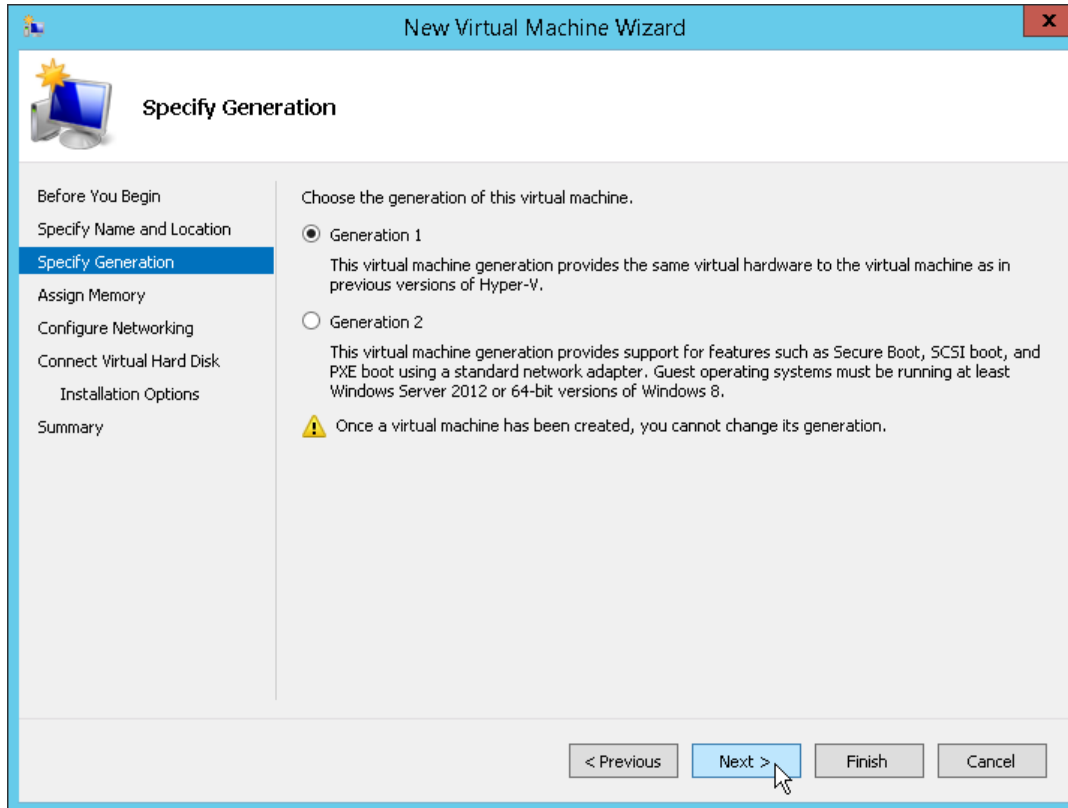
4. Select the iSCSI drive that we have created to store the virtual machine.



5. Click "Next" to proceed.



- Specify the generation for the virtual machine. Note that you cannot change its generation once a virtual machine has been created.



The screenshot shows the 'Specify Generation' step of the 'New Virtual Machine Wizard'. The wizard has a sidebar on the left with steps: 'Before You Begin', 'Specify Name and Location', 'Specify Generation' (selected), 'Assign Memory', 'Configure Networking', 'Connect Virtual Hard Disk', 'Installation Options', and 'Summary'. The main area is titled 'Specify Generation' and contains the following text:

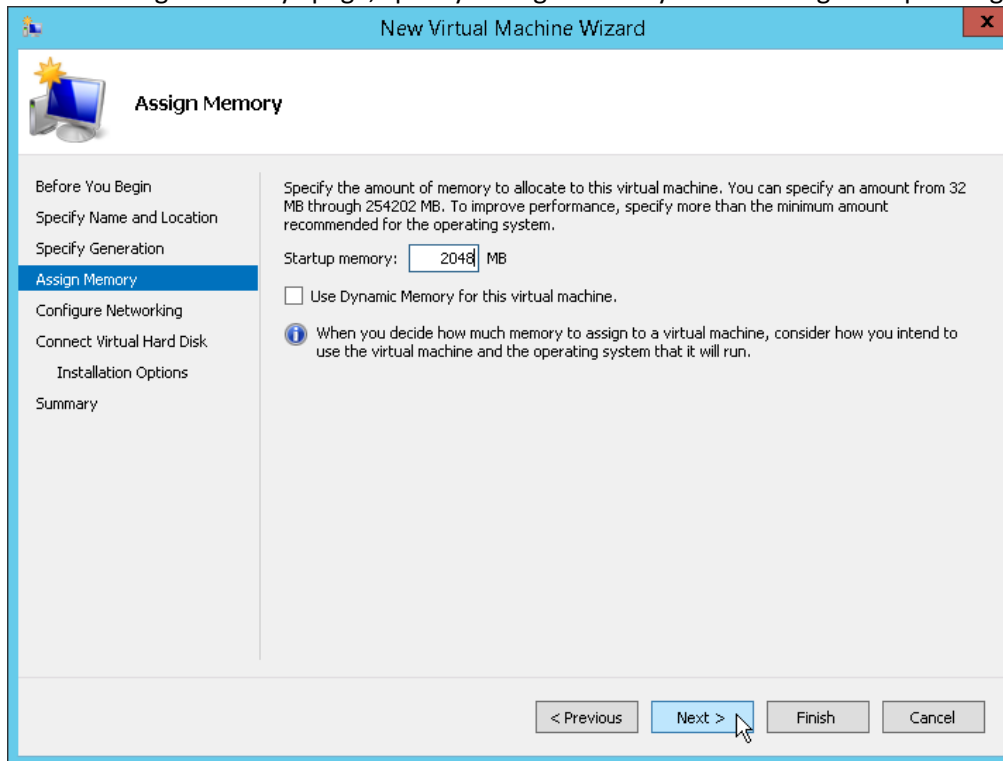
Choose the generation of this virtual machine.

- ☒ Generation 1
This virtual machine generation provides the same virtual hardware to the virtual machine as in previous versions of Hyper-V.
- ☐ Generation 2
This virtual machine generation provides support for features such as Secure Boot, SCSI boot, and PXE boot using a standard network adapter. Guest operating systems must be running at least Windows Server 2012 or 64-bit versions of Windows 8.

A warning icon (yellow triangle with an exclamation mark) is followed by the text: 'Once a virtual machine has been created, you cannot change its generation.'

At the bottom, there are four buttons: '< Previous', 'Next >' (highlighted with a mouse cursor), 'Finish', and 'Cancel'.

- On the "Assign Memory" page, specify enough memory to start the guest operating system.



The screenshot shows the 'Assign Memory' step of the 'New Virtual Machine Wizard'. The sidebar on the left has the same steps as the previous screenshot, with 'Assign Memory' now selected. The main area is titled 'Assign Memory' and contains the following text:

Specify the amount of memory to allocate to this virtual machine. You can specify an amount from 32 MB through 254202 MB. To improve performance, specify more than the minimum amount recommended for the operating system.

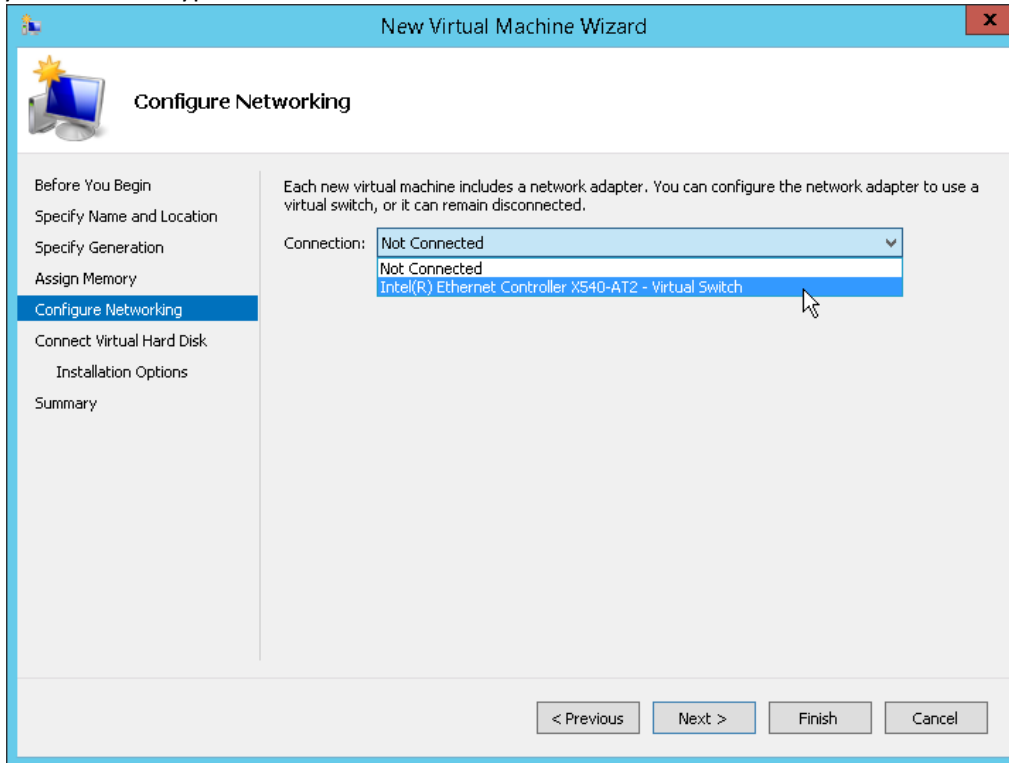
Startup memory: MB

☐ Use Dynamic Memory for this virtual machine.

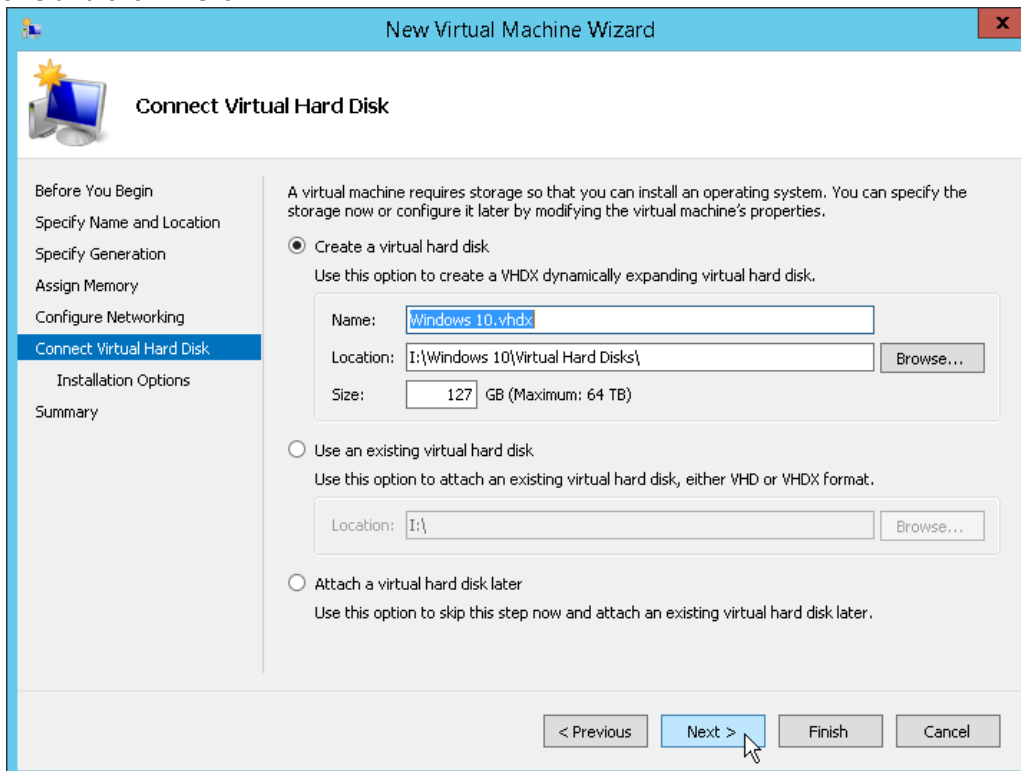
An information icon (blue circle with an 'i') is followed by the text: 'When you decide how much memory to assign to a virtual machine, consider how you intend to use the virtual machine and the operating system that it will run.'

At the bottom, there are four buttons: '< Previous', 'Next >' (highlighted with a mouse cursor), 'Finish', and 'Cancel'.

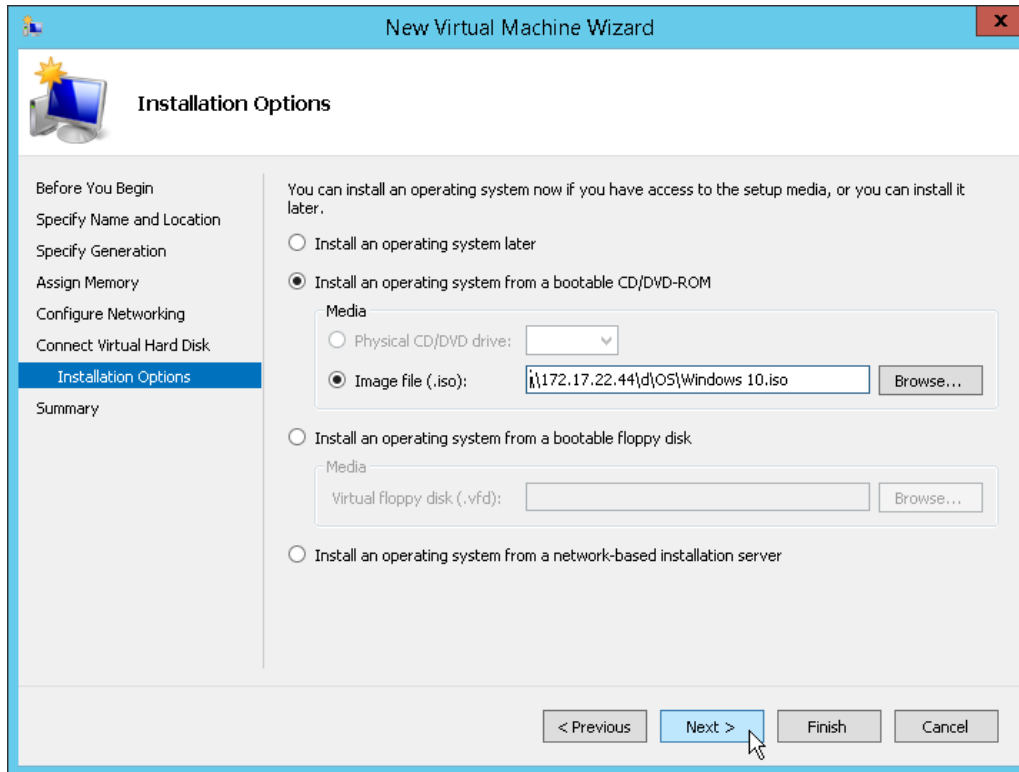
- On the “Configure Networking” page, connect the virtual machine to the switch you created when you installed Hyper-V.



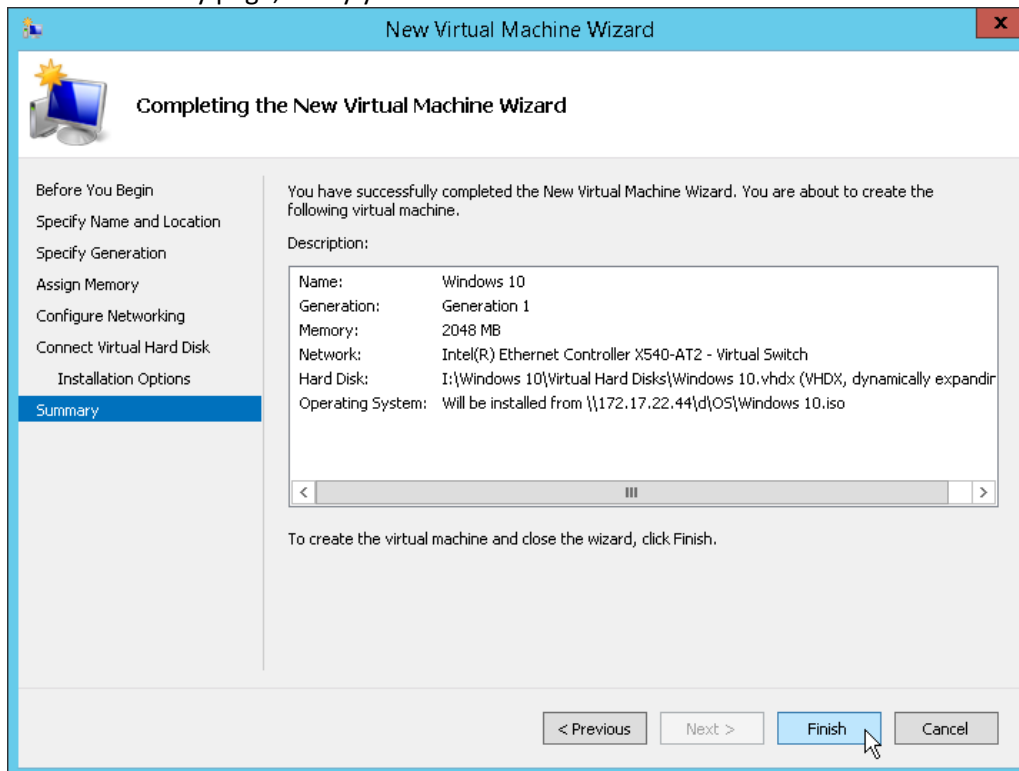
- In this example Hyper-V built a virtual disk in iSCSI LUN, if you will install the guest operating system from a DVD or an image file (an .ISO file), choose “Create a virtual hard disk”. Confirm the size and click “Next>”.



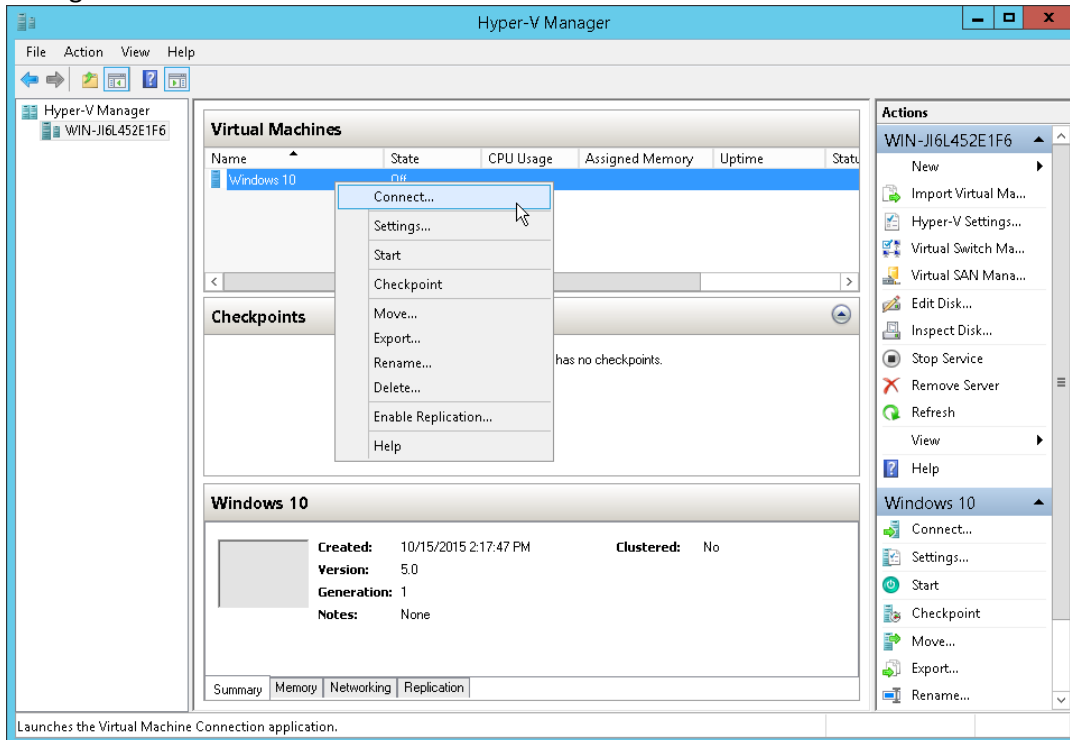
- Then click the option that describes the type of media you will use. For example, to use an .iso file, click “Install an operating system from a bootable CD/DVD” and then specify the path to the .iso file.



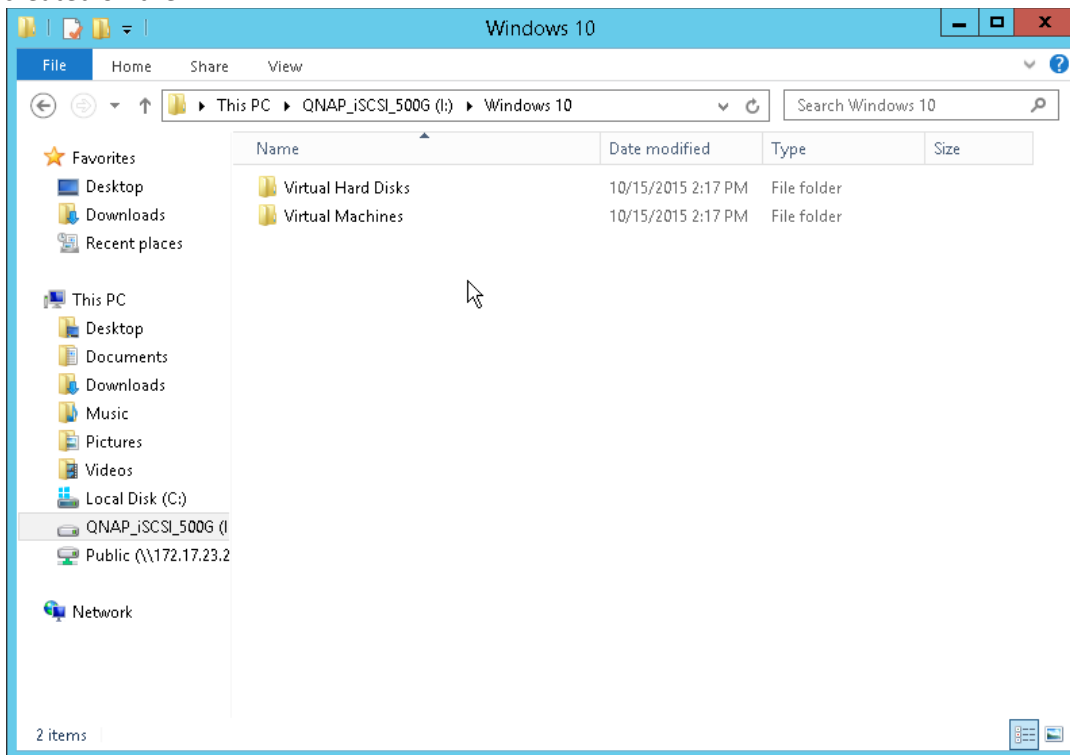
- On the Summary page, verify your selections and click “Finish”.



- From Hyper-V Manager, right-click the name of the virtual machine and click "Connect...". The virtual machine starts, searches the startup devices, and loads the installation package. Proceed through the installation.



- Open the Windows Explorer and click the iSCSI drive to view all the installation files or files created on the VM.

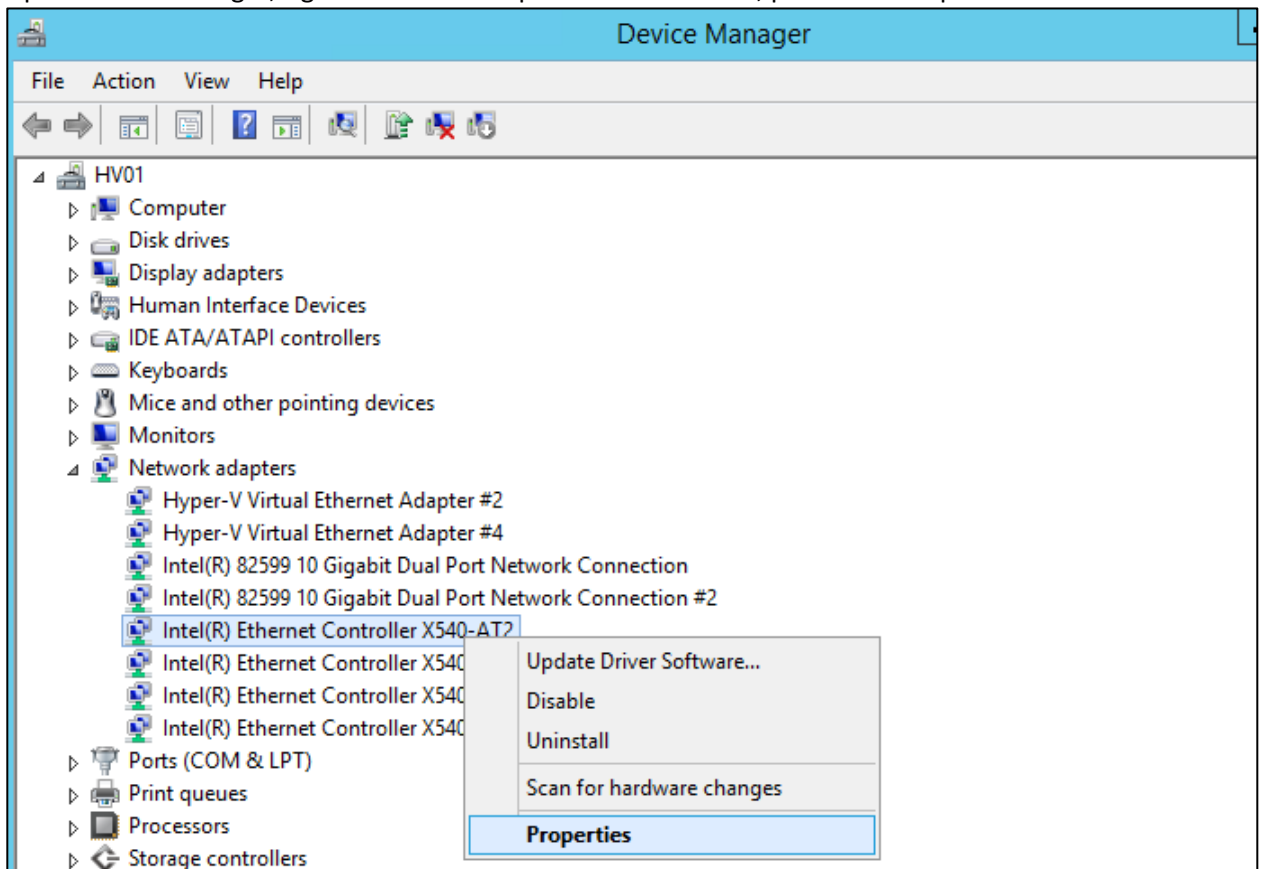


Appendix

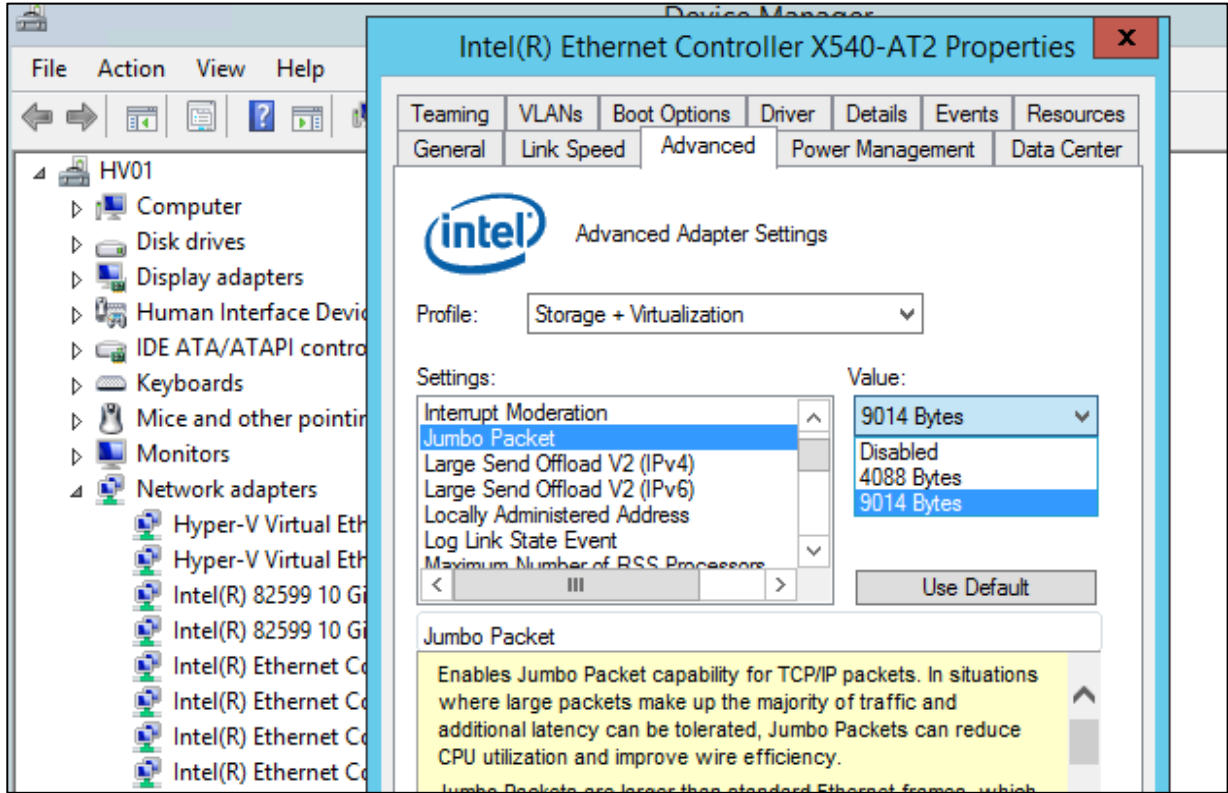
I. Optimize network performance

TIPS : Different brands, network adapter models may need different optimization, the effect may not be the same, here to Intel X540 network card as an example.

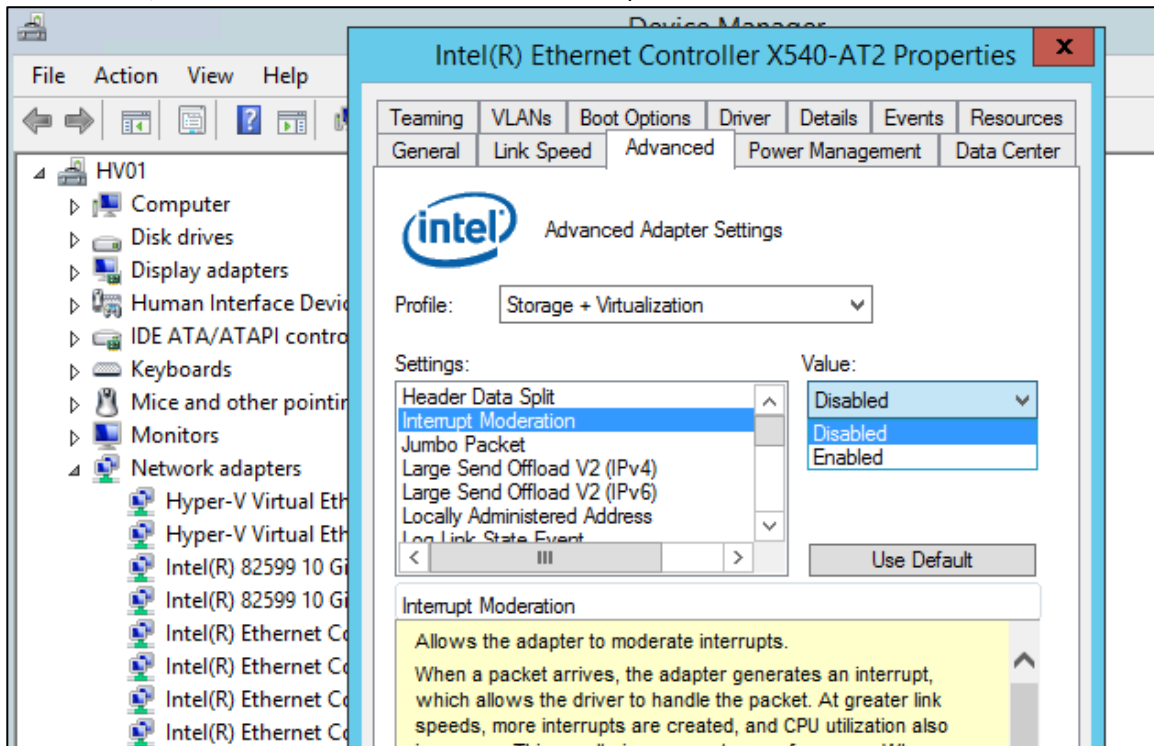
1. Open Device Manager, right-click the Data-port where the card, press the "Properties".



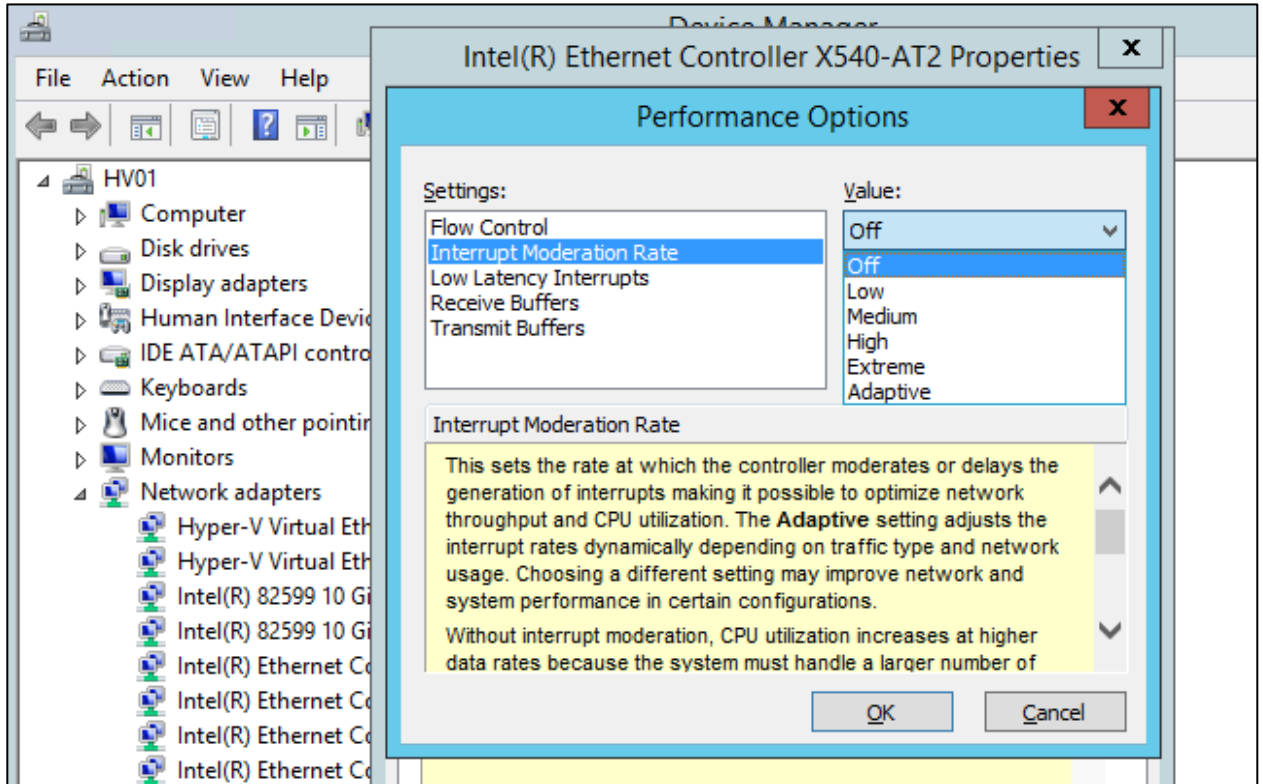
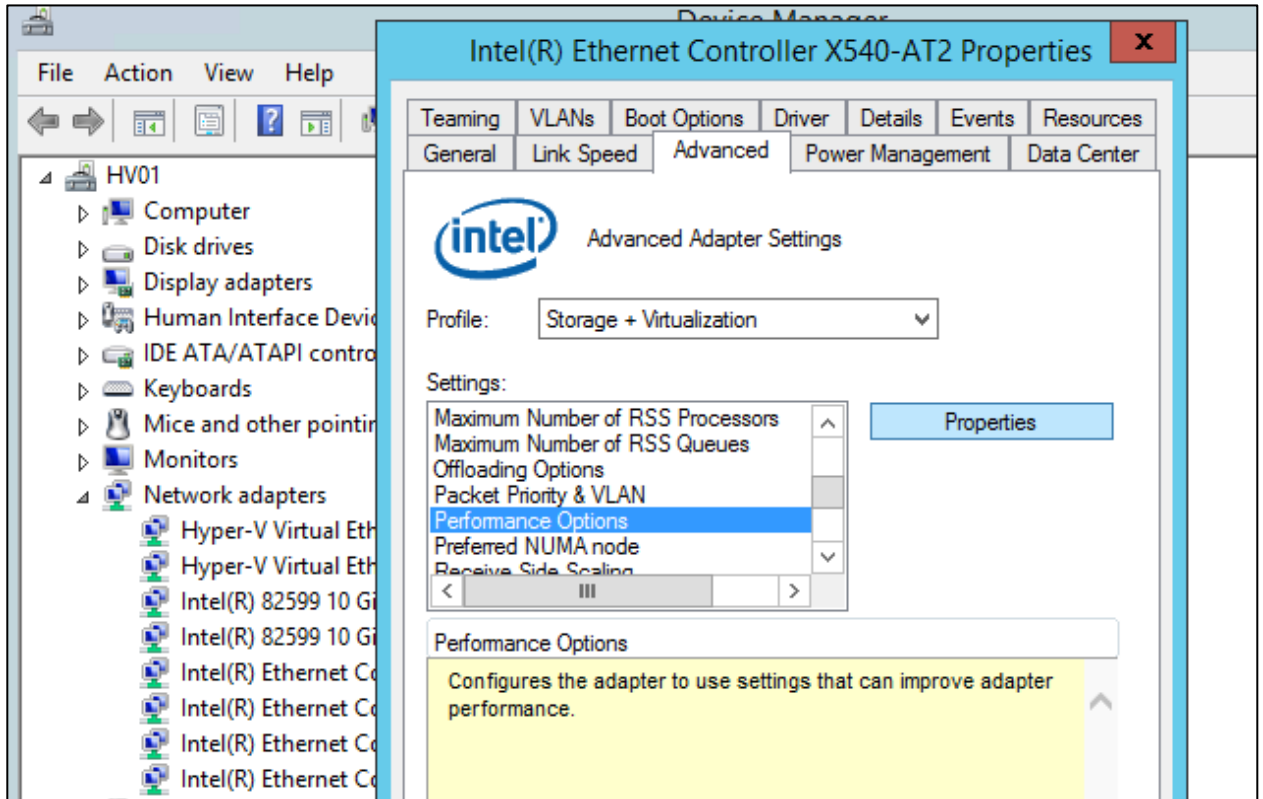
- Click the "Advanced" page, in "Settings" to find the "Jumbo Packet" item and modify the value to 9000 or 9014 bytes.



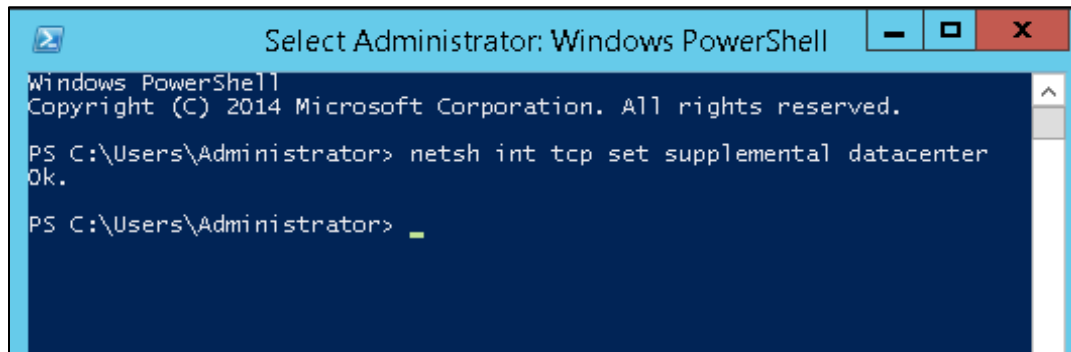
- Click "Interrupt Moderation", and modify the value to Disabled. (This step is optional, if your card is Intel X550, it is recommended to the default value).



- Click "Performance Options", then press the "Properties" button on the right, turn off "Interrupt Moderation Rate" . (This step is optional, if your card is Intel X550, it is recommended to leave the default.)



5. Open Windows PowerShell, enter "netsh int tcp set supplemental datacenter", until the screen shows OK.



```
Windows PowerShell
Copyright (C) 2014 Microsoft Corporation. All rights reserved.

PS C:\Users\Administrator> netsh int tcp set supplemental datacenter
Ok.

PS C:\Users\Administrator> _
```



II. Recommended updates and hotfixes for Windows Server

We recommend the following hotfixes that offer reliability and performance enhancements and protect against security vulnerabilities of the Windows Server. You may choose to install these hotfixes manually or automatically. The updates and hotfixes are organized by operating system version.

Windows Server 2012 R2:

Run the Windows Server 2012 R2 Update. For more information, see the Microsoft TechNet website at <https://technet.microsoft.com/en-us/library/dn645472.aspx>

Windows Server 2012:

Hotfix	Importance	Description
2796995	Recommended	Offloaded Data Transfers fail on a computer that is running Windows 8 or Windows Server 2012.

Windows Server 2008 R2 SP1:

Hotfix	Importance	Description
2528357	Required	Nonpaged pool leak when you disable and enable some storage controllers in Windows Vista, in Windows 7, in Windows Server 2008 or in Windows Server 2008 R2.
2684681	Required	Iscsipl.exe process stops responding when you try to reconnect a storage device to a computer that is running Windows Vista, Windows Server 2008, Windows 7, or Windows Server 2008 R2.
2754704	Required	A hotfix is available that provides a mechanism for DSM to notify MPIO that a particular path is back to online in Windows Server 2008 and Windows Server 2008 R2.

Windows Server 2008 R2:

Hotfix	Importance	Description
979711	Required	Stop error message on a computer that is running Windows 7 or Windows Server 2008 R2 and that has iSCSI storage: "0x0000000A"
2520235	Recommended	"0x0000009E" Stop error when you add an extra storage disk to a failover cluster in Windows Server 2008 R2.
2522766	Required	The MPIO driver fails over all paths incorrectly when a transient single failure occurs in Windows Server 2008 or in Windows Server

		2008 R2.
2528357	Required	Nonpaged pool leak when you disable and enable some storage controllers in Windows Vista, in Windows 7, in Windows Server 2008 or in Windows Server 2008 R2.
2684681	Required	Isccicpl.exe process stops responding when you try to reconnect a storage device to a computer that is running Windows Vista, Windows Server 2008, Windows 7, or Windows Server 2008 R2.
2718576	Required	MPIO disk is removed unexpectedly when a PR_IN command fails in a Windows Server 2008 R2 environment.
2754704	Required	A hotfix is available that provides a mechanism for DSM to notify MPIO that a particular path is back to online in Windows Server 2008 and Windows Server 2008 R2.

Windows Server 2008:

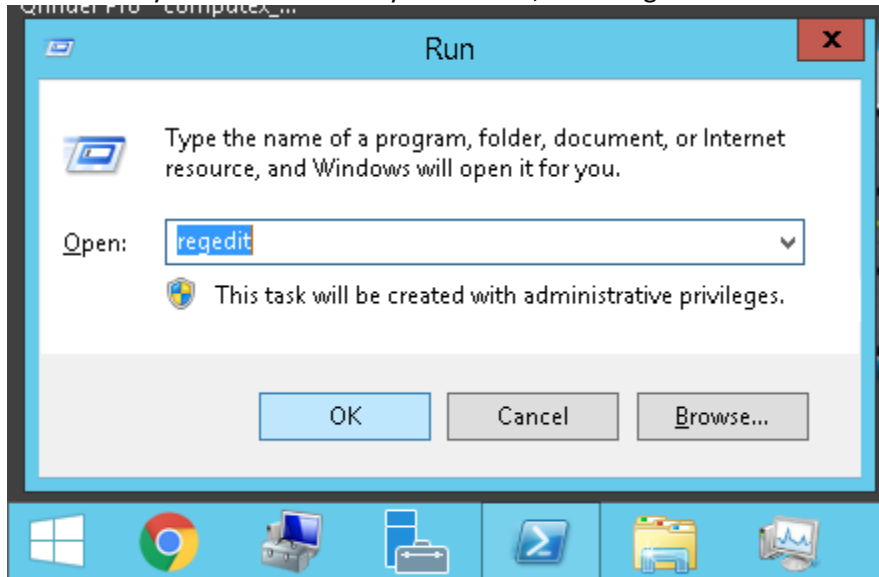
Hotfix	Importance	Description
2684681	Required	Isccicpl.exe process stops responding when you try to reconnect a storage device to a computer that is running Windows Vista, Windows Server 2008, Windows 7, or Windows Server 2008 R2.
2754704	Required	A hotfix is available that provides a mechanism for DSM to notify MPIO that a particular path is back to online in Windows Server 2008 and Windows Server 2008 R2.

Windows Server 2003 (and Windows Server 2003 R2) SP2:

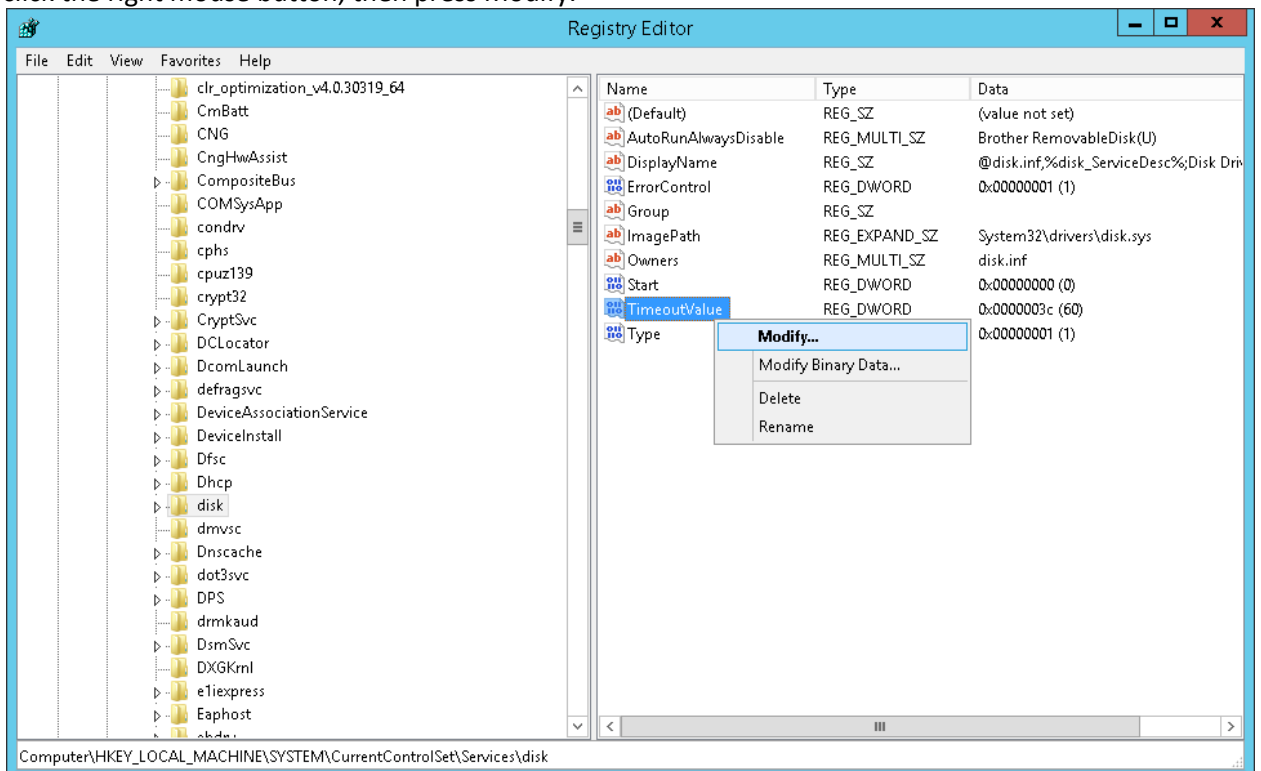
Hotfix	Importance	Description
945119	Required	Stop error that is related to the Storport.sys driver on a Windows Server 2003-based computer: "0x000000D1 (parameter1, parameter2, parameter3, parameter4) DRIVER_IRQL_NOT_LESS_OR_EQUAL"
982109	Required	Access to an MPIO-controlled storage device fails after you disconnect all data cables in Windows Server 2003.

III. Optimize MPIO high availability fault tolerance timer

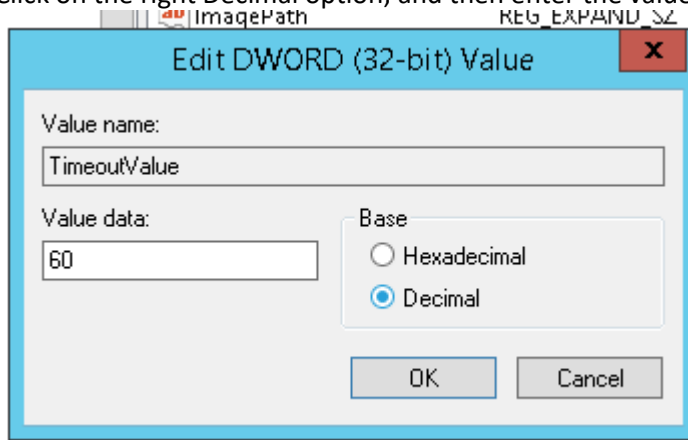
1. Press the keyboard Windows key + R button, enter regedit.



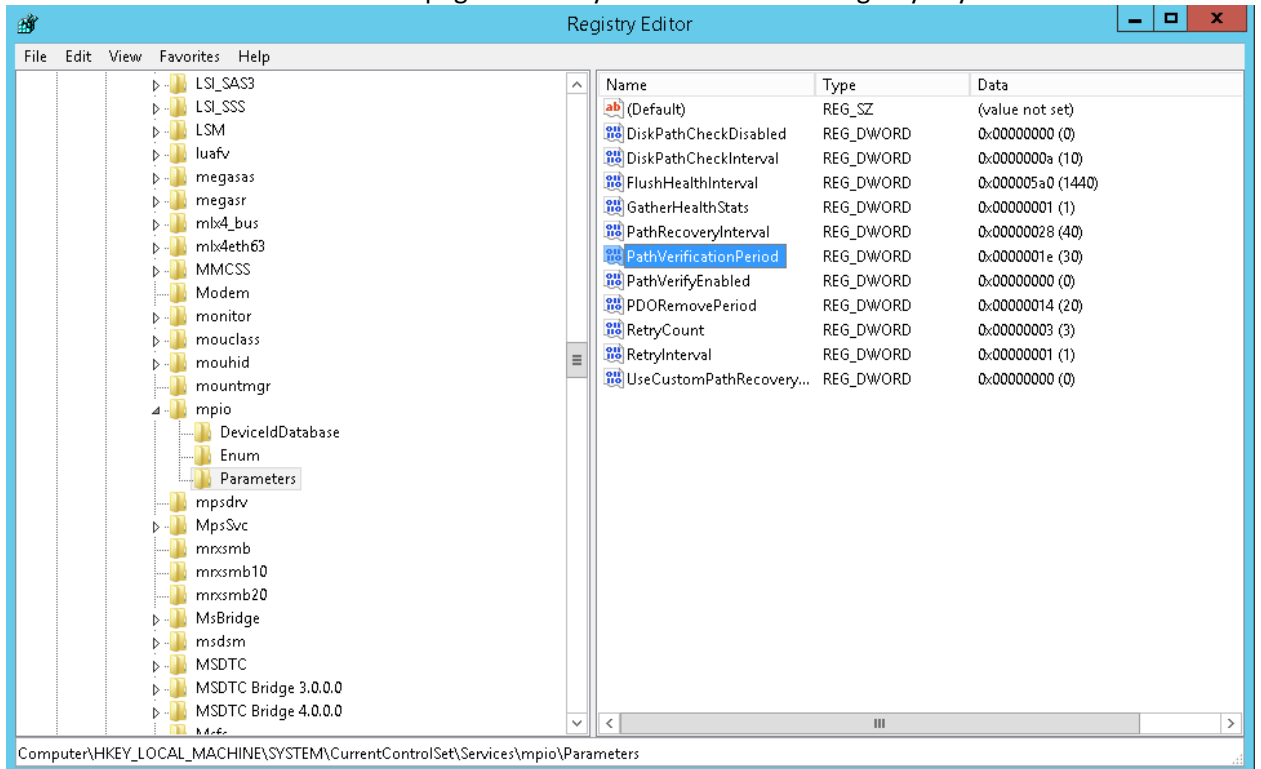
2. In "HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Disk" path, find "TimeOutValue", click the right mouse button, then press Modify.



- Click on the right Decimal option, and then enter the value on the left.



- Follow the instructions on the next page to modify the value of other registry keys.



TIPS : Proposed modification of the registry keys

Registry Entries for SCSI Miniport Drivers

Path : HKLM\SYSTEM\CurrentControlSet\Services\Disk

Value Name : TimeOutValue

Description : Timeout (seconds) after the disk is offline.

Default Value : 60

Recommended Value : 60 、 or adjust as necessary

Range: 1~255

Microsoft iSCSI Initiator Driver Timers

Path : HKLM\SYSTEM\CurrentControlSet\Control\Class\
{4D36E97B-E325-11CE-BFC1-08002BE10318}\0001\Parameters

Value Name : DelayBetweenReconnect

Description : When the connection is interrupted, the iSCSI driver attempts to reconnect, log in. Modify this value to adjust the reconnect interval (seconds).

Default Value : 5

Recommended Value : 10

Value Name : LinkDownTime

Description : An I/O request sent, the maximum time to wait (seconds), only to determine the connection is interrupted, and then re-connected again.

Default Value : 15

Recommended Value : 300

(Continued on next page)

TIPS : Proposed modification of the registry keys(Continued on the previous page)

Value Name : MaxRequestHoldTime

Description : An I/O request sent out found that the target is lost, the maximum time to wait (seconds), and then reconnect.

Default Value : 60

Recommended Value : 300

Value Name : SrbTimeoutDelta

Description : The system disk driver (such as disk.sys) does not take into account the network latency when deciding on a transmission timeout. This value provides a reference time (in seconds) for network timeouts to these disk drivers.

Default Value : 15

Recommended Value : 300

Microsoft Multipath I/O (MPIO) Timers

Path : HKLM\SYSTEM\CurrentControlSet\Services\mpio\Parameters

Value Name : PathVerificationPeriod

Description : Indicate the time period (in seconds) that MPIO performs path validation.

Default Value : 30

Recommended Value : 30 、 or adjust as necessary

Value Name : PDORemovePeriod

Description : The amount of time (in seconds) that the MPIO LUN remains in system memory, even if all device paths fail. When this time is exceeded, the I/O operation will fail and the system will no longer attempt to recover the connection path and inform the application that I/O has failed.

Default Value : 20

Recommended Value : 600

TIPS : Proposed modification of the registry keys(Continued on the previous page)

Value Name : RetryCount

Description : The number of times that DSM (device-specific modules) must retry when it determines that an I / O request has failed.

Default Value : 3

Recommended Value : 3 、 or adjust as necessary

Value Name : RetryInterval

Description : Indicate the time interval (in seconds) that must be retried when DSM (device-specific modules) determines that an I/O request has failed, °

Default Value : 1

Recommended Value : 1 、 or adjust as necessary



References

Microsoft Windows Server 2012 R2 update. Retrieved from Microsoft TechNet.

<https://technet.microsoft.com/en-us/library/dn645472.aspx>

Microsoft MPIO policy. Retrieved from Microsoft TechNet.

[https://technet.microsoft.com/en-us/library/dd851699\(v=ws.11\).aspx](https://technet.microsoft.com/en-us/library/dd851699(v=ws.11).aspx)