# Use MPIO with QNAP Turbo NAS

# How to connect to your QNAP Turbo NAS from Windows Server 2012 using MPIO

QNAP provides you with what others cannot!

In addition to the other available features on your Turbo NAS, MPIO (Multipath Input Output) enables you to have multiple paths to reach an iSCSI target. Please note that only x86-based Turbo NAS support MPIO.

Benefits of using MPIO on a Turbo NAS:
- Ensures failover. It will avoid downtime n the event of network problems (faulty cable, switch power unit malfunction) with every application remaining online.
- It can provide load balancing. Whenever a large transfer occurs, it can use different switches to avoid the possibility of overloading a switch.
- It is supported by many third-party applications.

In this application note, we will set a standard failover multipath I/O to access your favorite Turbo NAS from Windows Server 2012.

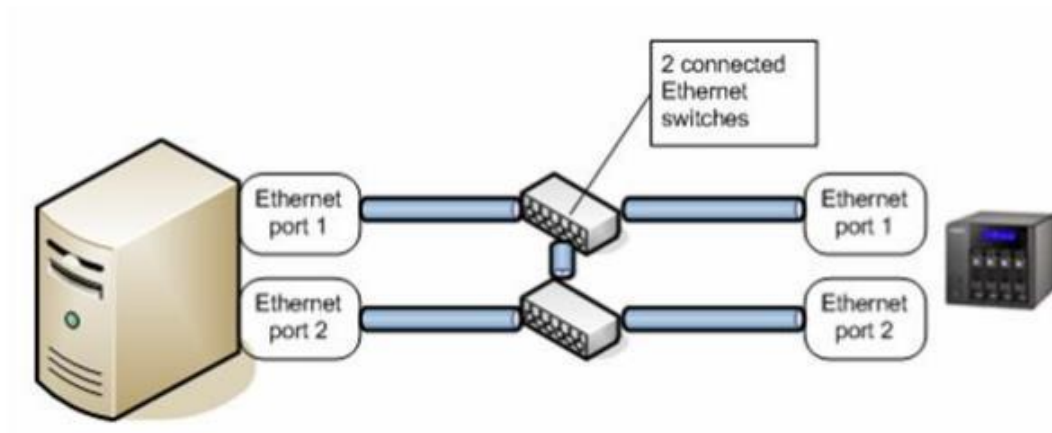Before getting started, please note:
- DO NOT use NIC Teaming on the server: NIC Teaming used with iSCSI is not supported by Microsoft.
- DO NOT use MCS and MPIO together to connect a target. Microsoft does not support that configuration: "*Although it is technically possible to layer Microsoft MPIO 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](http://download.microsoft.com/download/A/E/9/AE91DEA1-66D9-417C-ADE4-92D824B871AF/uGuide.doc)

# Abstract

MPIO is useful when both your Turbo 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 broken cable or switch failure.

![QNAP logo]

**Logical network architecture**

On Windows Server 2012, you will need 2 network cards with 2 different IP addresses. On the Turbo NAS, you can enable the trunking mode to allow network failover (port trunking is enabled by default on Turbo NAS).
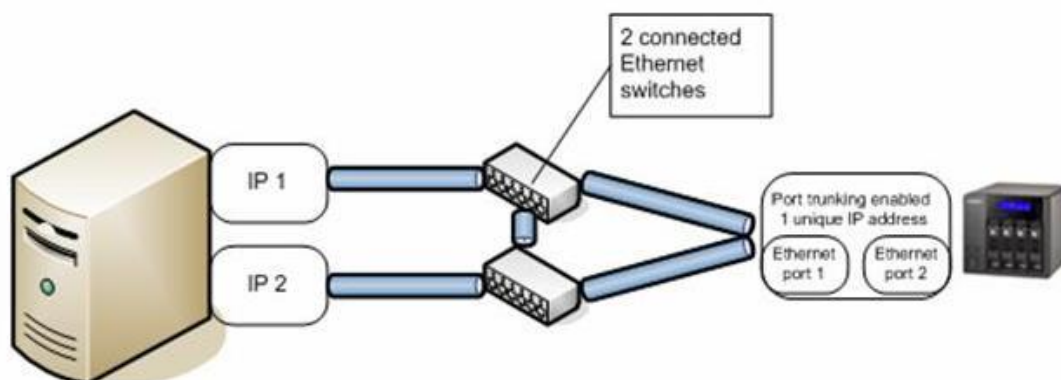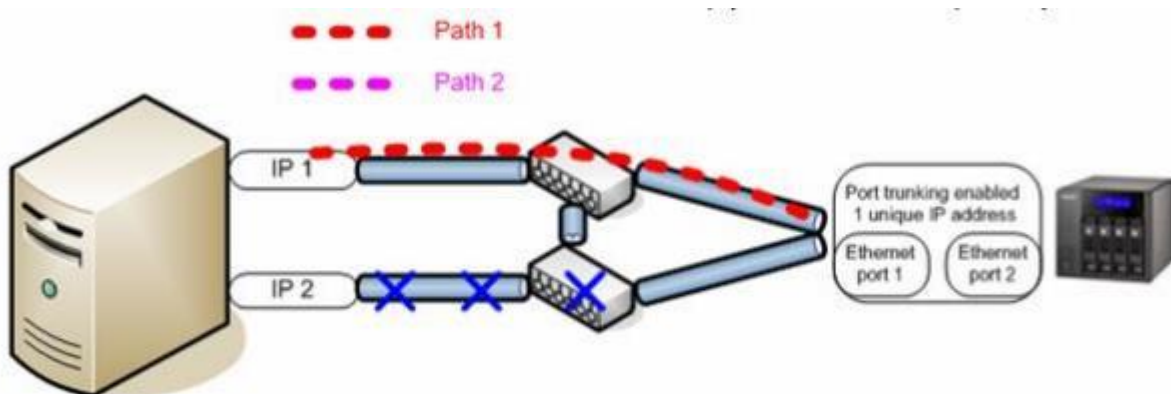


Here are the 2 logical paths that Windows Server 2012 will use:

## Different failures and failover
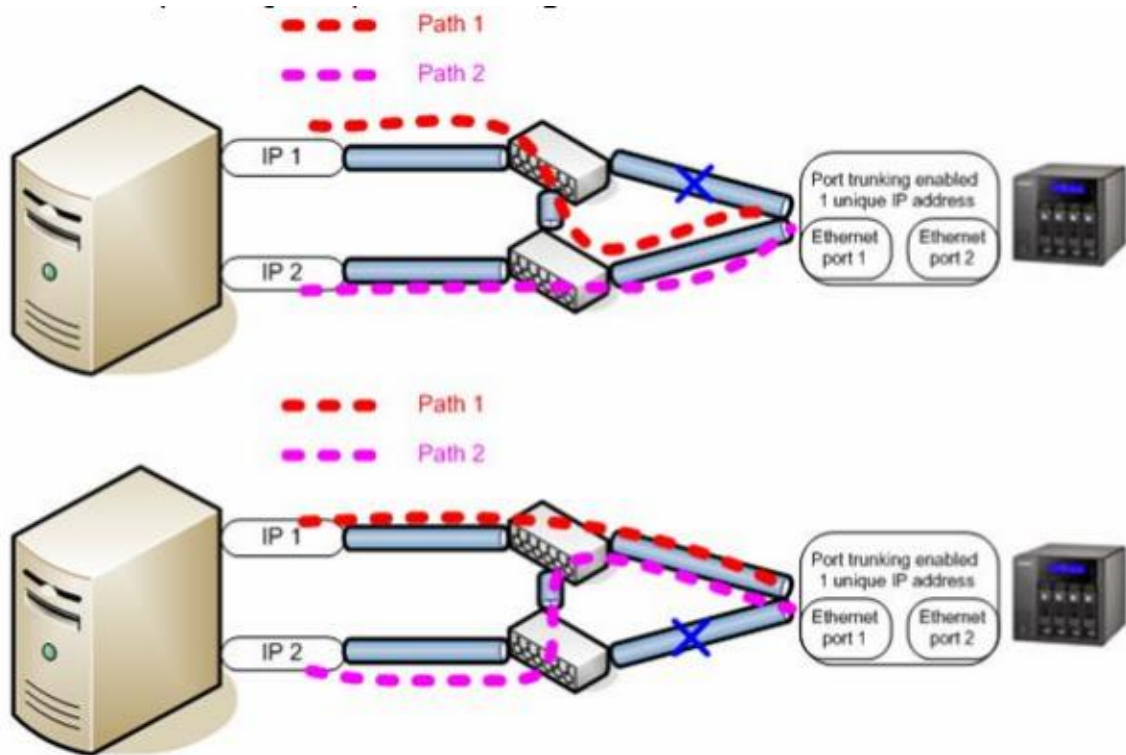
Handled by MPIO feature
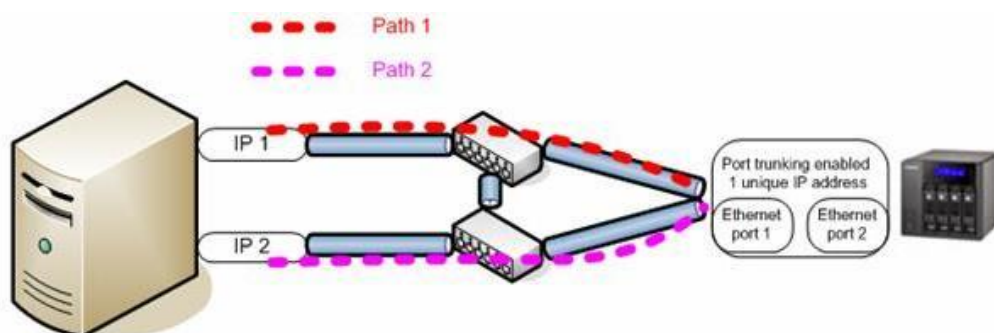
If the cable or the switch linked to IP1 fails, path 1 will fail, but path 2 will remain up:
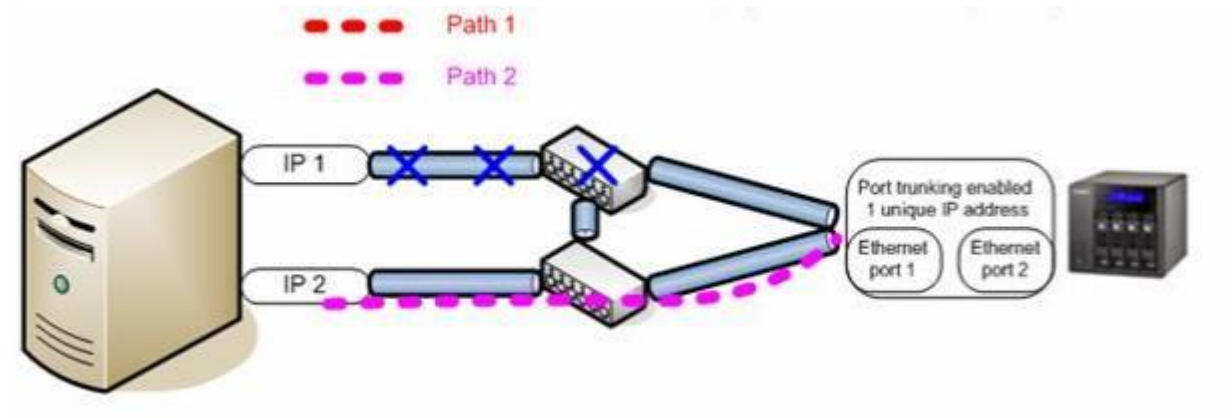


If the cable or the switch linked to IP2 fails, path 2 will fail, but path 1 will remain up:

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

- Have at least 2 network interfaces, with different IP addresses on Windows Server 2012.
- Have Multipath I/O feature enabled.
- Have Multipath enabled on iSCSI devices.
- Have an existing iSCSI target created on the Turbo NAS.
- To allow full network failover, have the trunking mode enabled on the Turbo NAS.
- You MUST be running firmware version 3.2.2 (or above) on your Turbo NAS.

**Set up**

## Set up an iSCSI target on your Turbo NAS

You can refer the online application note " How to create and use the iSCSI target service on the QNAP NAS" on http://www.qnap.com/i/en/trade_teach/
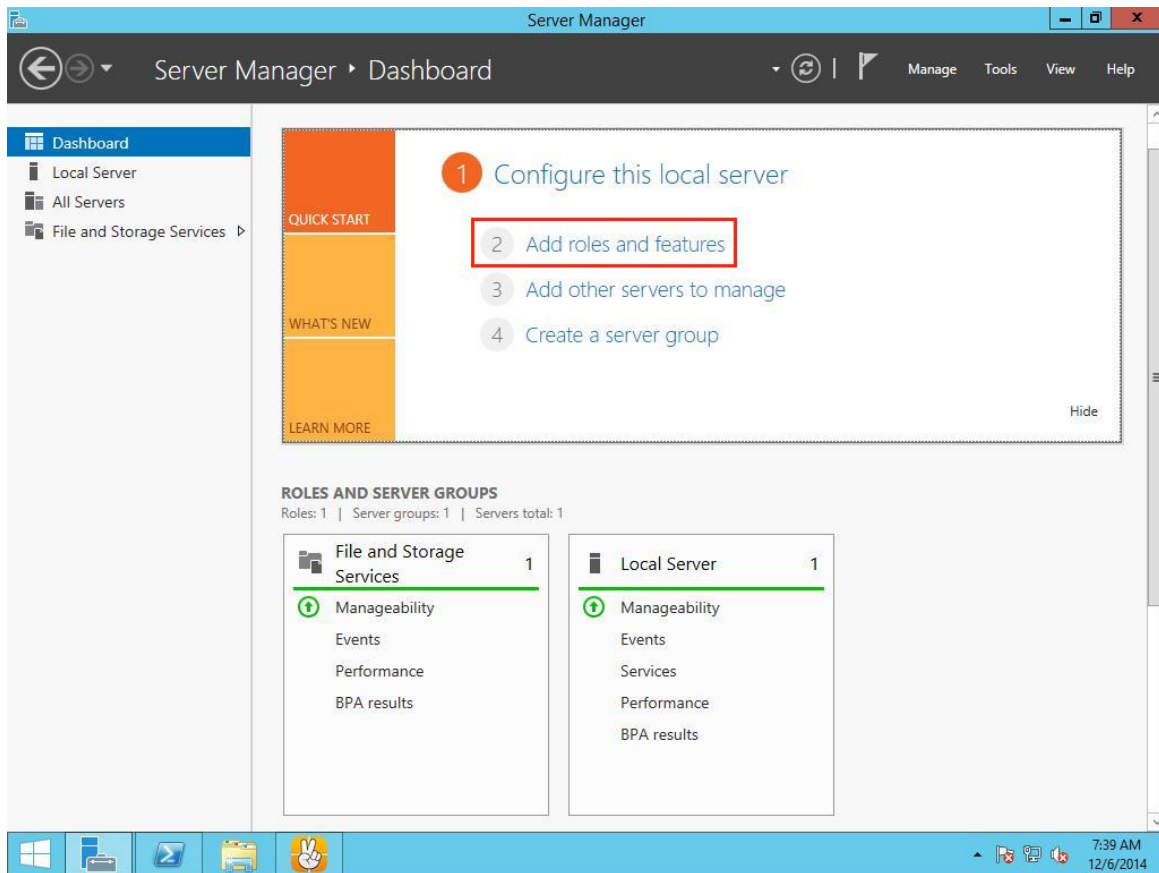
## Enable Multipath feature in Windows Server 2012

First, ensure that MPIO is enabled on Windows Server 2012.
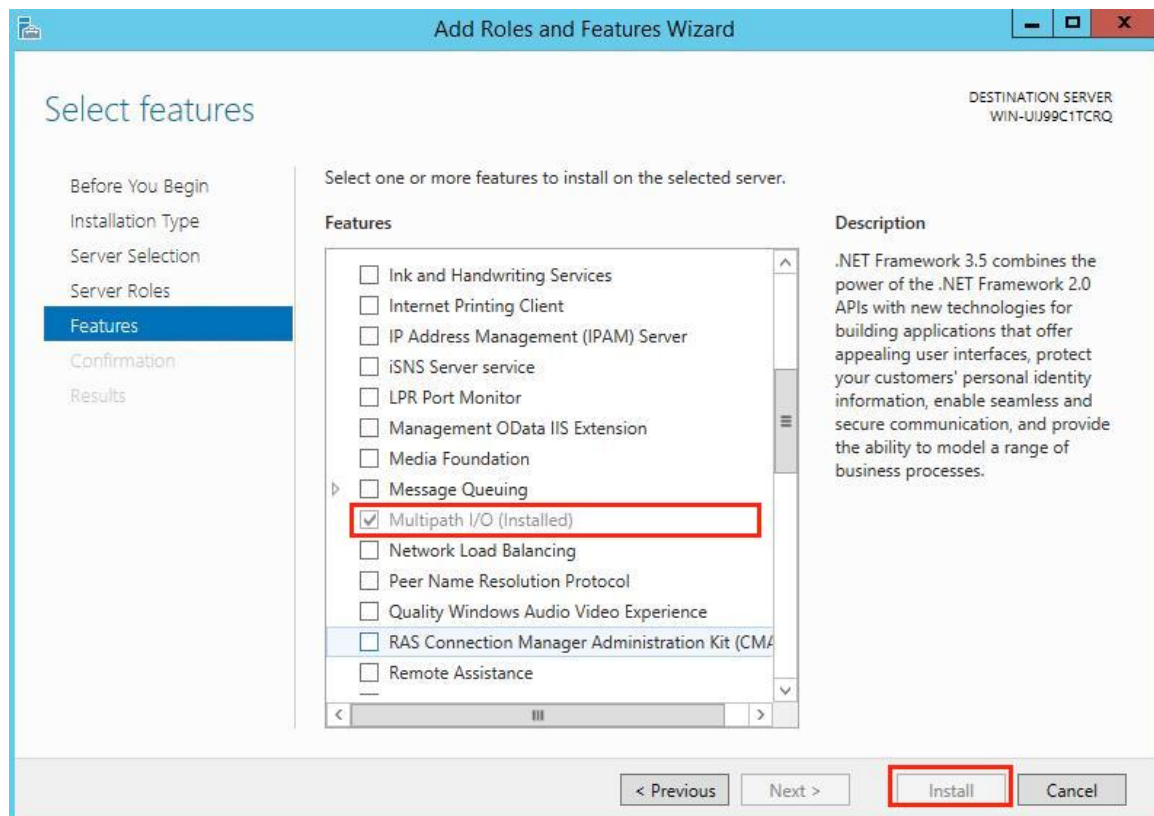Go to the "Server Manager" panel, "Tools" and check if Multipath I/O is enabled.



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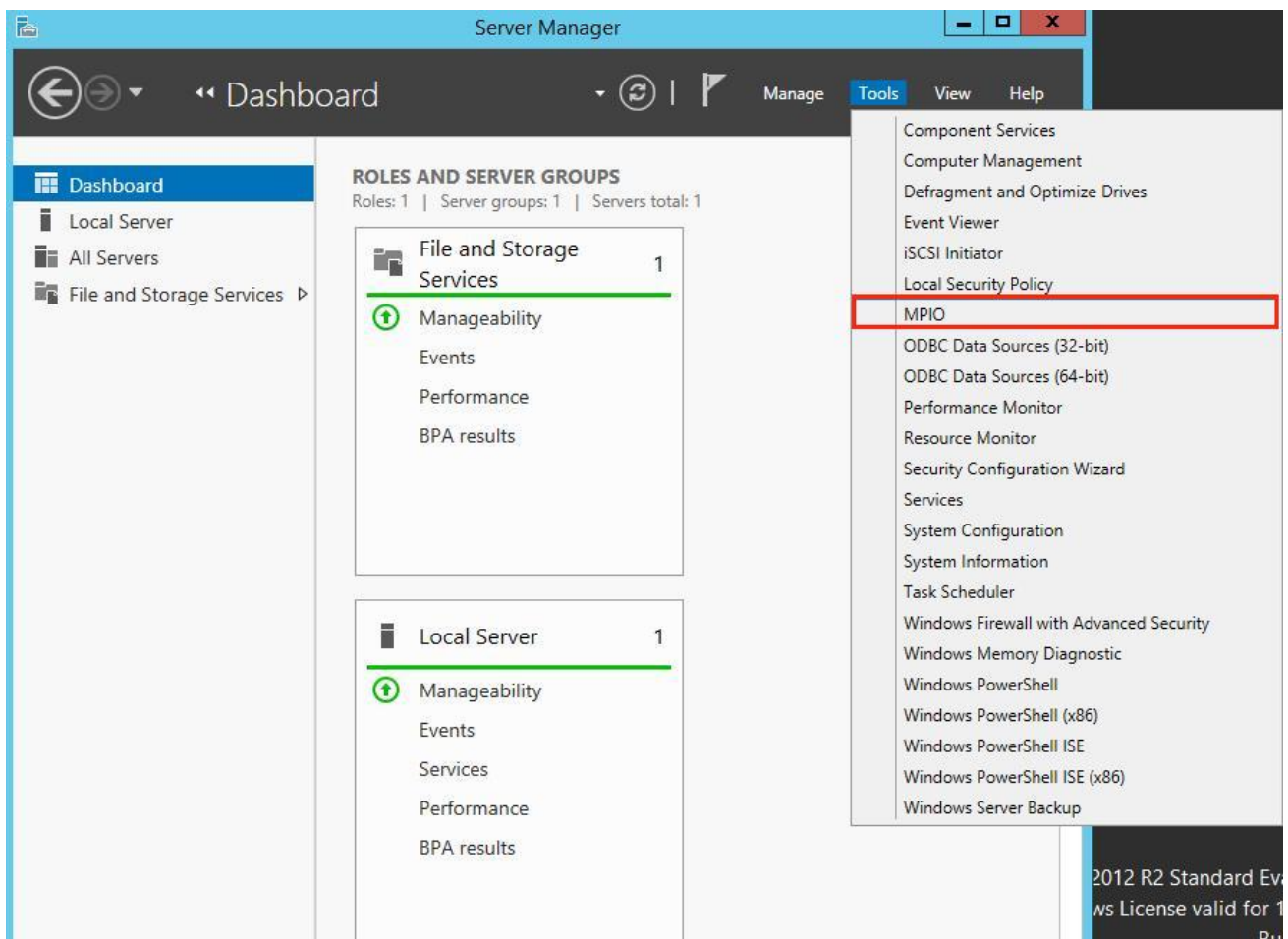
If Multipath I/O is not enabled, you can add it by using "Add roles and features"
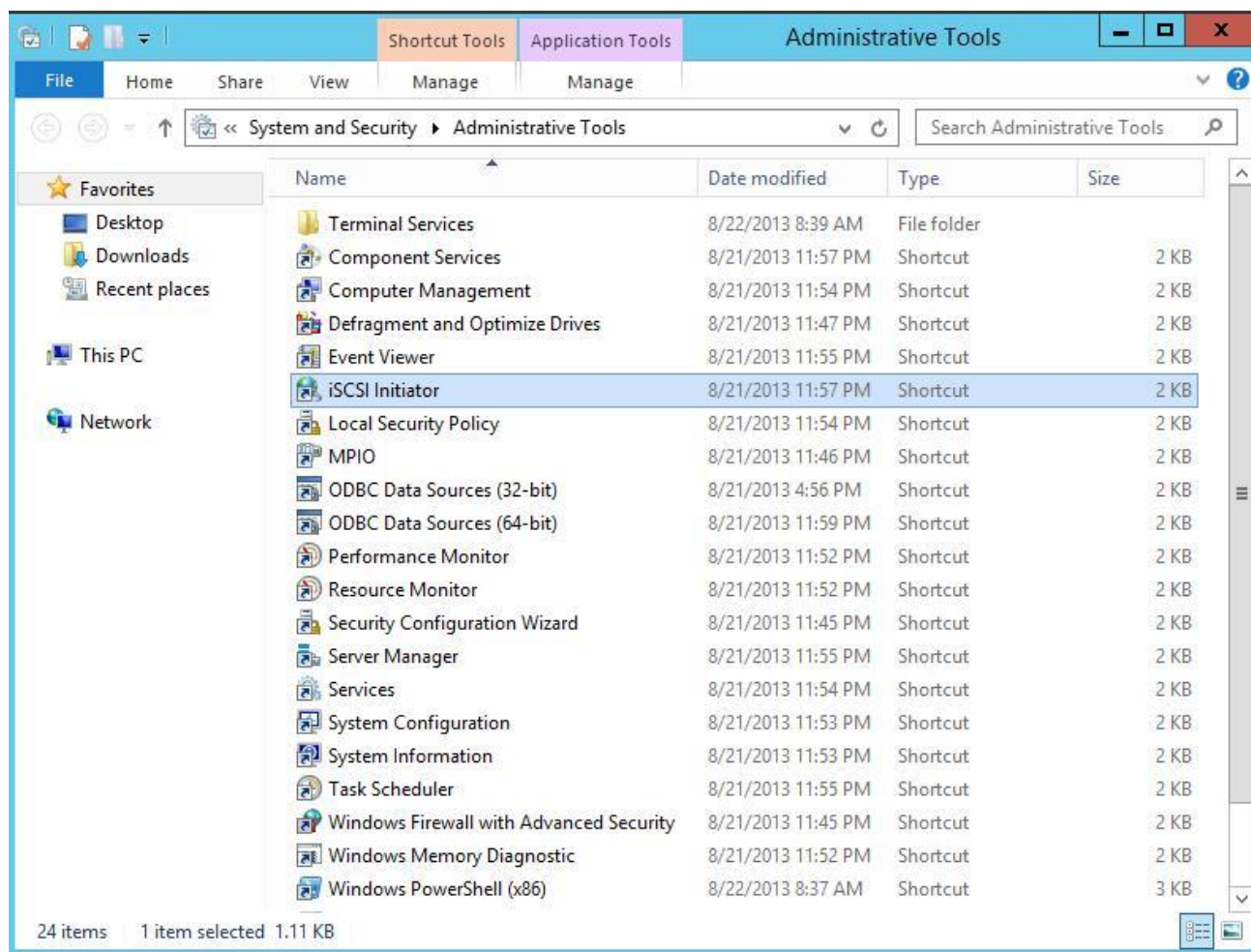


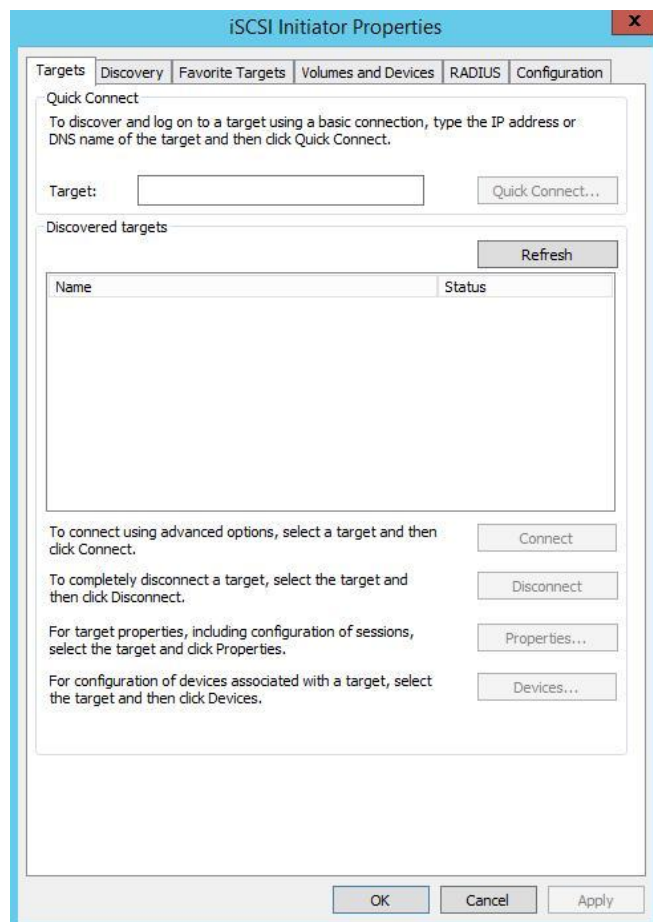Choose the checkbox "Multipath I/O", and then click "install".



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Once MPIO (Multipath I/O) is enabled, you can add an iSCSI LUN with MPIO support, for ONLY one of your network card:
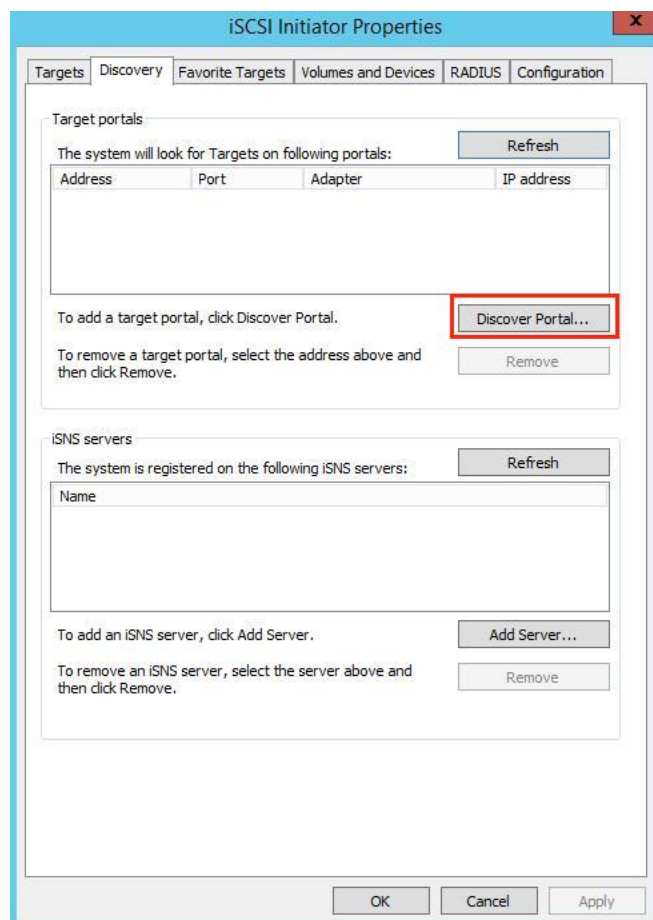
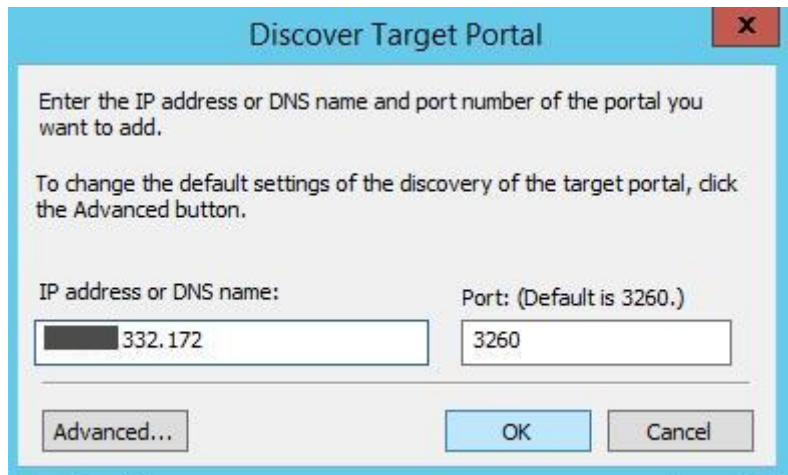From the Administrative Tools, launch the iSCSI Initiator:

You will open a new
window and you will
be able to connect to the
first path to your iSCSI
target LUN.



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

Enter the IP address or
DNS name of your Turbo NAS



Click "OK".
Return to the initiator
window; go to the
"Targets" tab, and you
will see all the targets
on your Turbo NAS.

Select the target you want
to connect to, and then
click "Connect"
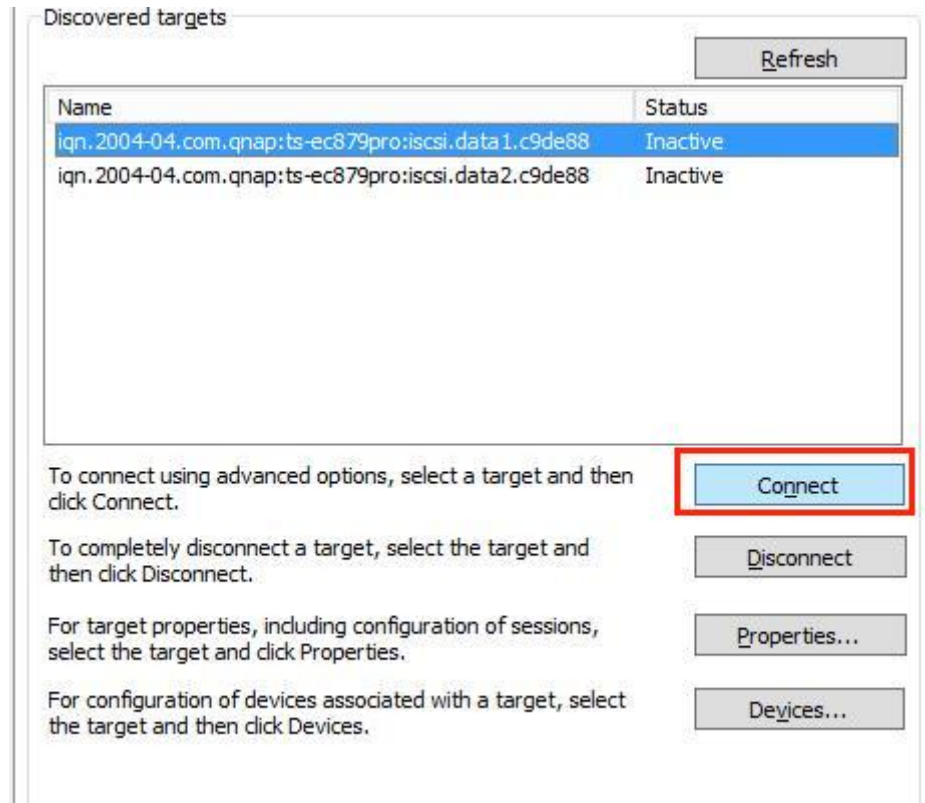
In the new window, check
"Add this connection to the
list of Favorite Targets " to
make that iSCSI target LUN
to be connected at Windows
startup.

Check "Enable multi-path"
Then click "Advanced... "
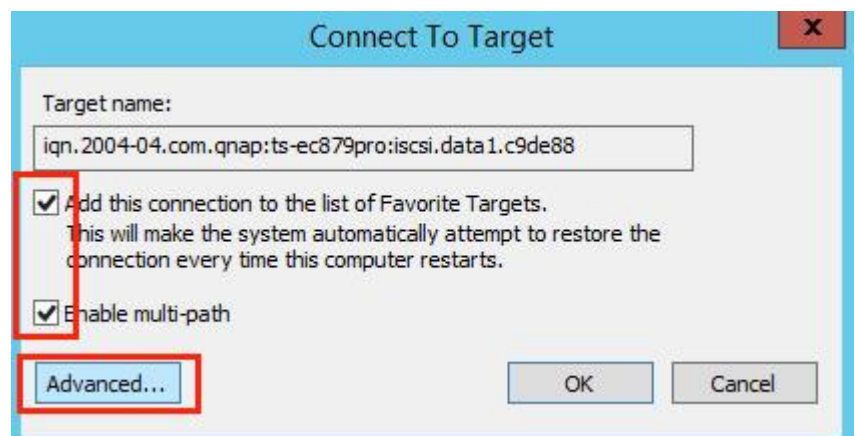
In the Advanced Settings you can add a specific target initiator pair in one of the
iSCSI networks ONLY by choosing the initiator IP (first IP address, 172.17.32.121 for example) and target portal IP. We will add the remaining iSCSI path once MPIO is configured (http://technet.microsoft.com/enus/library/dd834763.aspx. We need at least one iSCSI connection to enable Multipath on iSCSI devices.)

Click "OK".
Then click "OK" again.
You can see if your iSCSI target LUN is 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:



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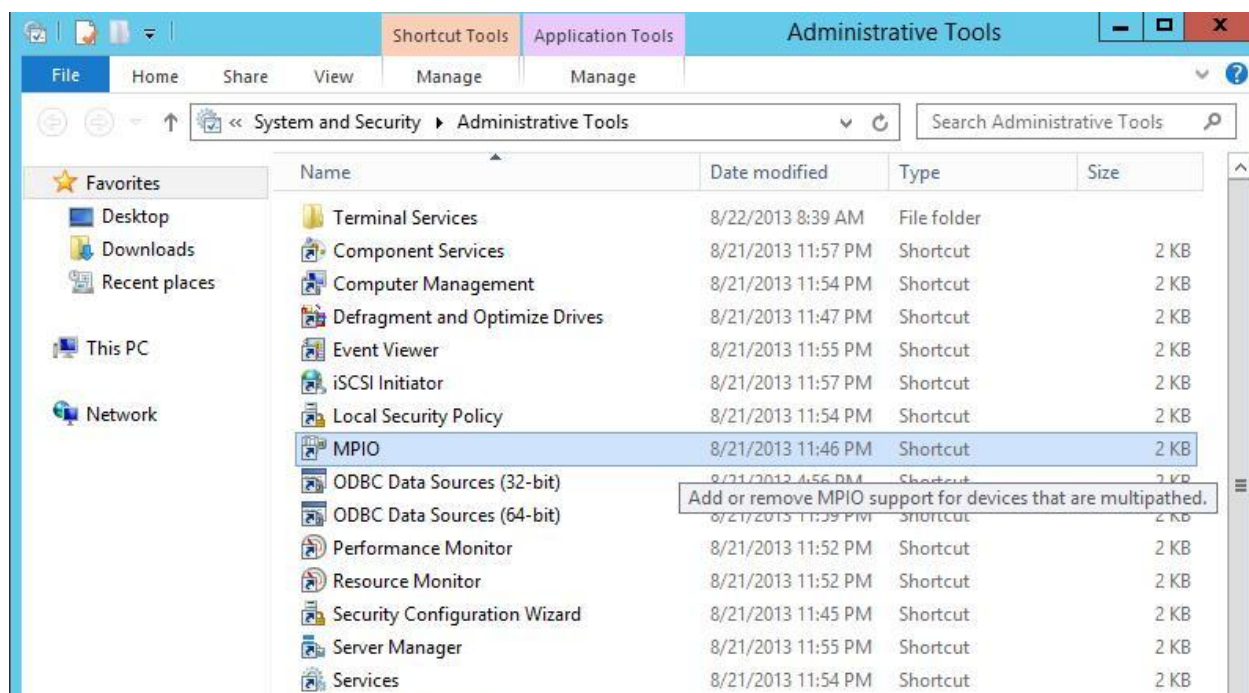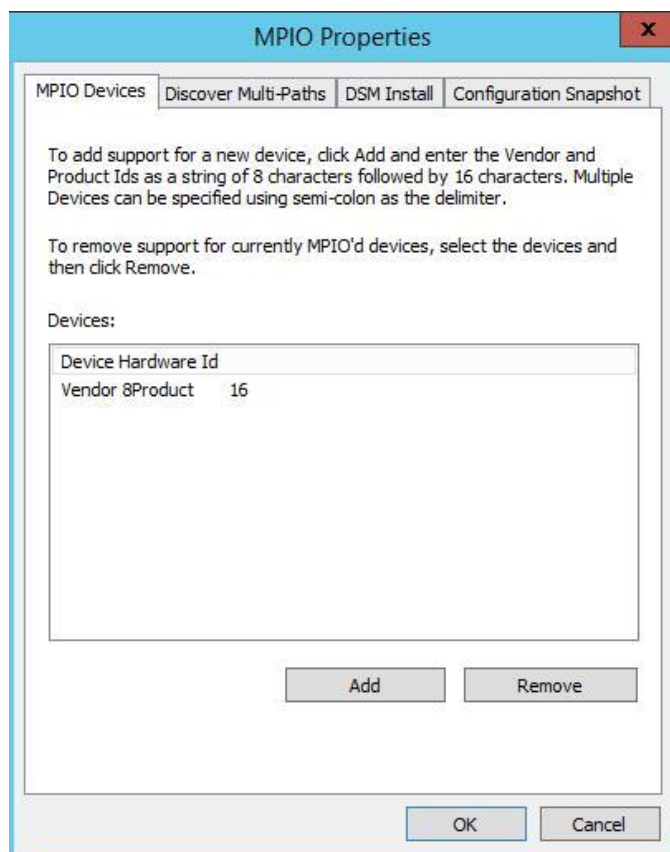
We are going to add multipath
support for iSCSI devices.
Change to the
"Discover Multi-paths" tab.
Then check "add support for
iSCSI devices" and click
"Add" (you must connect
to the iSCSI device otherwise this
part will be grayed out)
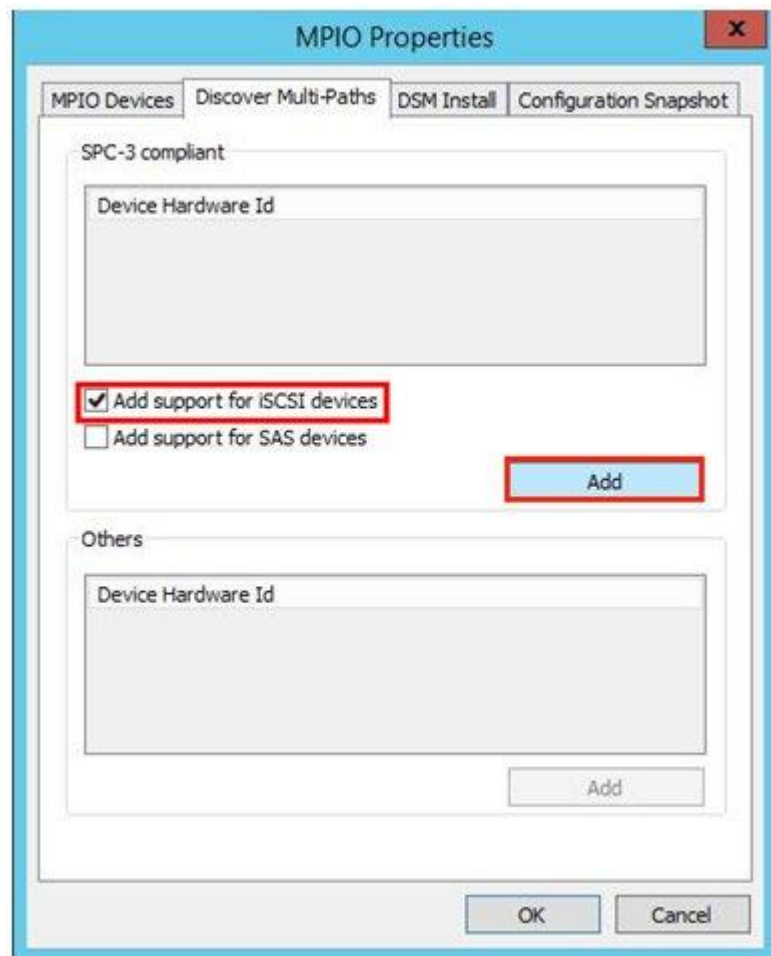
Click "Yes "to restart Windows.
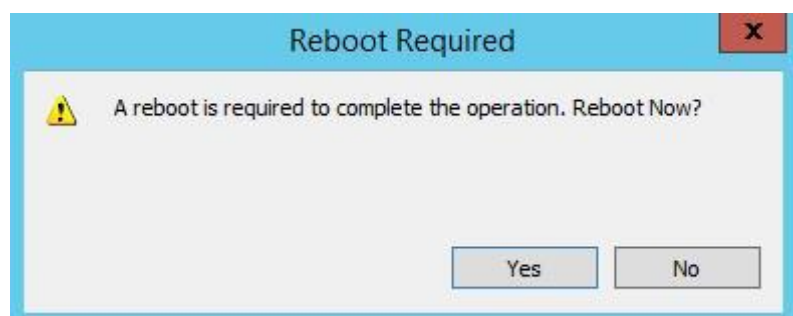
Once you have restarted,
you can go back to the MPIO
properties and see a new device.

No action is necessary here; just
click "OK" once you see the new
device



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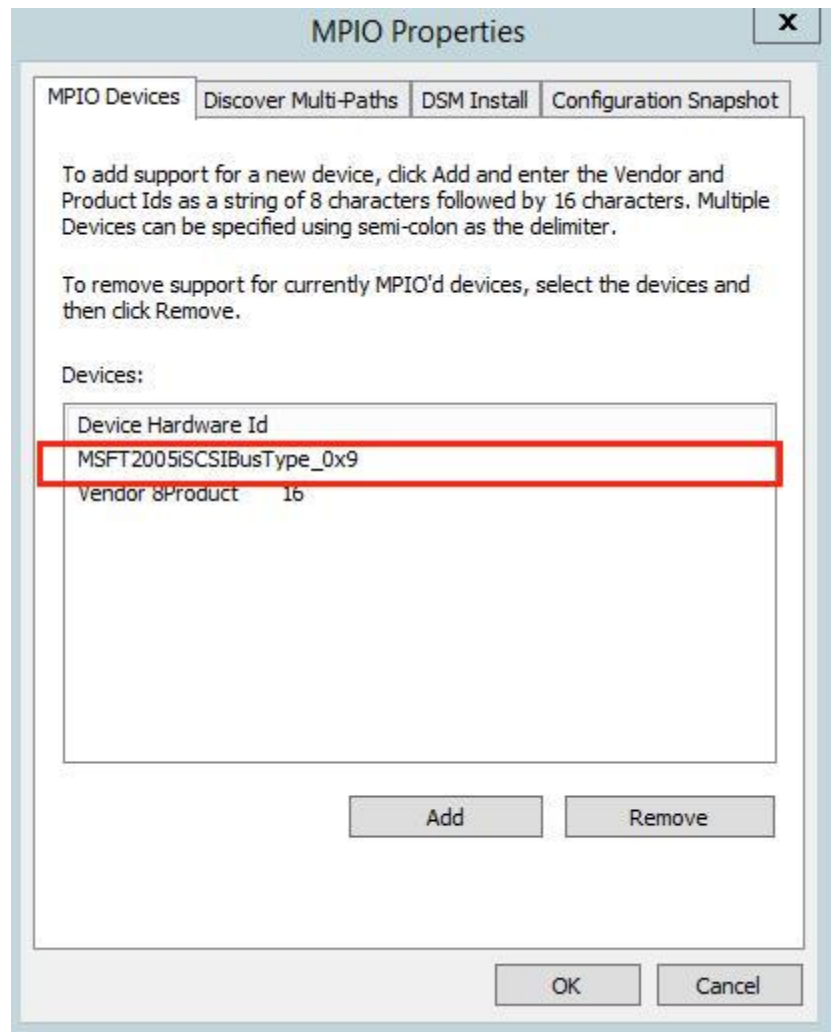
Connect the second path to iSCSI target LUN.

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 "Connect" again, even if the target is already connected. (Remember we have previously connected the target with 1 path)
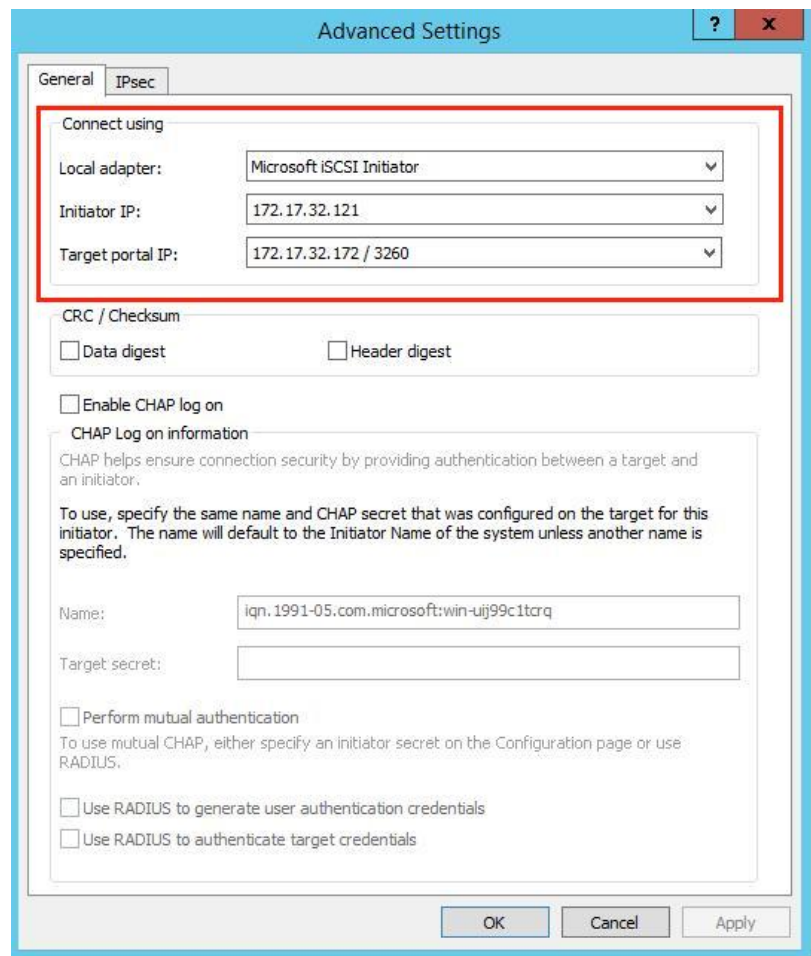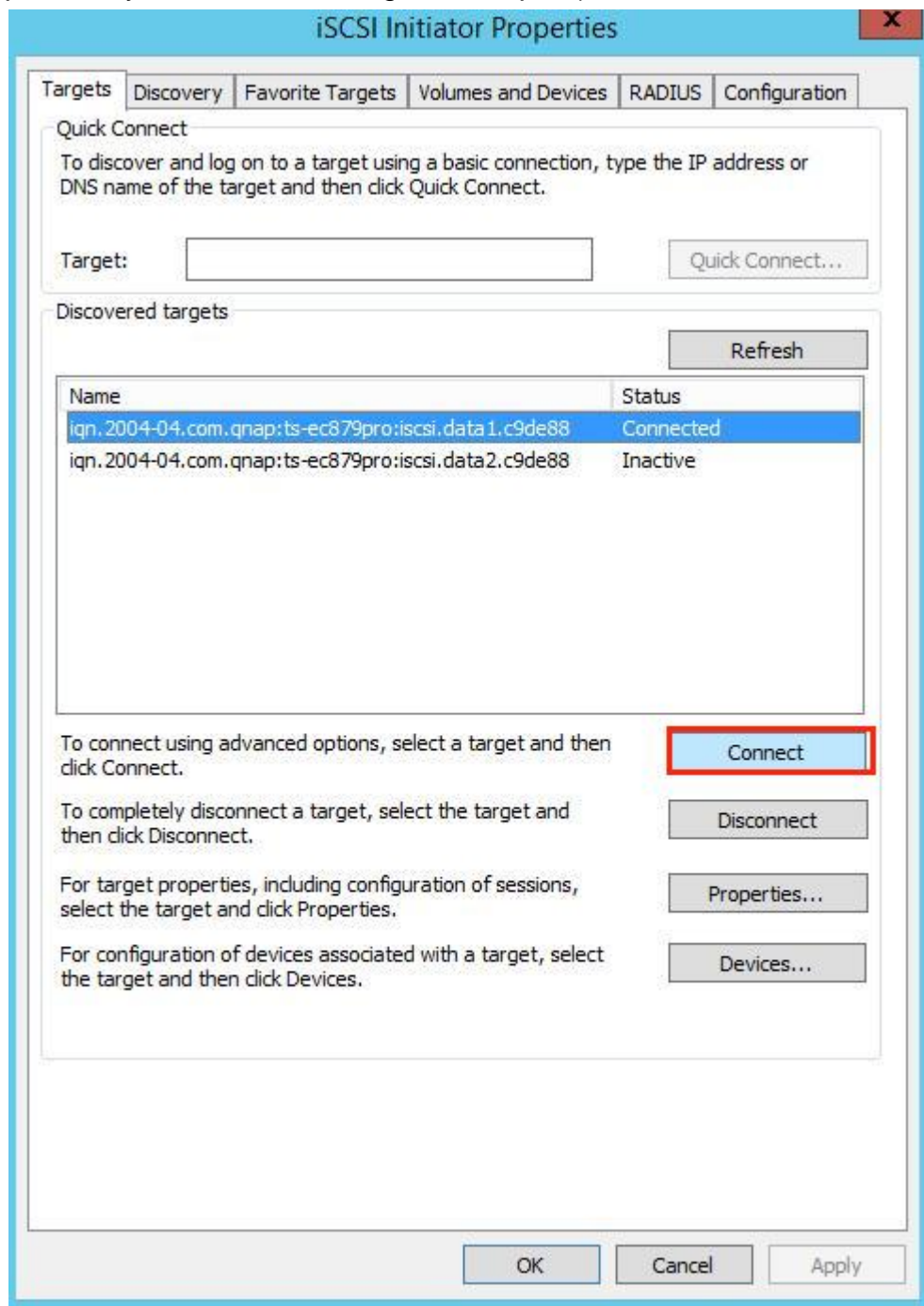
Again:
- Check "Add this connection to the list of Favorite Targets connection" to make that iSCSI target LUN be connected at Windows startup.
- Check "Enable multipath".
Click "Advanced..."
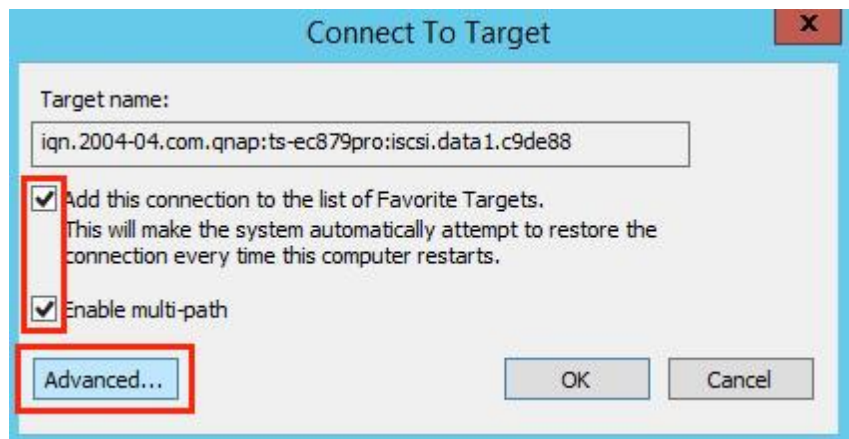
Add the specific target-initiator pair in the remaining iSCSI network:
- Choose Microsoft iSCSI Initiator
- Select your second IP address as the source IP (Second IP: 172.17.32.126)
- Select your Turbo NAS portal
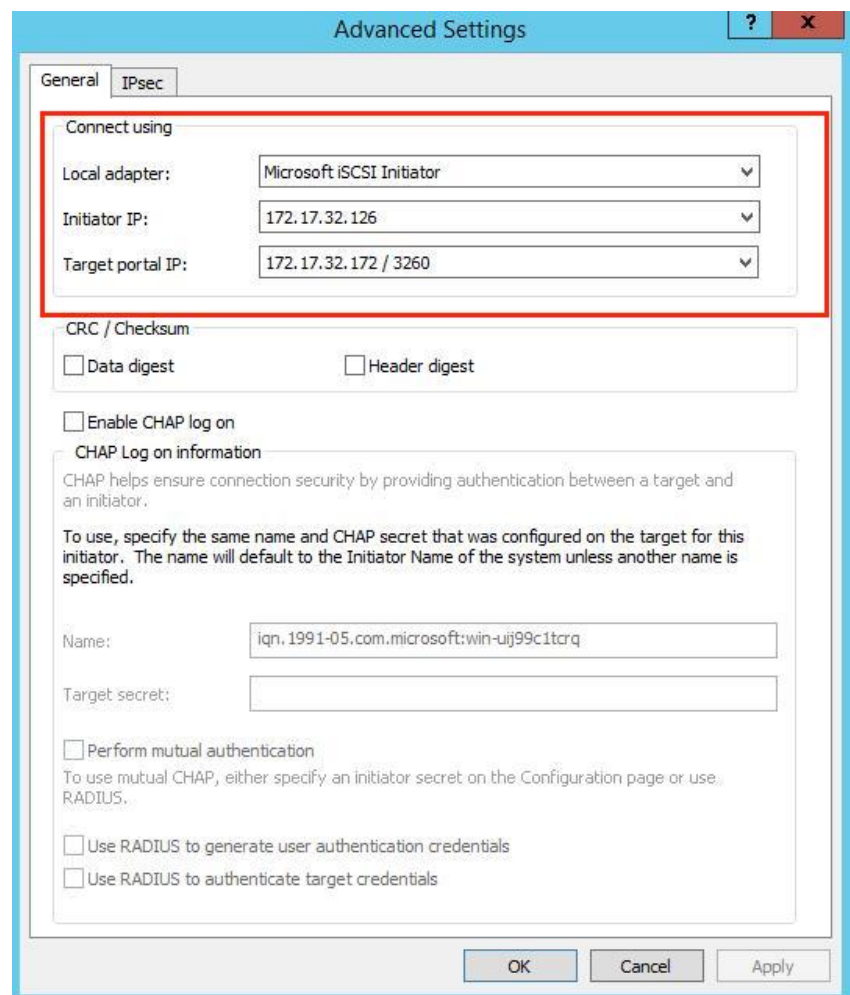
Click "OK".
Then click "OK" again.
Your iSCSI target is connected with MPIO with failover. If one of your network links fails, the connection will remain.

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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.



Click "Properties…"



nc.
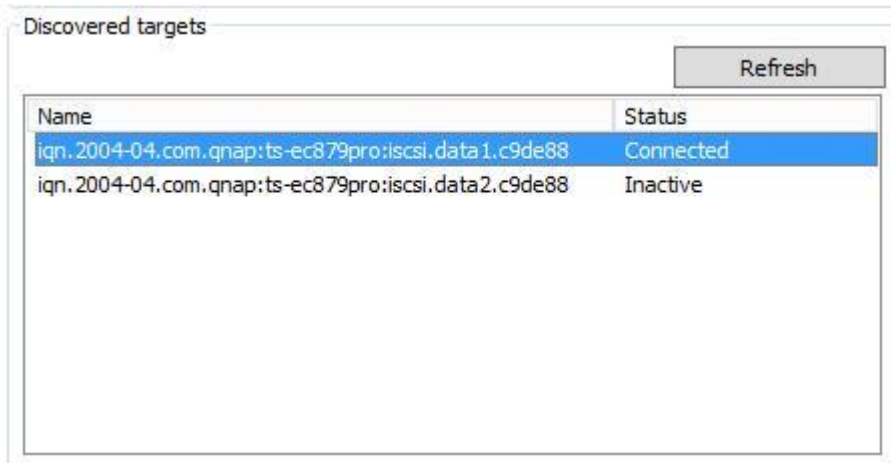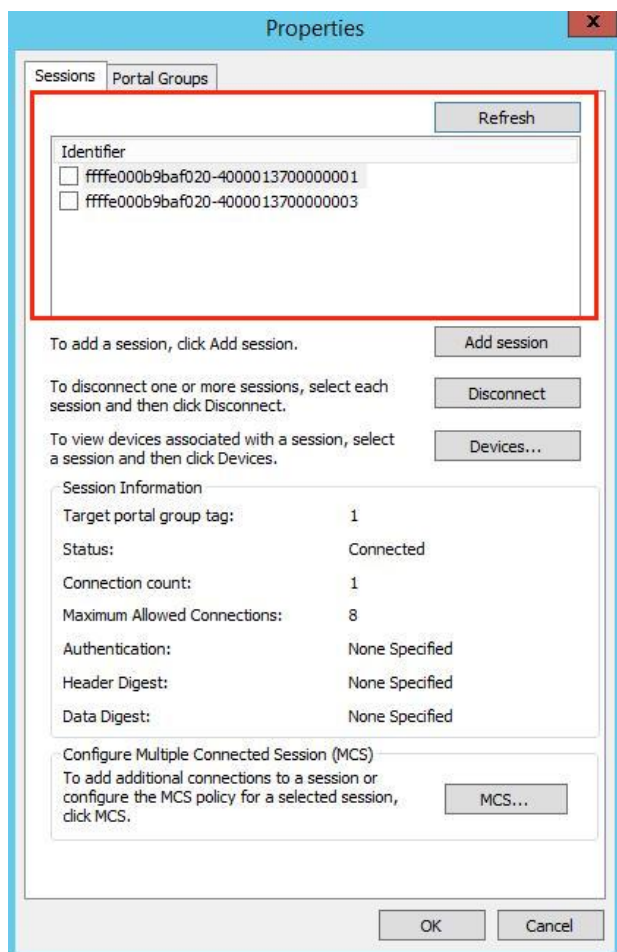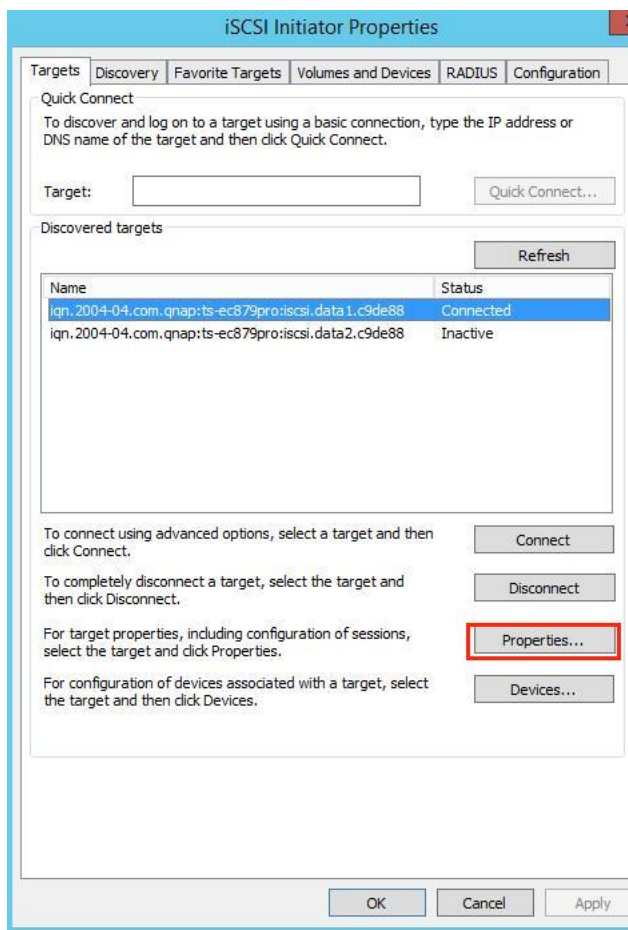
You can see the 2 sessions
that have different paths.

In the "Devices" tab

**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:ts-ec879pro:iscsi.data1.c9de88 | Connected |

**Devices**

| Name | Address |
|------|---------|
| Disk 2 | Port 6: Bus 0: Target 0: LUN 0 |
| Disk 2 | Port 6: Bus 0: Target 1: LUN 0 |

Volume path names:

Legacy device name:        \\.\PhysicalDrive2

Device interface name:      \\?\mpio#disk&ven_qnap&prod_iscsi_storage&rev_4.

Configure Multipath IO (MPIO)

To configure the MPIO policy for a
selected device, click MPIO.          [ MPIO... ]

[ OK ]

you can see 2 devices

Note that the two devices will be handled by the MPIO layer to avoid the system seeing two different disks. You will see only one disk in the disk management panel.

- You can also find those two connections by opening a command prompt window (cmd.exe) and using "netstat.exe". We can see the two connections that are connected to the same IP.

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

PS C:\Users\Administrator> netstat -n

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    127.0.0.1:49160        127.0.0.1:49161        ESTABLISHED
  TCP    127.0.0.1:49161        127.0.0.1:49160        ESTABLISHED
  TCP    172.17.32.121:49154    172.17.32.172:3260     ESTABLISHED
  TCP    172.17.32.126:49168    172.17.32.172:3260     ESTABLISHED
PS C:\Users\Administrator>
```

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- In "Server Management" console, go to "All Server" > "File and Storage Services" > "Disk". You can see the newly added disks as designated.



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- You can now format the disk, bring it online and create a volume for it

**DISKS**
All disks | 3 total

TASKS ▼

| Number | Virtual Disk | Status | Capacity | Unallocated | Partition | Read Only | Clustered | Subsystem | Bus Type | Nam |
|---|---|---|---|---|---|---|---|---|---|---|
| ▲ WIN-UIJ99C1TCRQ (3) | | | | | | | | | | |
| 2 | | Offline | 10.0 GB | 10.0 GB | Unknown | ✓ | | | iSCSI | QNA |
| 0 | | Online | 233 GB | 0.00 B | MBR | | | | SATA | WDC |
| 1 | | Online | 492 MB | 0.00 B | MBR | | | | USB | USB |

New Volume...
Bring Online
Take Offline
Reset Disk

Last refreshed on 12/6/2014 8:42:45 AM

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Server Manager

◄◄ File and Storage Services ▸ Volumes ▸ Disks     Manage   Tools   View   Help

Servers
Volumes
**Disks**
Storage Pools

| Number | Virtual Disk | Status | Capacity | Unallocated | Partition | Read Only | Clustered | Subsystem | Bus Type | Nam |
|---|---|---|---|---|---|---|---|---|---|---|
| ▲ WIN-UIJ99C1TCRQ (3) | | | | | | | | | | |
| 0 | | Online | 233 GB | 0.00 B | MBR | | | | SATA | WDC |
| 1 | | Online | 492 MB | 0.00 B | MBR | | | | USB | USB |
| 2 | | Online | 10.0 GB | 0.00 B | GPT | | | | iSCSI | QNA |

Last refreshed on 12/6/2014 8:42:45 AM

**VOLUMES**
Related Volumes | 1 total

TASKS ▼

| ⚠ Volume | Status |
|---|---|
| ▲ WIN-UIJ99C1TCRQ (1) | |
| E: | |

Go to Volumes Overview >

**STORAGE POOL**
QNAP iSCSI Storage  Multi-Path Disk Device on WIN...   TASKS ▼

No related storage pool exists.

Go to Storage Pools Overview >

## Jumble Frame

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.*"

In Windows Server 2012, click "Configure" in your network interface properties
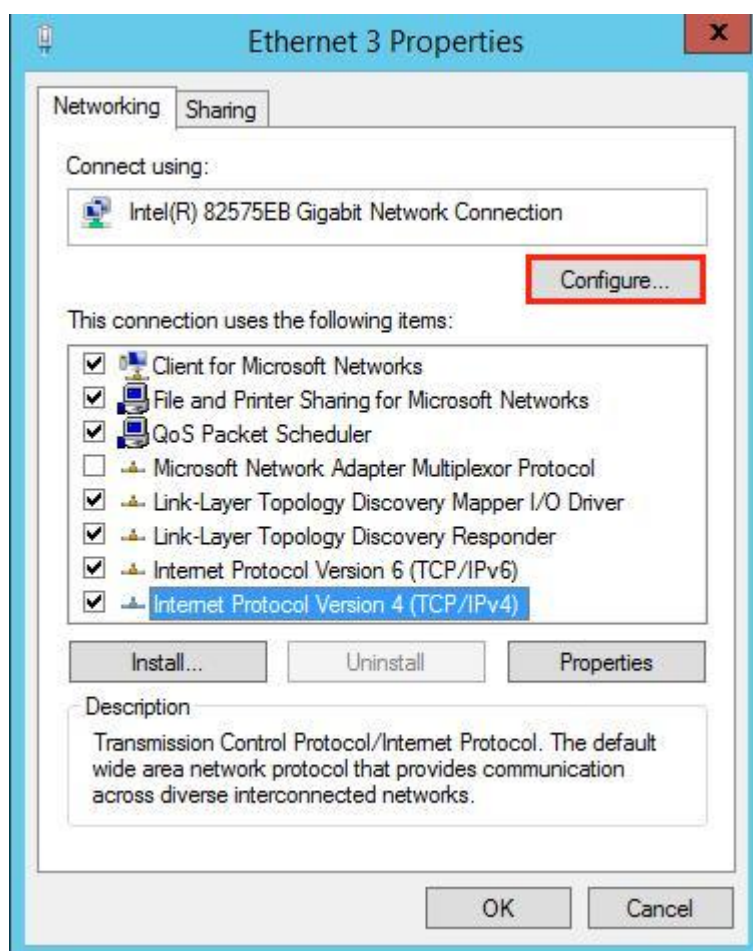
Go the "Advanced" tab, find "Jumbo Packet" in menu. Specify the speed in Value menu.
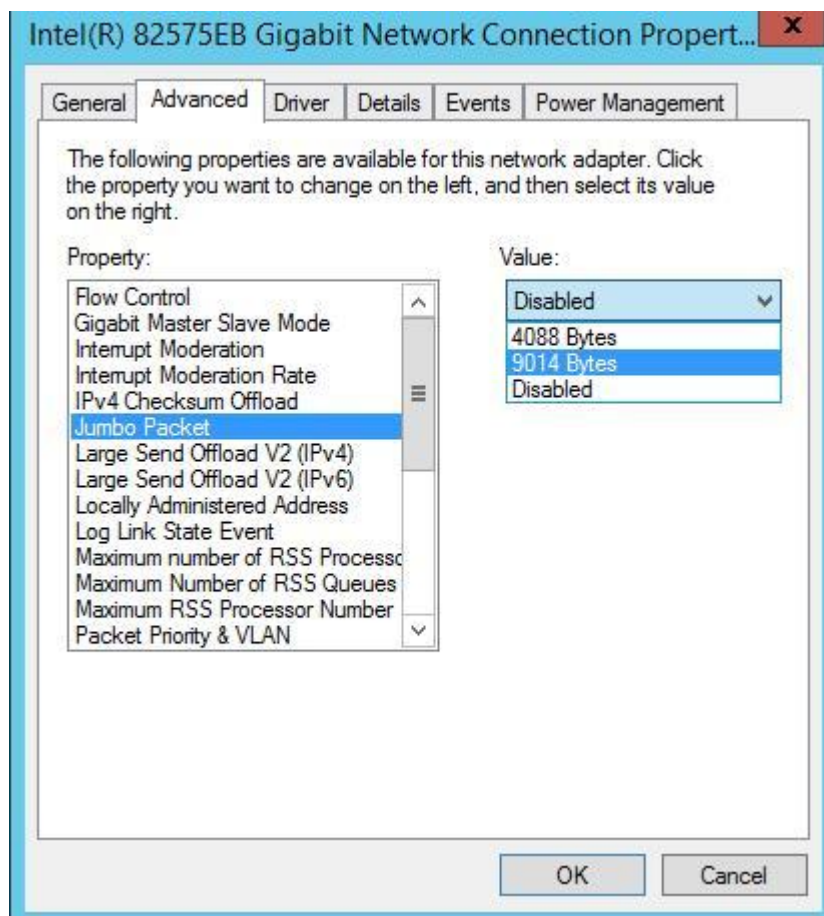
And on your Turbo NAS from the "Control Panel", go to "System Settings" > "Network". Find the interface used to connect to Window Server 2012 and click the "Edit" icon
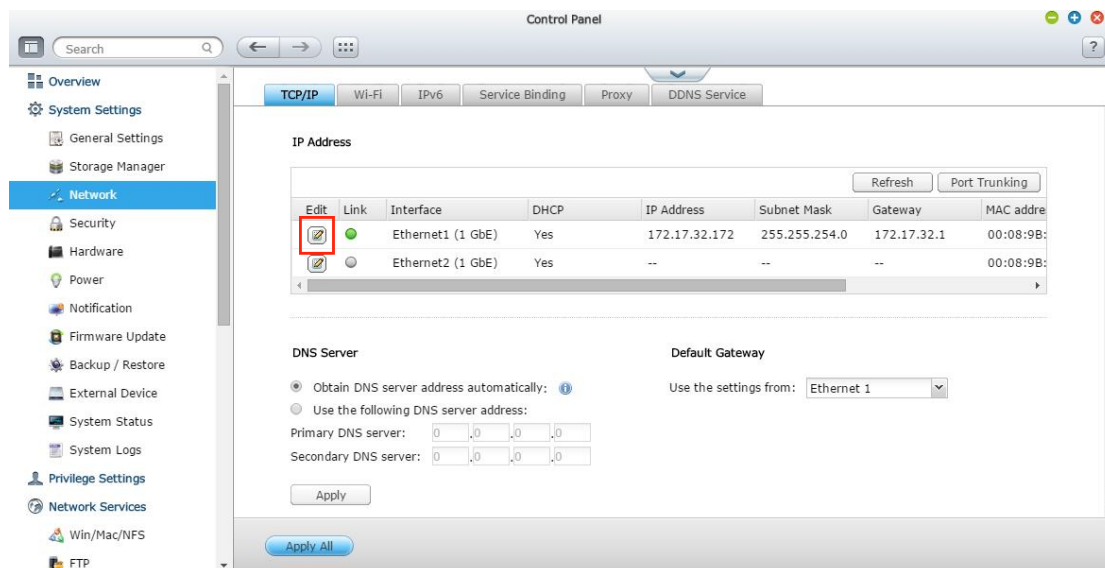


In "Network Parameters", specify the speed in "Jumbo Frame".
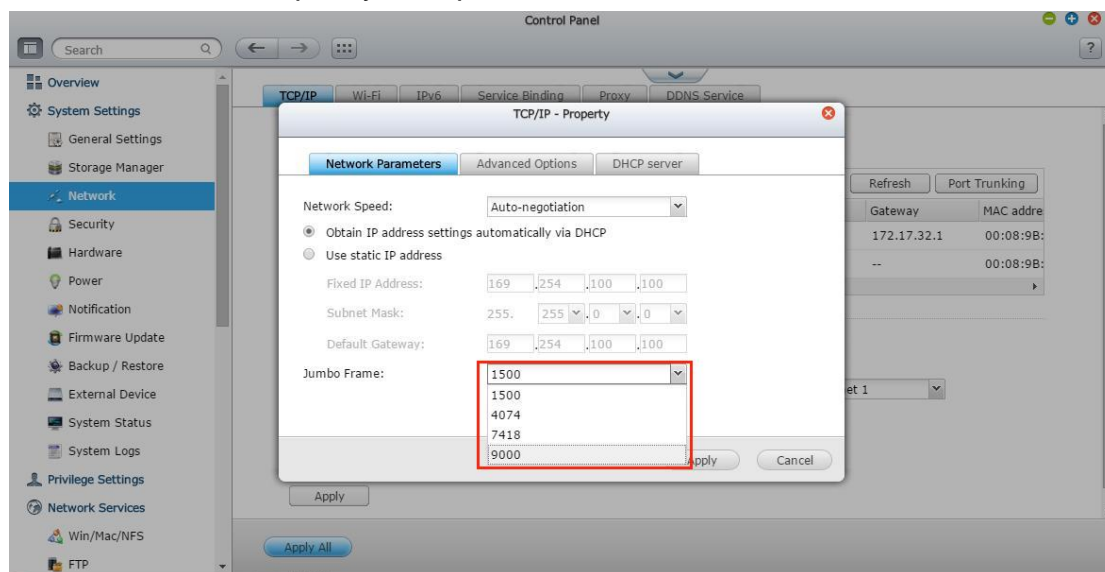
You can also unbind unnecessary protocols from your iSCSI NICs to optimize your connection. This should be done only on DEDICATED network interfaces that are only used for iSCSI.

Clear the checkbox for "Client for Microsoft Networks"
Clear the checkbox for "File and Printer Sharing for Microsoft Networks"
Clear the checkbox for "QoS Packet Scheduler"
Clear the checkboxes for the "Link-Layer Topology Discovery Mapper I/O Driver"
Clear the checkboxes for the "Link-Layer Topology Discovery Responder
Clear the checkboxes for the "Internet Protocol Version 6 (TCP/IPv6)"

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Double click "Internet Protocol
Version 4 (TCP/IP4)"; click
"Advanced" in the "General" tab

Internet Protocol Version 4 (TCP/IPv4) Properties    x

General | Alternate Configuration

You can get IP settings assigned automatically if your network supports
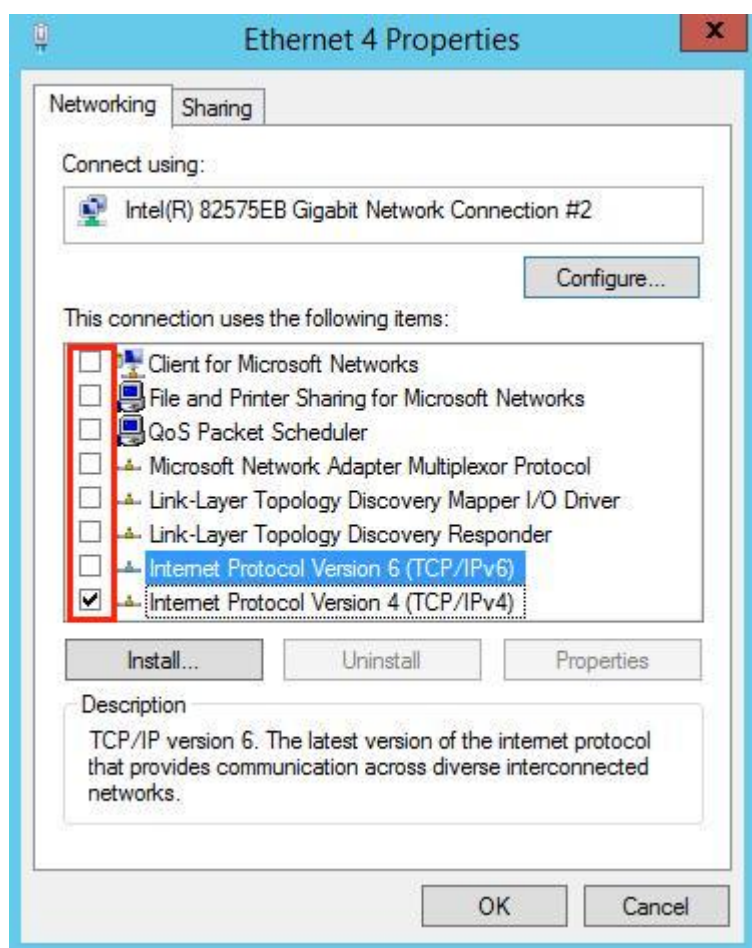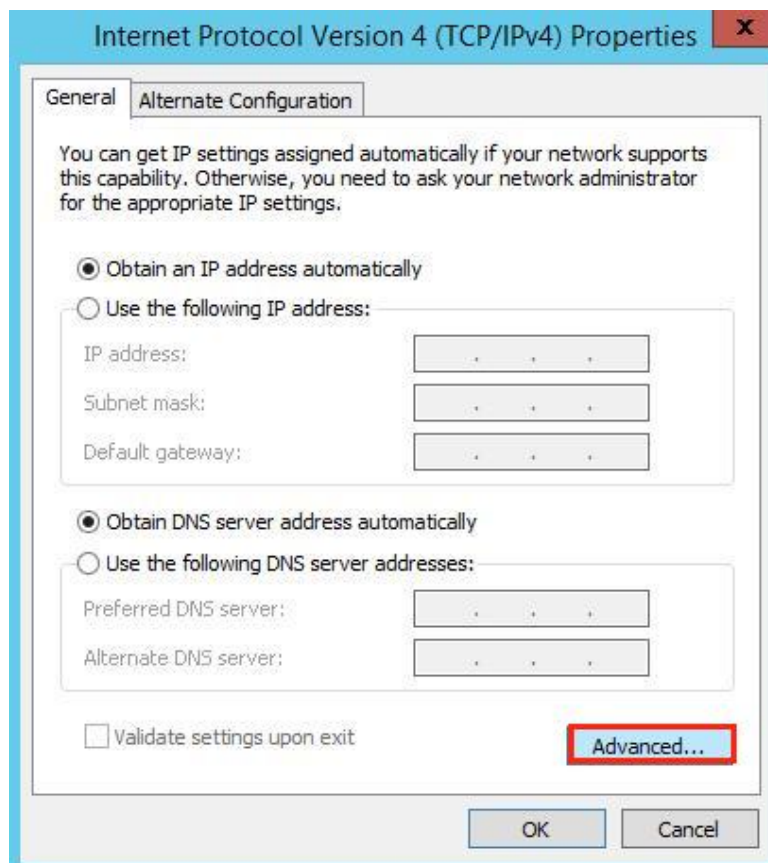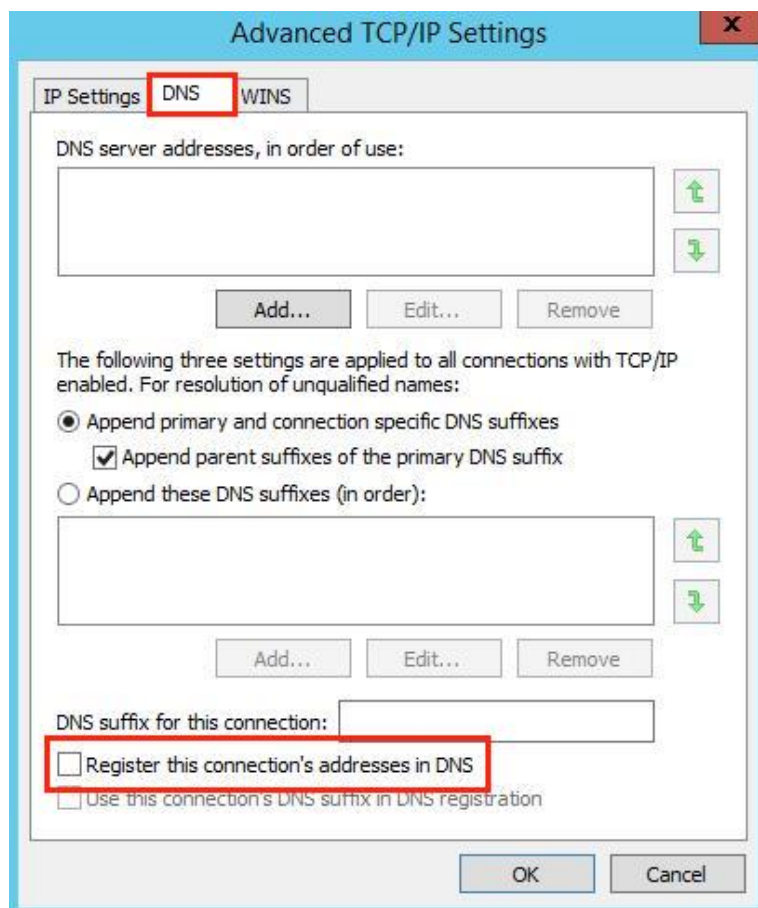this capability. Otherwise, you need to ask your network administrator
for the appropriate IP settings.

○ Obtain an IP address automatically

○ Use the following IP address:

IP address:

Subnet mask:

Default gateway:

● Obtain DNS server address automatically

○ Use the following DNS server addresses:

Preferred DNS server:

Alternate DNS server:

☐ Validate settings upon exit                    Advanced...

OK        Cancel

Go to the "DNS" tab and clear the
checkbox for "Register this
connection's address in DNS"

Advanced TCP/IP Settings    x

IP Settings | DNS | WINS

DNS server addresses, in order of use:

Add...       Edit...      Remove

The following three settings are applied to all connections with TCP/IP
enabled. For resolution of unqualified names:

● Append primary and connection specific DNS suffixes
   ☑ Append parent suffixes of the primary DNS suffix

○ Append these DNS suffixes (in order):

Add...       Edit...      Remove

DNS suffix for this connection:

☐ Register this connection's addresses in DNS
☐ Use this connection's DNS suffix in DNS registration

OK        Cancel

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Go to the "WINS" tab and clear the checkbox for "Enable LMHOSTS Lookup" and select the radio button for "Disable NetBIOS over TCP/IP"