QNAP and Failover Technologies

USE MPIO WITH QNAP NAS

 V1.6

How to connect to your QNAP NAS from Windows 2008 using the MPIO feature

QNAP provides you what others cannot!

Added to all other features that are already available on your QNAP NAS, MPIO (Multipath Input Output) enables you to have multiple paths to reach an iSCSI target.
MPIO is part of all x86-based QNAP NAS, e.g. TS-239, TS-439, TS-509, TS-639, TS-809 (see http://www.qnap.com/images/products/comparison/Comparison_NAS.html).

Benefits of using MPIO on a QNAP NAS:

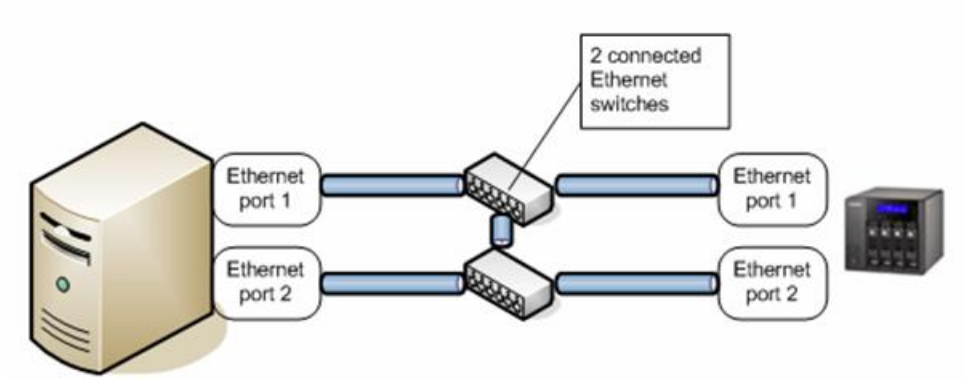
- It ensures **Failover**! In case of network problem (e.g. faulty cable, switch power unit malfunction), it will avoid downtime! All applications will remain online!
- It can provide **load balancing**! Whenever a large transfer occurs, it can use different switches for the transfer to avoid a possible switch overload if only one is used!
- It is supported by many third party applications.

In this application notes, we will set a standard failover multipath I/O to access your favorite QNAP NAS from a Windows 2008 server.

Before getting started, please note:

- DO NOT use NIC Teaming on the server: NIC Teaming used with iSCSI is not supported by Microsoft.
- DO NOT use MCS and MPIO together to connect to a target. Microsoft does not support that configuration: "*Although it is technically possible to layer Microsoft MPIO and MCS together since they function at different layers in the Windows stack, Microsoft does not support the layering of MPIO and MCS due to complexities this can introduce if troubleshooting is needed on a configuration*." (See "Microsoft iSCSI Software Initiator Version 2.X Users Guide" http://download.microsoft.com/download/A/E/9/AE91DEA1-66D9-417C-ADE4-92D824B871AF/uGuide.doc)

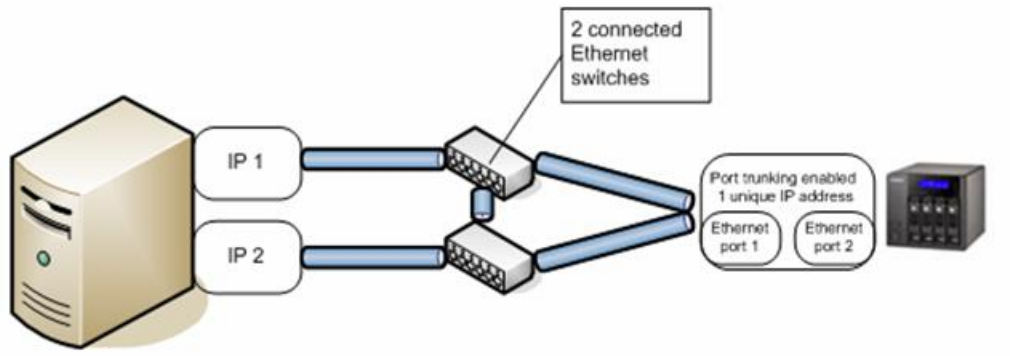
In this Application note, you will find:



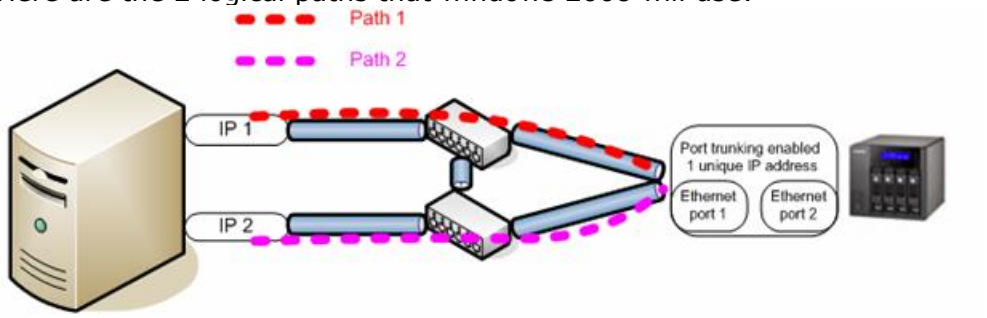
MPIO is useful when both your QNAP NAS and Windows server are connected with 2 network cards, 2 cables on 2 different switches.
You can use network failover in such configuration, and you will be able the use Multipath feature in case of a defunct cable or a switch failure.

Logical network architecture

On the Windows server 2008, you will need 2 network cards with 2 different IP addresses. On the QNAP NAS, you can enable the trunking mode to allow network failover (port trunking is enabled by default on QNAP NAS).



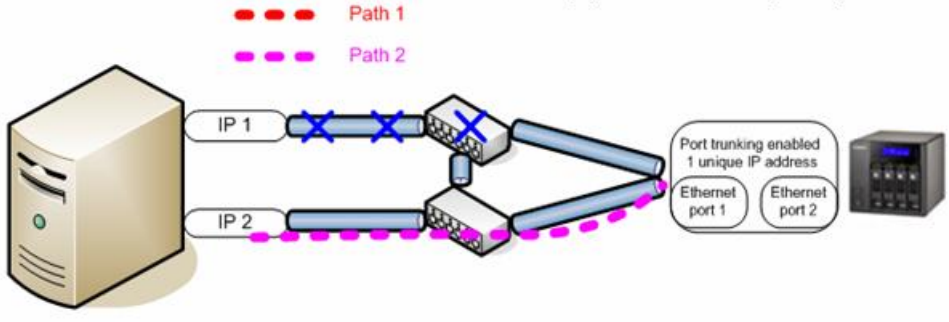
Here are the 2 logical paths that windows 2008 will use:



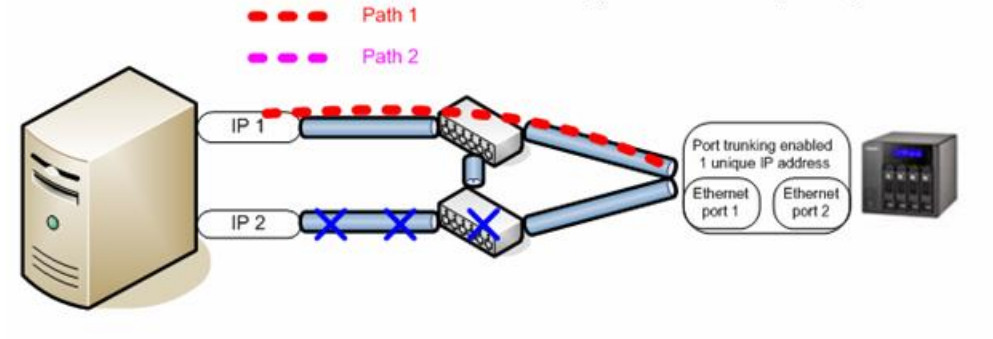
Different possible failures and failover concept

Handled by MPIO feature

If the cable or the switch linked to IP1 failed, path 1 will fail, but path 2 will remain up:

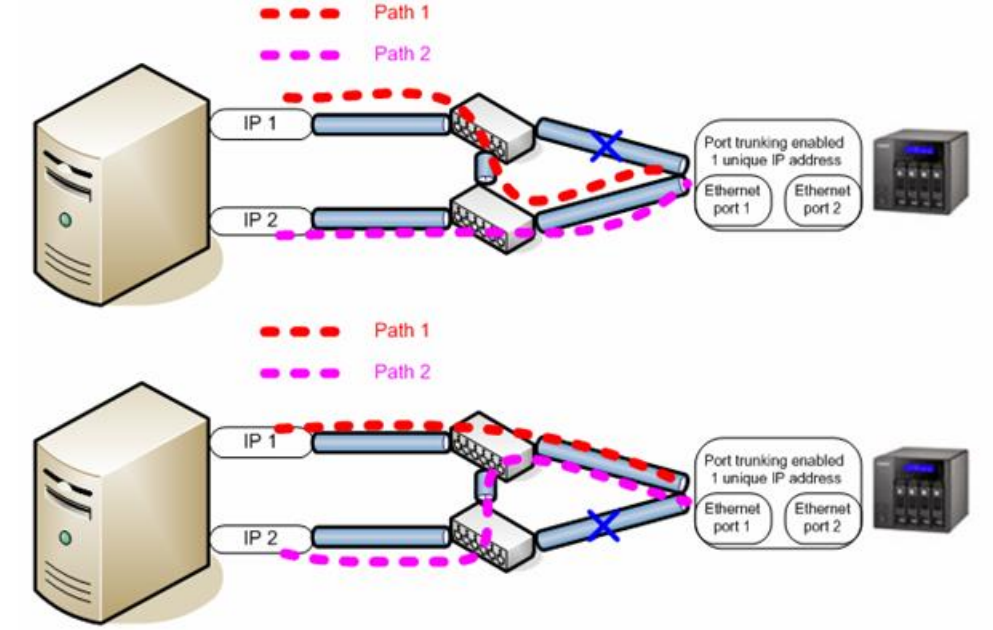


If the cable or the switch linked to IP2 failed, path 2 will fail, but path 1 will remain up:



Handled by QNAP trunking mode (failover setting)

If one of the cable linked to the QNAP NAS failed, all paths will remain UP, because it is protected by the QNAP port trunking mode:



Prerequisites

- Have a minimum of 2 networks interfaces, with different IP addresses on your Windows 2008 Server.
- Have Multipath I/O feature enabled
- Have Multipath enabled on iSCSI devices
- Have an existing iSCSI target created on the NAS
- To allow full network failover, have trunking mode enabled on the QNAP NAS.
- You MUST have a firmware 3.2.2 or above on your QNAP NAS.

Steps review

The following procedure will guide you to:

- Set up an iSCSI target on your QNAP NAS
- Enable Multipath feature in Windows 2008
- Add your QNAP iSCSI portal
- Connect 1 path for 1 iSCSI target LUN
- Enable Multipath on iSCSI devices and reboot
- Connect the second path to your iSCSI target LUN

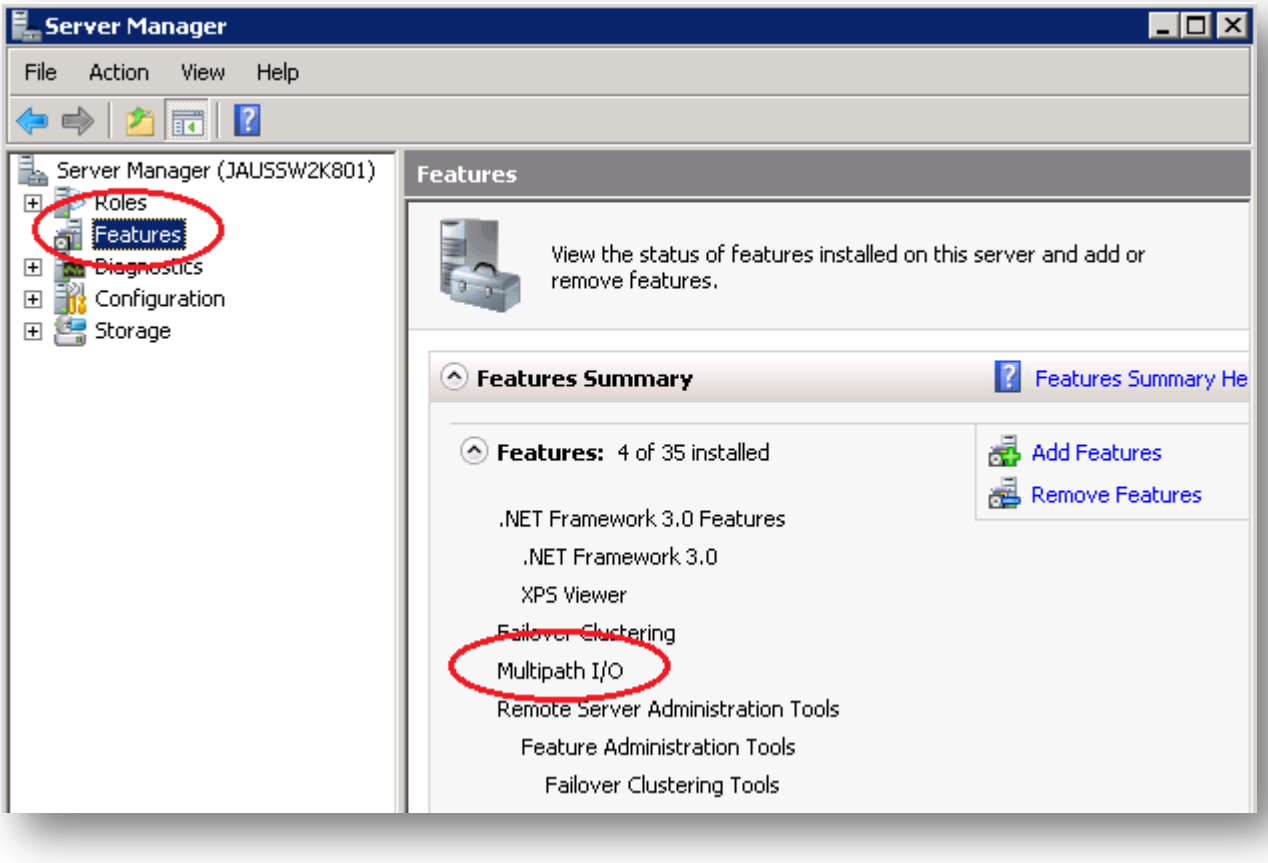
Set up an iSCSI target on your QNAP NAS

You can refer the online application note "*Create and use the iSCSI target service on the QNAP NAS*" on http://www.QNAP.com/pro_features.asp.

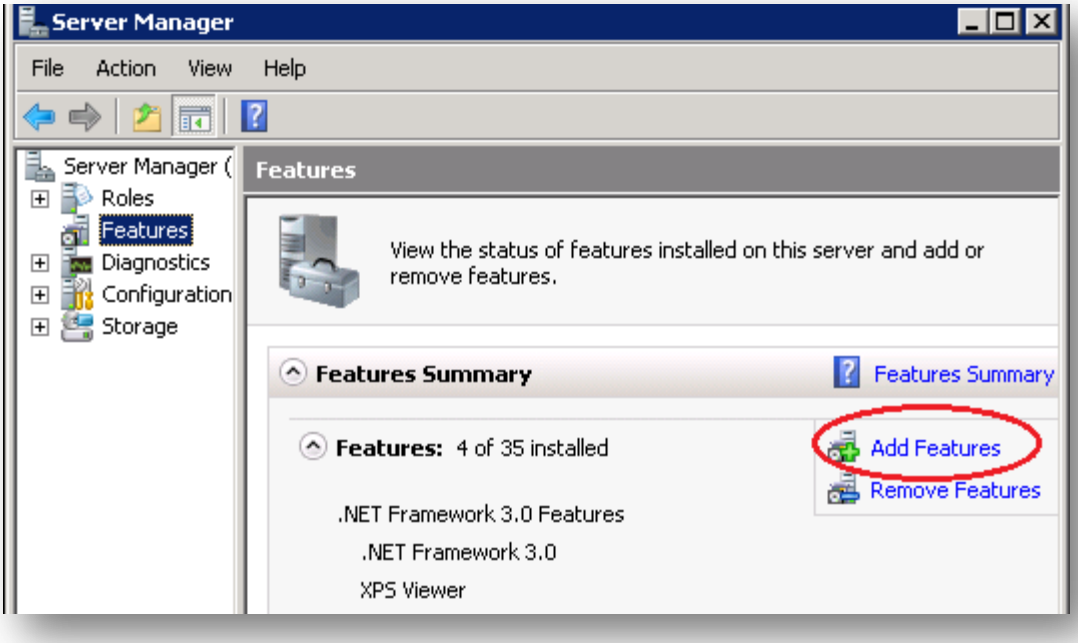
Enable Multipath feature in Windows 2008

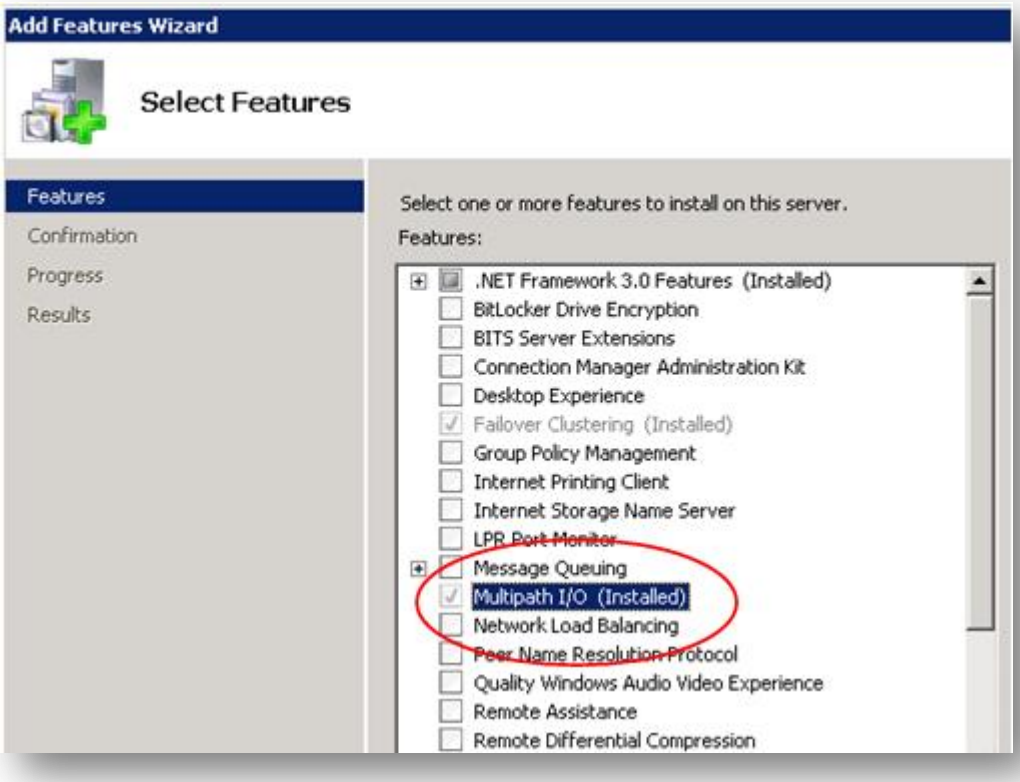
First, ensure that MPIO feature is enabled on your Windows 2008 server.

Go to the "Server Manager" panel, "Features" and check if Multipath I/O is enabled:



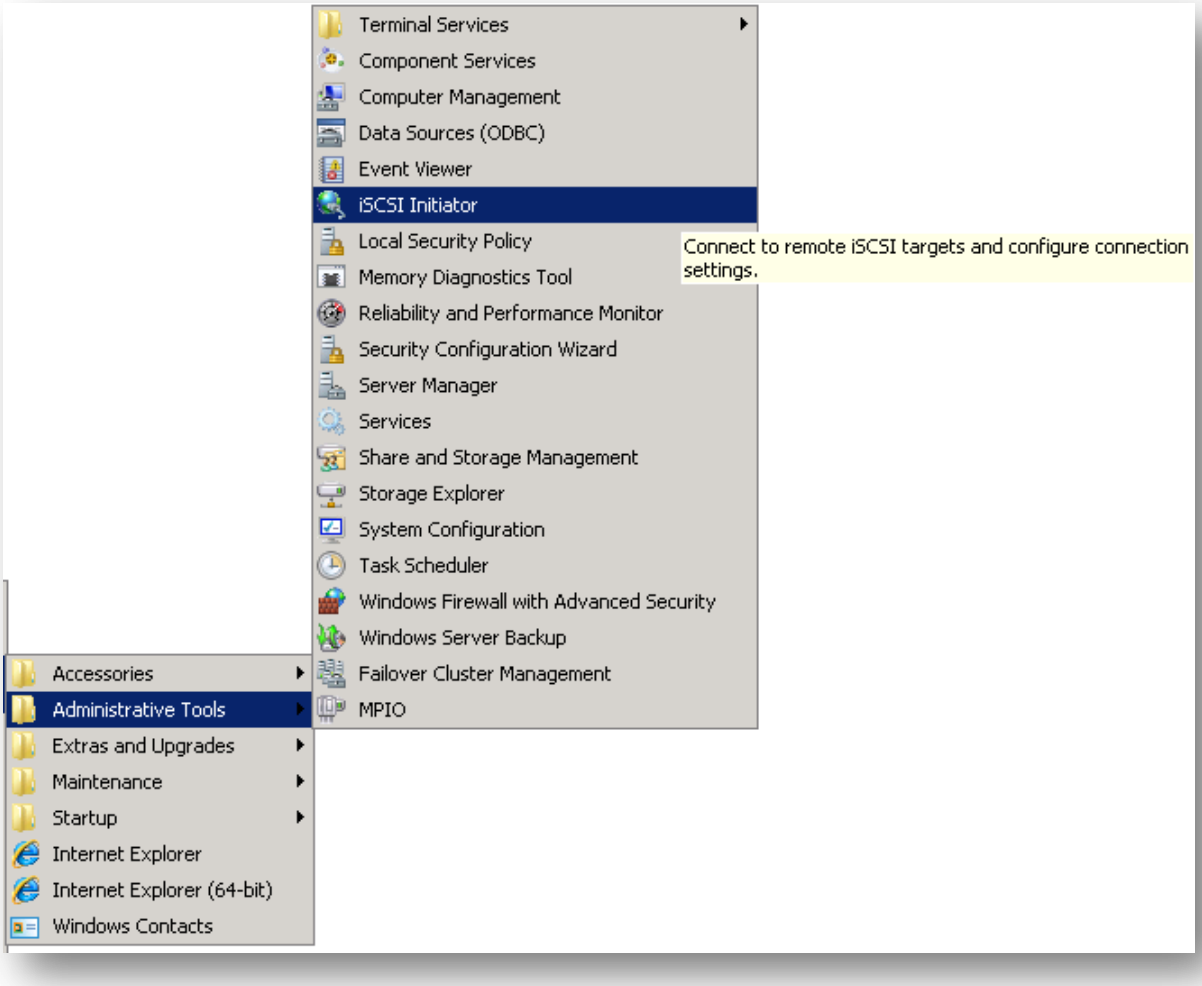
If Multipath I/O is missing, you can add it by using "Add features”:



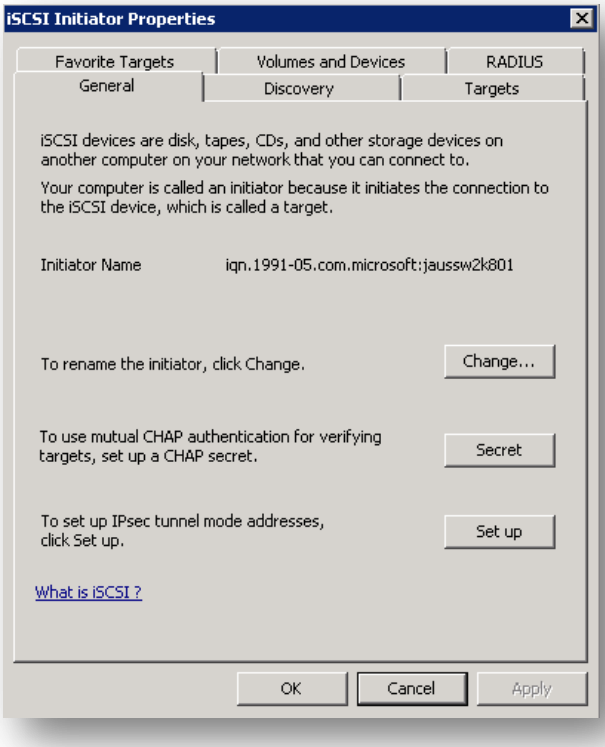


Once MPIO (Multipath I/O) is enabled on your server, you can add an iSCSI LUN with MPIO support, for **ONLY one of your network** card:

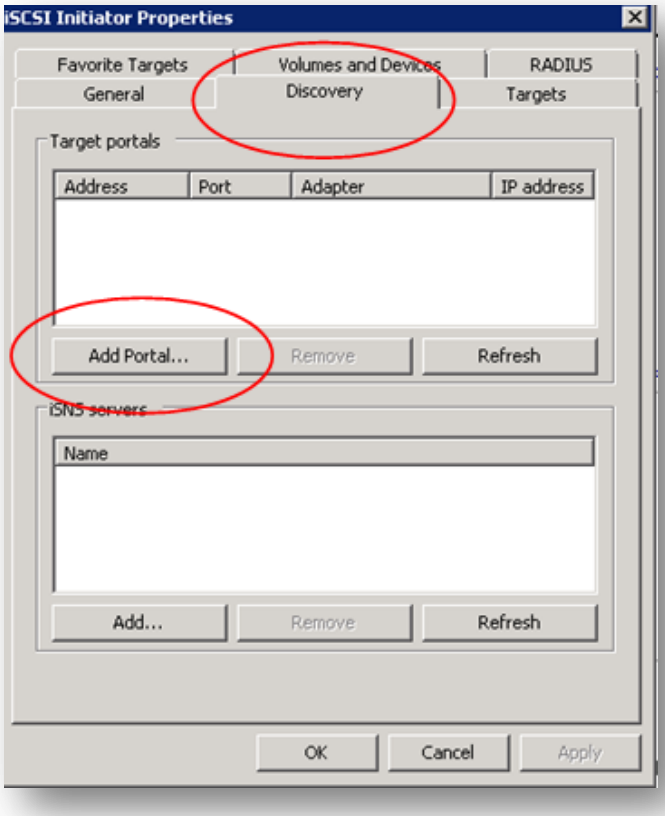
From the Administrative Tools, launch the iSCSI Initiator:



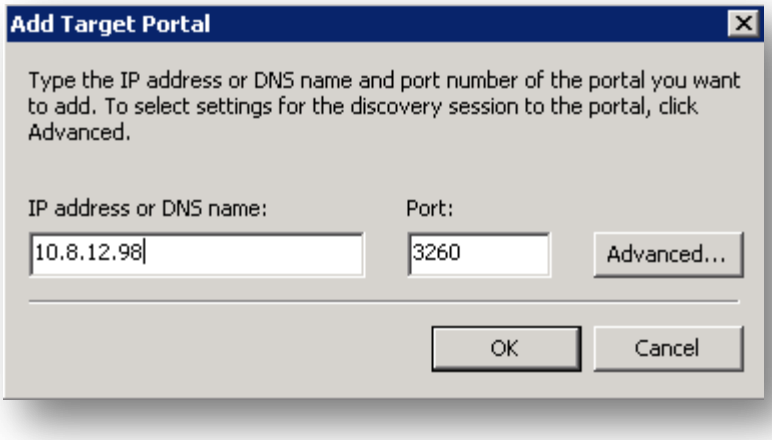
You will obtain a new window. From there you will be able to connect the first path to your iSCSI target LUN.



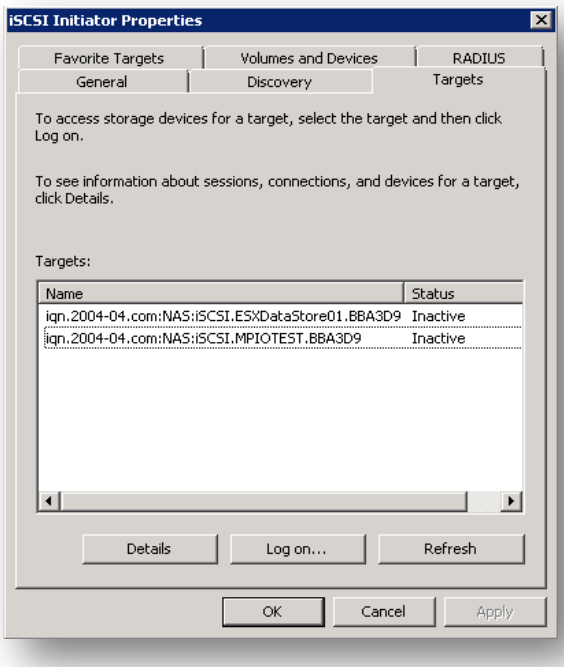
Click the "Discovery" tab, and then click "Add Portal" to add your QNAP NAS:



Enter the IP address or DNS name of your QNAP NAS:

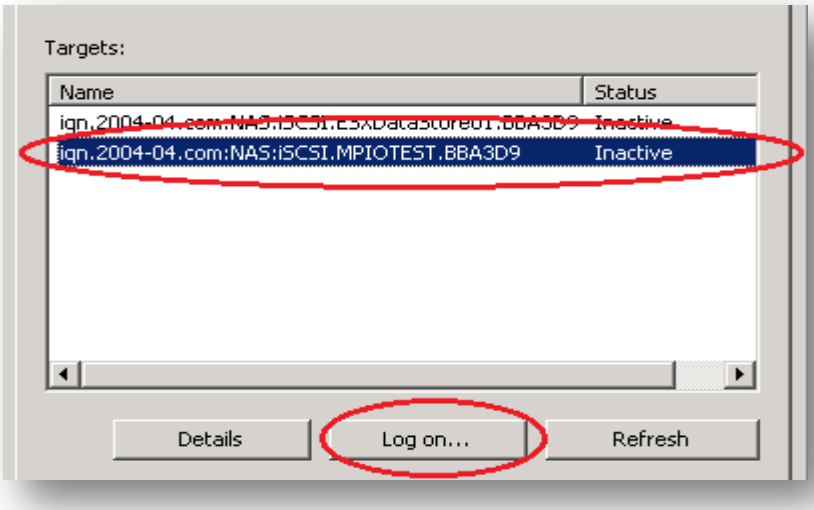


Then click "OK".
Return to the initiator window; go to the "Targets" tab.
You will see all the targets on your QNAP NAS.

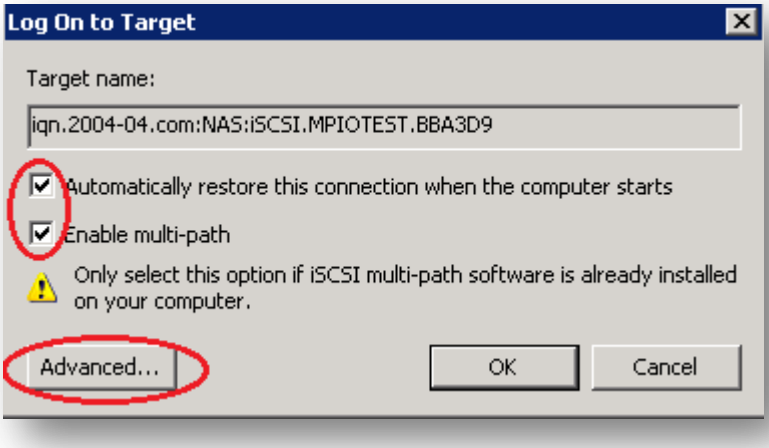


Connect 1 path for 1 iSCSI target LUN

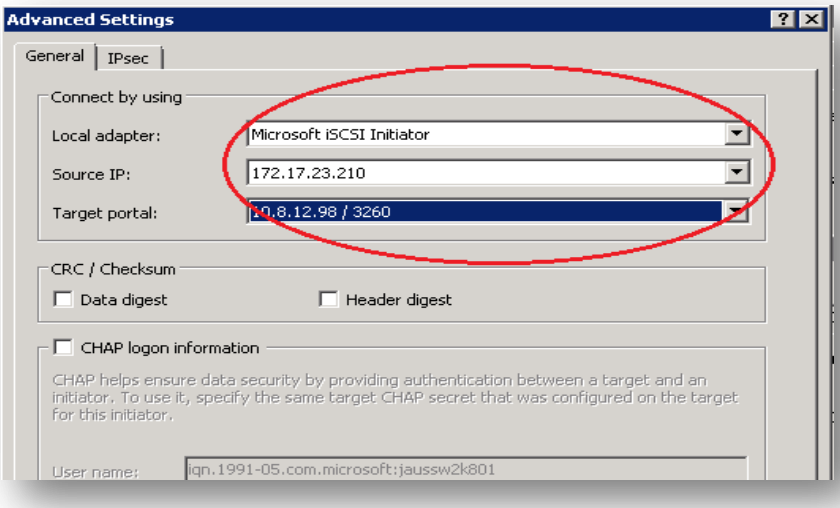
Select the target you want to connect to, and then click "Log on..."



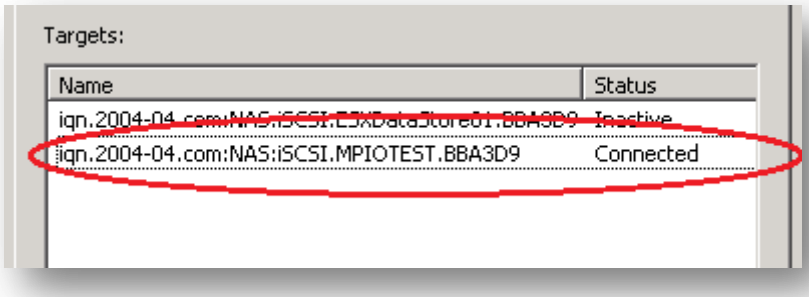
On the new window, check "Automatically restore this connection when computer starts" to make that iSCSI target LUN to be connected at Windows startup.
Check "Enable multi-path"
Then click "Advanced..."



On the advanced tab you can add the specific target-initiator pair in **one of the iSCSI networks ONLY** by choosing the initiator, IP source (first IP) and portal.
We will add the remaining iSCSI path once MPIO is configured (http://technet.microsoft.com/en-us/library/dd834763.aspx. We need at least one iSCSI connection to enable Multipath on iSCSI devices.)

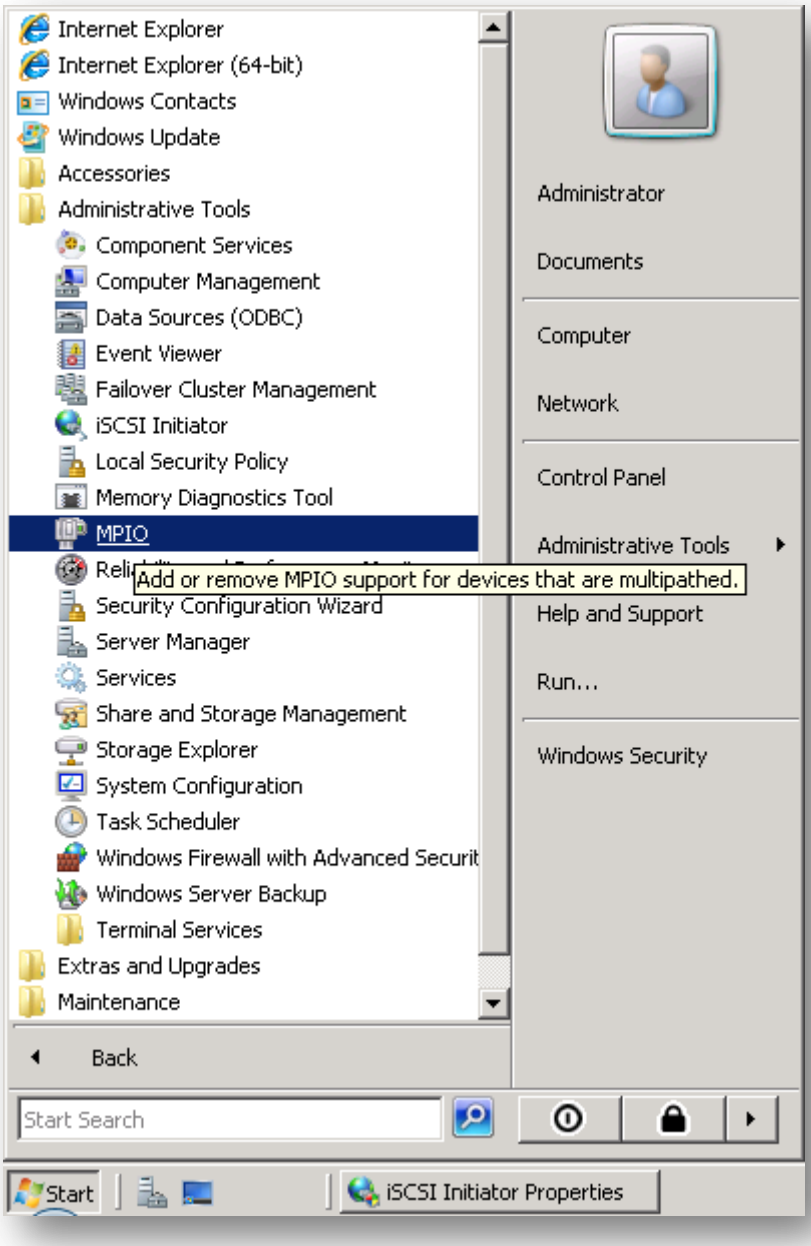


Click “OK”.
Then click “OK” again.
You can see your iSCSI target LUN connected.

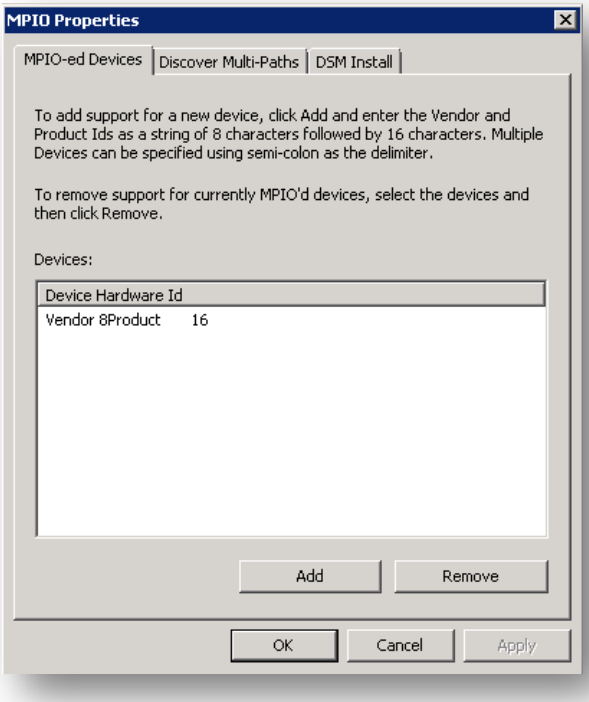


Enable Multipath on iSCSI devices and reboot

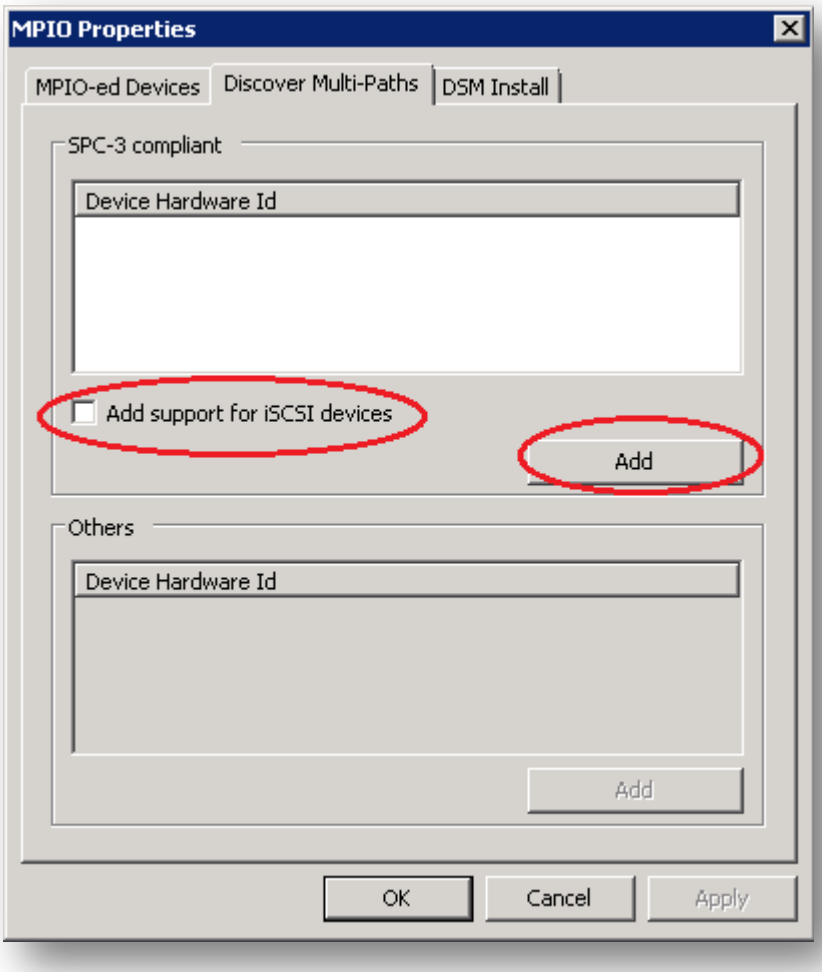
Now, we have to enable MPIO (Multipath I/O) for iSCSI devices.
To do so, we have to open the MPIO panel from the administrative tools:



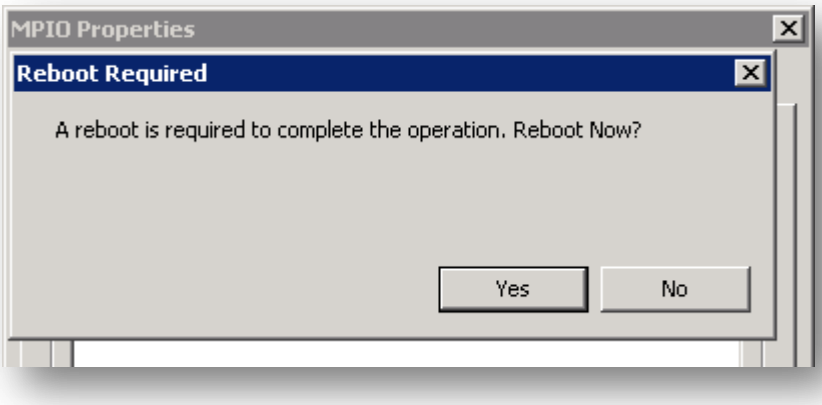
Here is the MPIO panel:



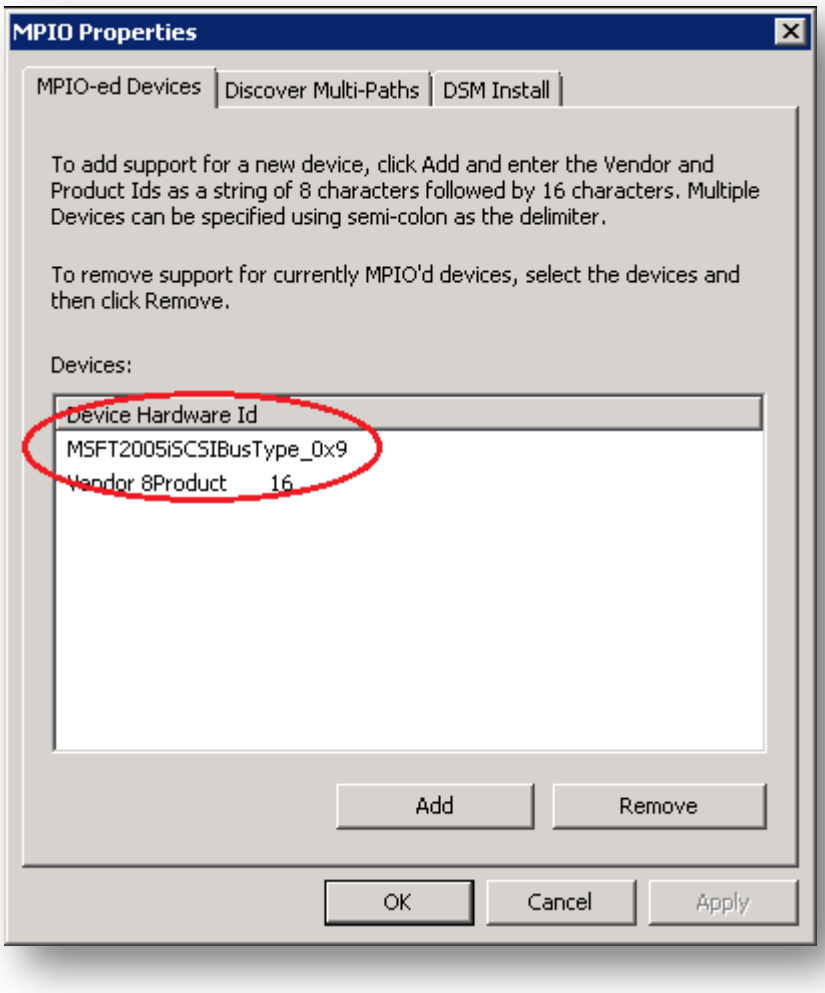
We are going to add the multipath support for iSCSI devices. Change to the "Discover Multi-paths" tab. Then:
- Check "add support for iSCSI devices" and click "Add" **(you must connect to the iSCSI device before otherwise this will be grayed)**



- Restart Windows.



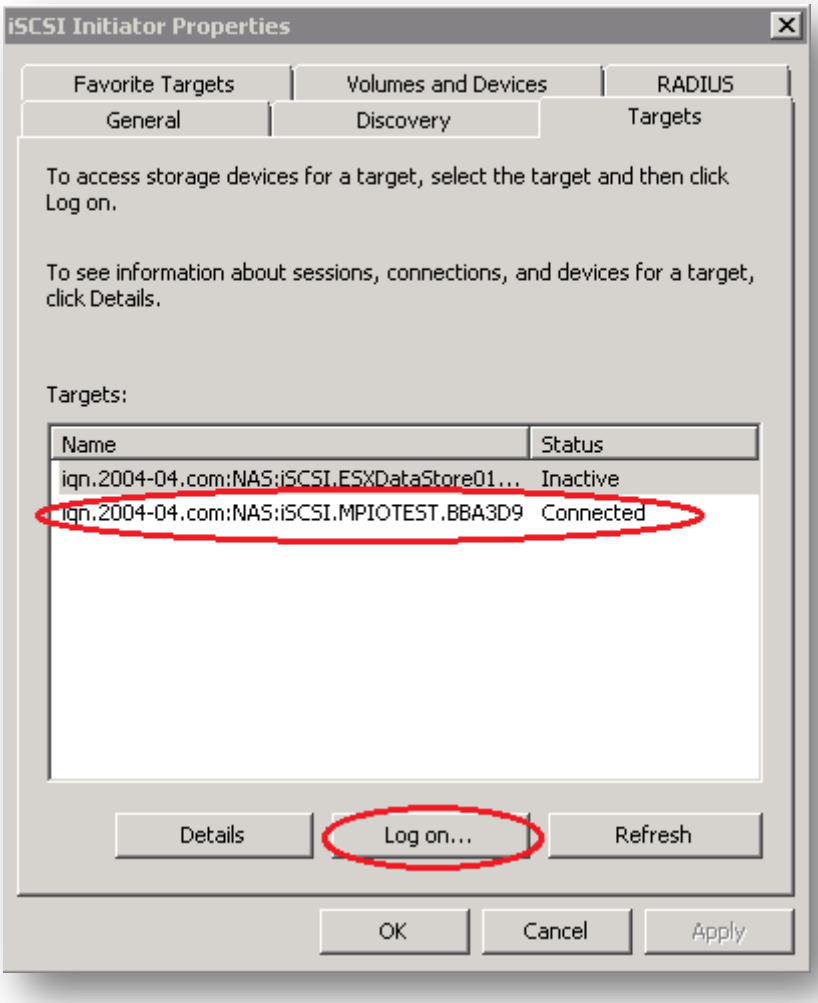
Once you have restarted, you can go back to the MPIO properties and see a new device.



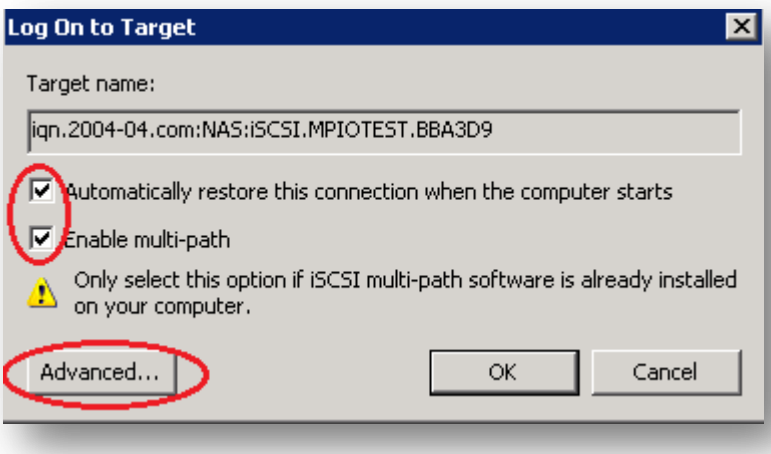
No action is necessary here; just click "OK" once you have seen the new device.

Connect the second path to your iSCSI target LUN.

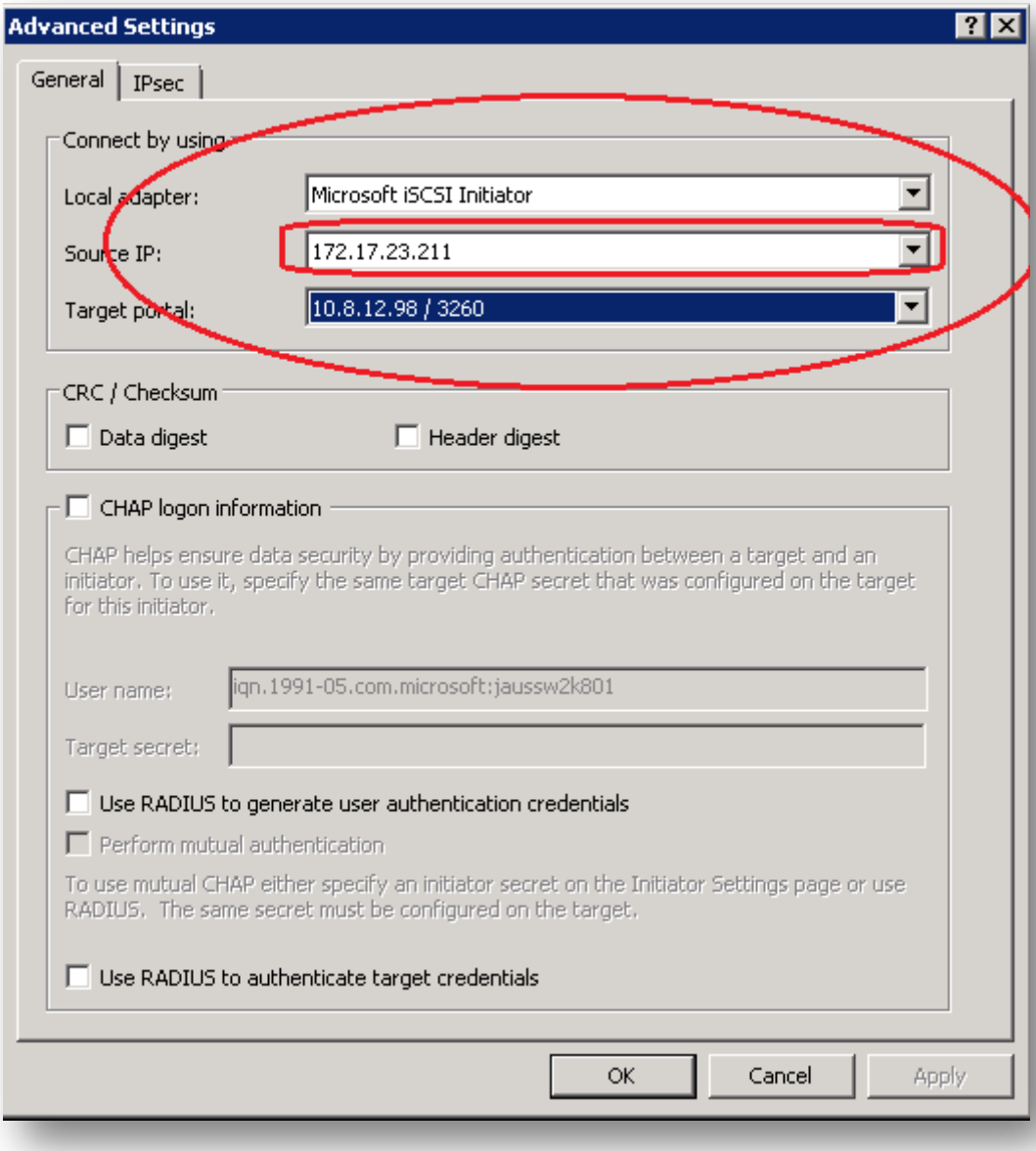
We will now connect the second path to our iSCSI target LUN.
You can open the iSCSI initiator from the administrative tools.
Go to the "Targets" tab.
Click "Log On" again, even if the target is already connected. *(Remember we have connected the target with 1 path before, and check "restore the connection on Windows startup".)*



Again:
- Check "Automatically restore this connection when computer starts" to make that iSCSI target LUN be connected at Windows startup.
- Check "Enable multi-path".
Click "Advanced..."



Add the specific target-initiator pair in the remaining iSCSI network:
- Choose Microsoft iSCSI Initiator
- Select your second IP address as the source IP
- Select your QNAP NAS portal



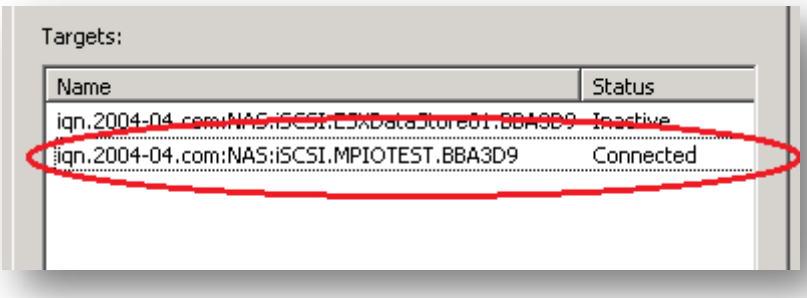
Click "OK".
Then click "OK" again.

Your iSCSI target is connected with MPIO with failover mode. If one of your network links fails, the connection will remain.

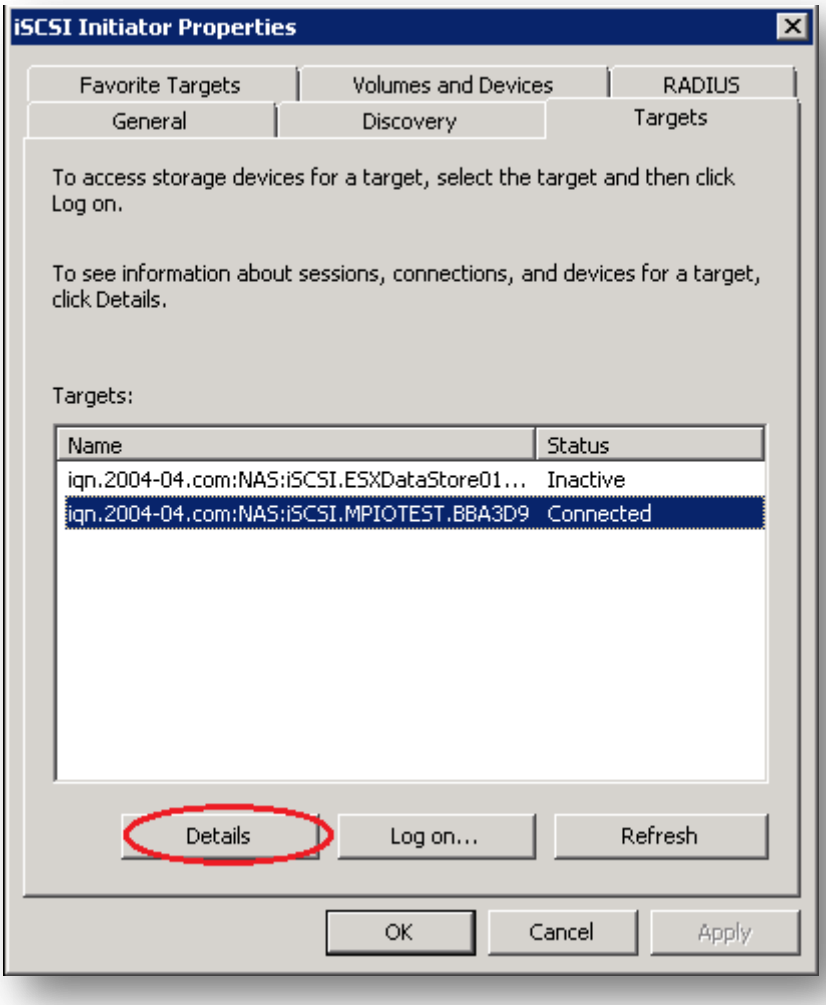
Check the settings

We are done, but we can verify if everything is ok:
- In the main iSCSI initiator panel, select your target LUN and click "Details". You will see your two connected sessions.

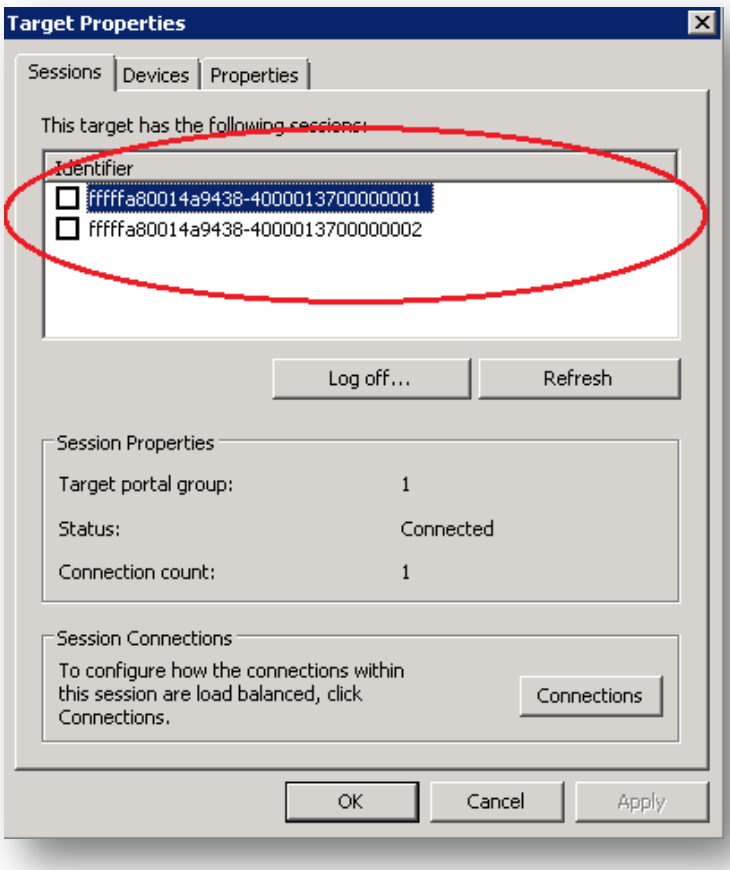
iSCSI initiator panel:
The LUN is connected:



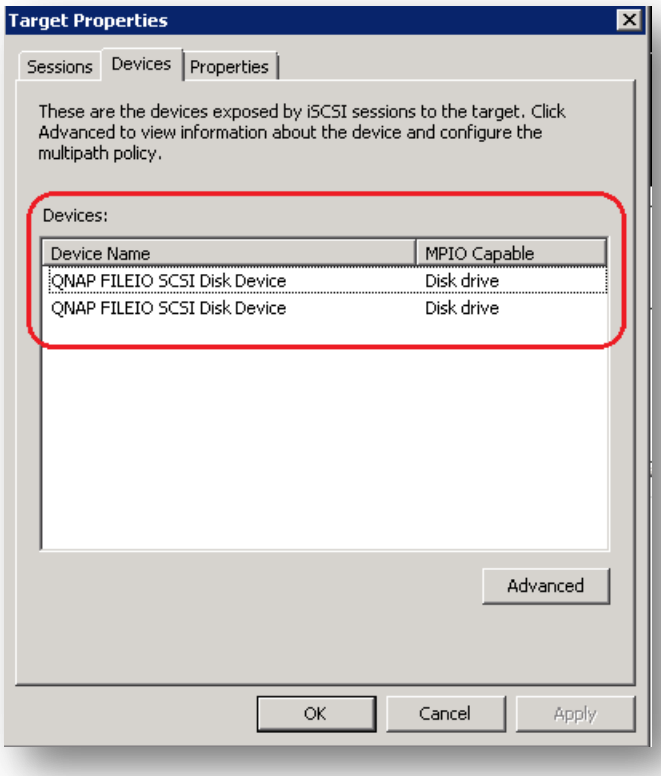
Click "Details".



You can see the 2 sessions (that have different path):



In the "Devices" tab, you can see 2 devices:

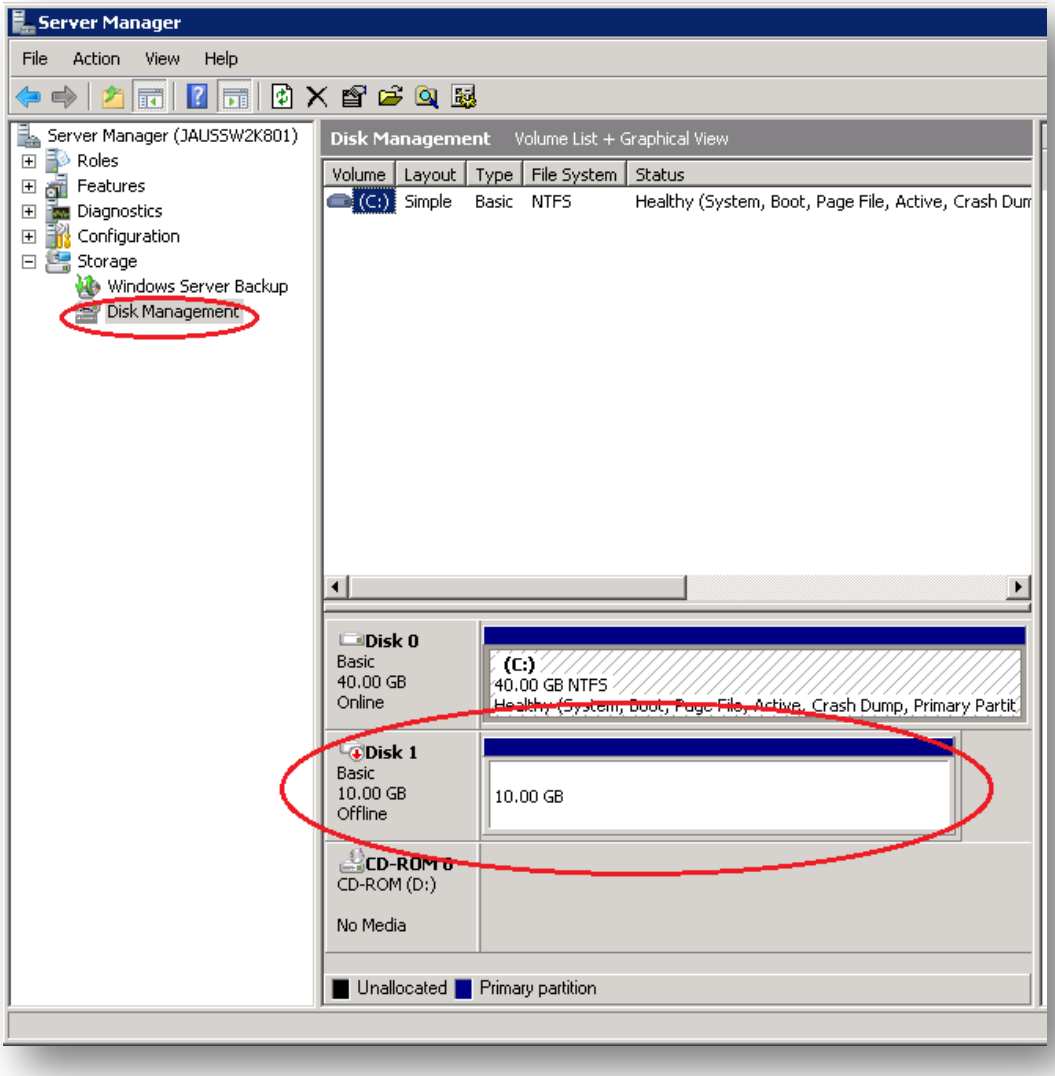


Note that the two devices will be handled by the MPIO layer to avoid the system to see 2 different disks. You will see only 1 disk in the disk management panel (see below).

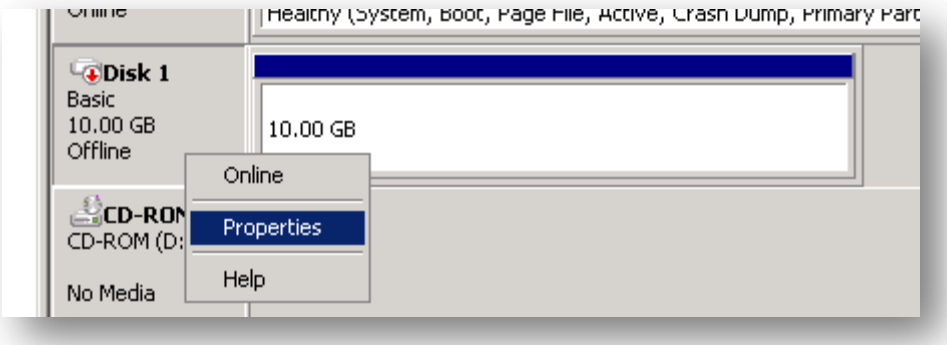
- You can also find those 2 connections by opening a command prompt window (cmd.exe) and using netstat.exe. We can see the 2 connections that you made by clicking 2 times on "logon":

```
C:\Users\Administrator>netstat -n

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    172.17.23.210:49164    10.8.12.98:3260        ESTABLISHED
  TCP    172.17.23.211:49165    10.8.12.98:3260        ESTABLISHED
  TCP    172.17.23.214:3389     10.8.12.35:56117       ESTABLISHED

C:\Users\Administrator>
```

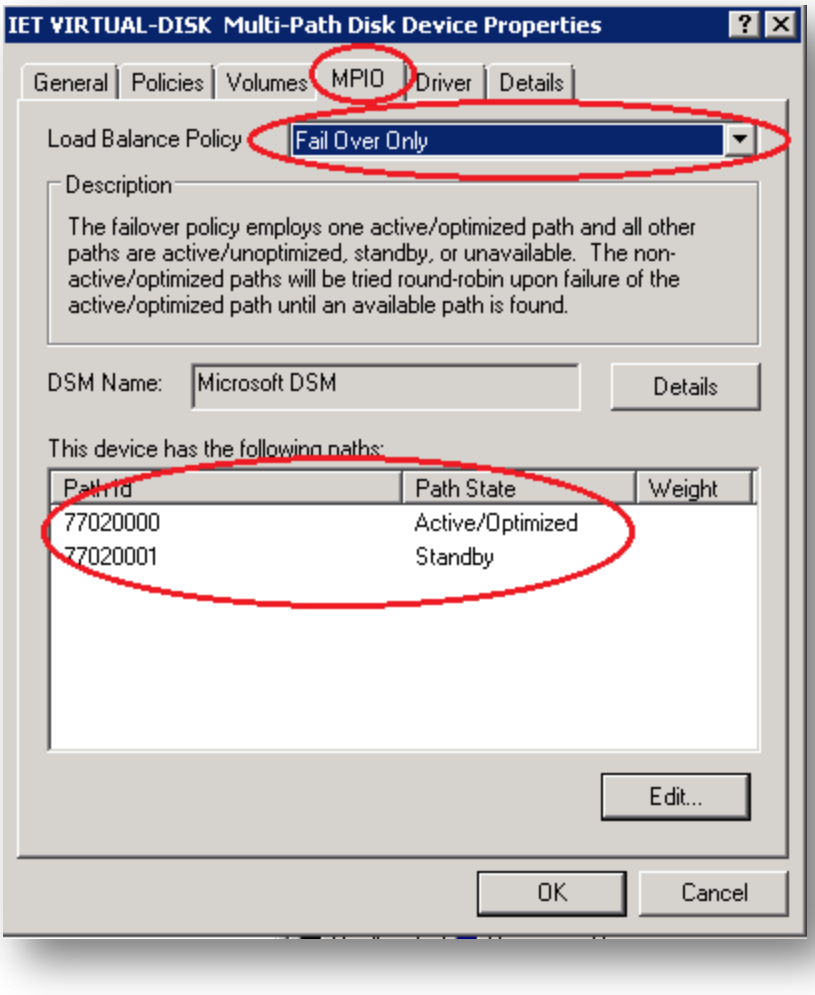
- In "Server Management" console, go to "Storage" > "Disk Management". You can configure the newly added disks as appropriate. You can check the properties of the disk. You can go to the MPIO tab and set the load balancing policy. By default failover is used.



Right click on the newly added disk and click “Properties”.

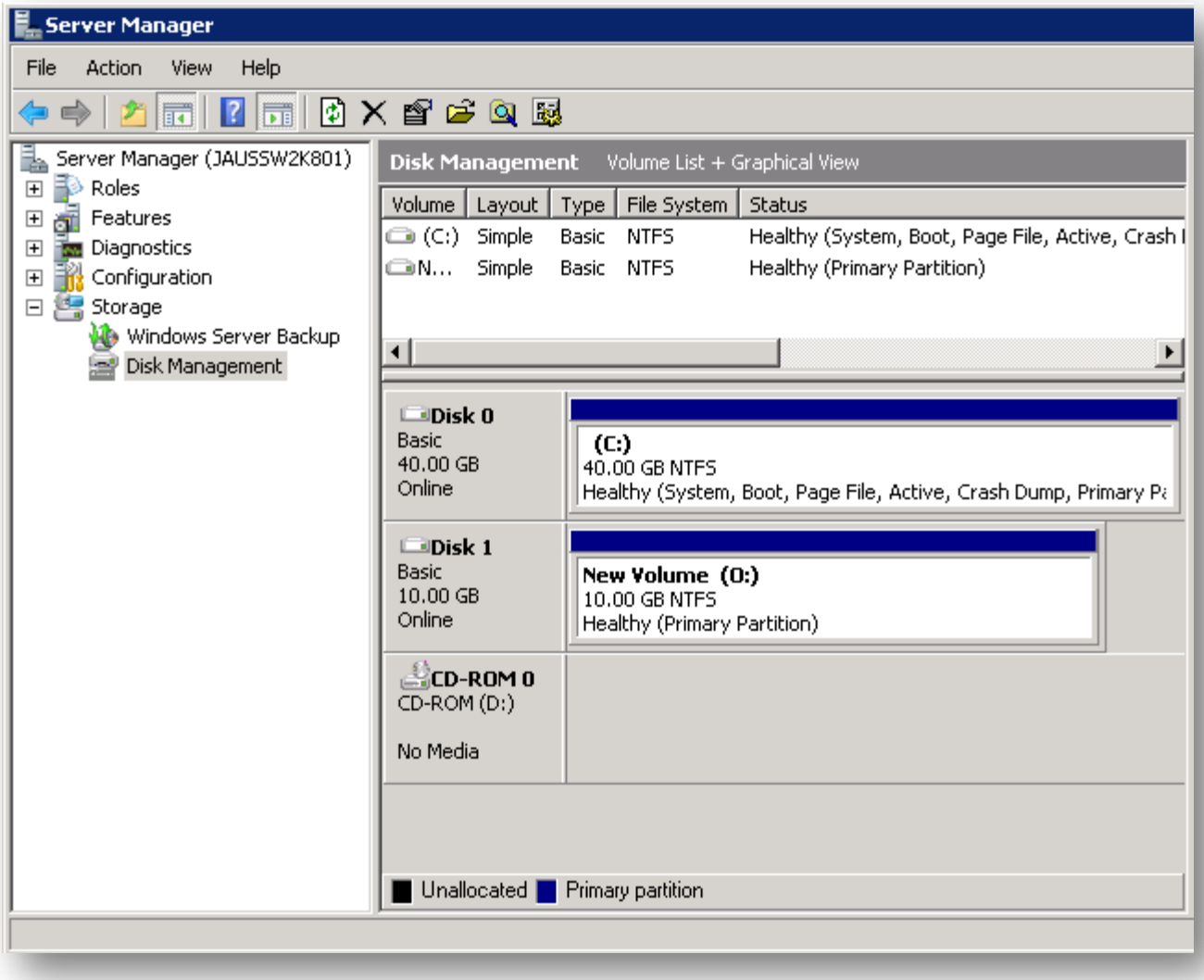


Go to the MPIO tab to see the settings:



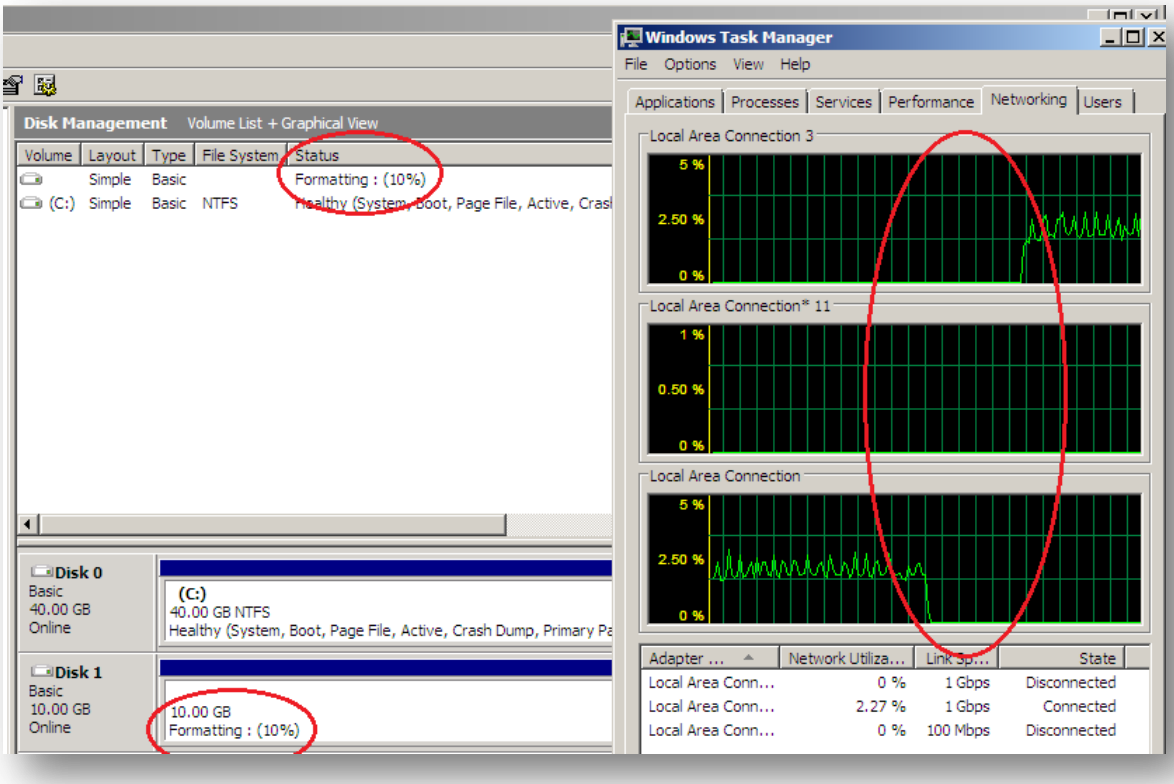
You will see the load balancing policy, which is failover by default.

You can now format the disk and use it.



Example of a failover

During the formatting of the disk, one of the network cables has been disconnected. The system started to use the second path after a few seconds:



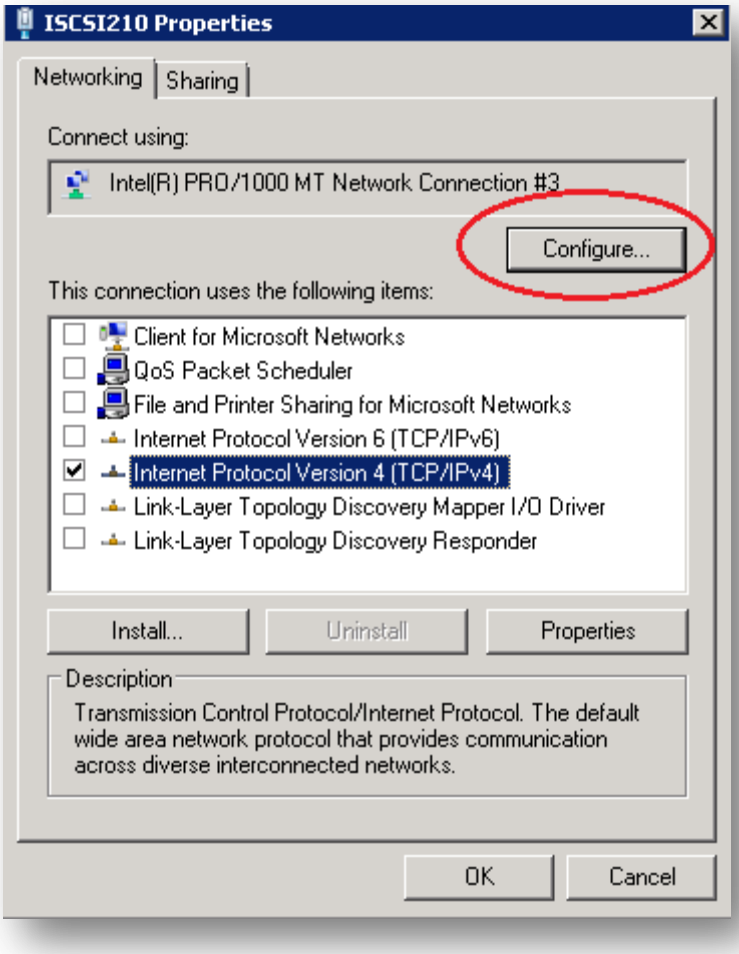
Advices

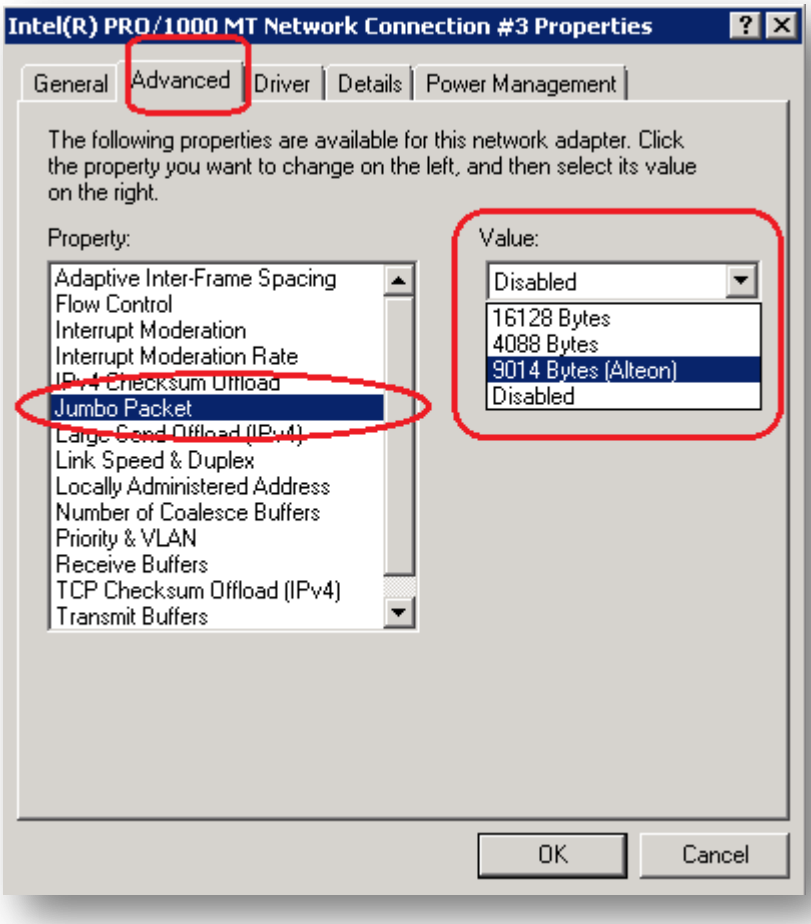
According to *Microsoft iSCSI Software Initiator Version 2.X Users Guide*, you can enable Jumbo Frame (jumbo packet) on all your equipment to enhance performance.

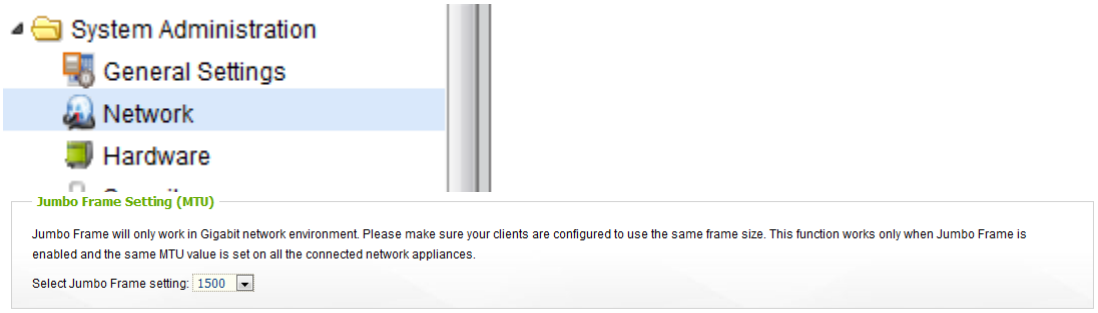
> *"if Jumbo Frames if supported in your network infrastructure. Jumbo Frames can be used to allow more data to be transferred with each Ethernet transaction and reduce the number of frames. This larger frame size reduces the overhead on both your servers and iSCSI targets. For end to end support, each device in the network needs to support Jumbo frames including the NIC and Ethernet switches."*

(Beware that Jumbo Frame are available on TS-119 TS-219 TS-219P TS-410 TS-419P TS-419U TS-239 Pro SS-439 Pro TS-439 Pro TS-439U-SP/RP TS-639 Pro SS-839 Pro. Refer to: http://www.QNAP.com/images/products/comparison/Comparison_NAS.html)

On your Windows 2008 server, configure your network interface properties







You can also unbind unnecessary protocols from your iSCSI NICs

This has to be done only on DEDICATED network interfaces that are used only for iSCSI!

- Clear the checkbox for "Client for Microsoft Networks"
- Clear the checkbox for "QoS Packet Scheduler"
- Clear the checkbox for "File and Printer Sharing for Microsoft Networks"
- Clear the checkboxes for the "Link-Layer Topology" options
- Clear the checkbox for "Register this connection's address in DNS"
- Clear the checkbox for "Enable LMHOSTS Lookup"
- Select the radio button for "Disable NetBIOS over TCP/IP"