

iStorage Server and Microsoft DHCP for diskless booting via gPXE

Monday, Sep 19th, 2011



KernSafe Technologies, Inc.

www.kernsafe.com

Copyright © KernSafe Technologies 2006-2011. All right reserved.

Table of Contents

Overview	3
Configuring iStorage Server	4
Creating Target	4
Installation of tFPT server	10
Installation of DHCP server on Windows Server 2008 R2	11
Installing Operating System on the network hard drive	22
Contact.....	25

Overview

KernSafe iStorage Server is an advanced and powerful, full-featured software-only iSCSI Target that fully conforms to the latest iSCSI Standard 1.0 (former Draft 20). It is an IP SAN solution allowing you to quickly export existing storages such as disk images, VHD files, physical disks, partitions, CD/DVD-ROMs, tapes or any other type of SCSI based devices and even a variety of popular CD/DVD images to the client machines. The software thus delivers immediate benefits, as it allows storage to be consolidated, virtualized and centrally managed. iStorage Server also provides RAID-1 (mirror) feature enabling you to create two iSCSI devices for mirror backup. Furthermore, iStorage Server also supports a lot of features such as: VHD (Virtual Hard Disk) target, snapshots, STPI, RAID-1 and failover, these features are very important and popular in storage industry world and make iStorage Server suitable for any size of business.

This article will demonstrate how to install operating system on an iSCSI target that is connected using Microsoft's DHCP Server via gPXE boot. Network diskless boot is a process that runs the operating system on the remote server which is running iStorage Server instead of executing it locally. You can also use a local hard drive for SWAP files or crash dumps. That can provide enormous benefit for virtualization computing servers environments in relation to RAID arrays. To boot a machine without any hard drive you will need network card that is capable of performing network boot.

In this case we will need at least two computers – machine with installed iStorage Server that is running DHCP server and sufficient hard drive capacity for installing operating system and a client machine capable of network diskless booting.

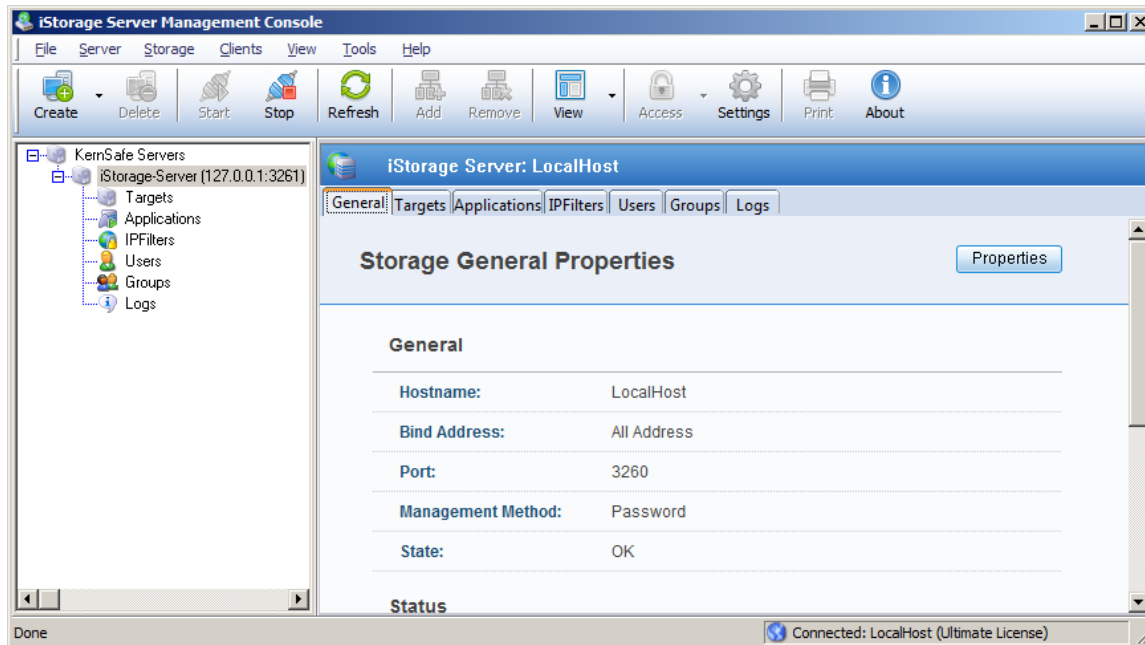
Configuring iStorage Server

Preparing server for network diskless boot

We will create iSCSI Target image file using iStorage Server on which we will install operating system for network diskless boot.


Creating Target


Open iStorage Server Management Console.



Launch the iStorage Server Management Console, press the **Create** button on the toolbar, the **Create iSCSI Target Wizard** will appear.

Select device type.

Create iSCSI Target Wizard 

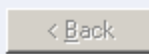
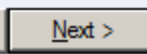
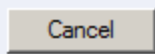
iSCSI Device Type 

Select which device type of the iSCSI target you want to create.

☒ **Hard Disk**
Create iSCSI target by using physical disk, partition, standard image file or VHD.


☐ **CD/ DVD Device**
Create iSCSI target by using physical optical drive or CD / DVD image file.


☐ **Generic SCSI**
Create iSCSI target by using generic SCSI device, such as disk, CD-ROM, tape, printer.

Choose **Hard Disk**.

Press the **Next** button to continue.

Create iSCSI Target Wizard 

iSCSI Medium Type 

Select medium of the iSCSI disk you want to create.

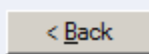
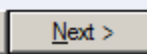
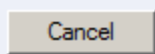
☒ **Image File**
Create iSCSI disk by using standard image file or Virtual Hard Disk (.VHD).

☐ **RAM Space**
Create iSCSI disk by using memory space.

☐ **Security Images**
Create iSCSI disk images for each initiators, any image is individual for each initiator.

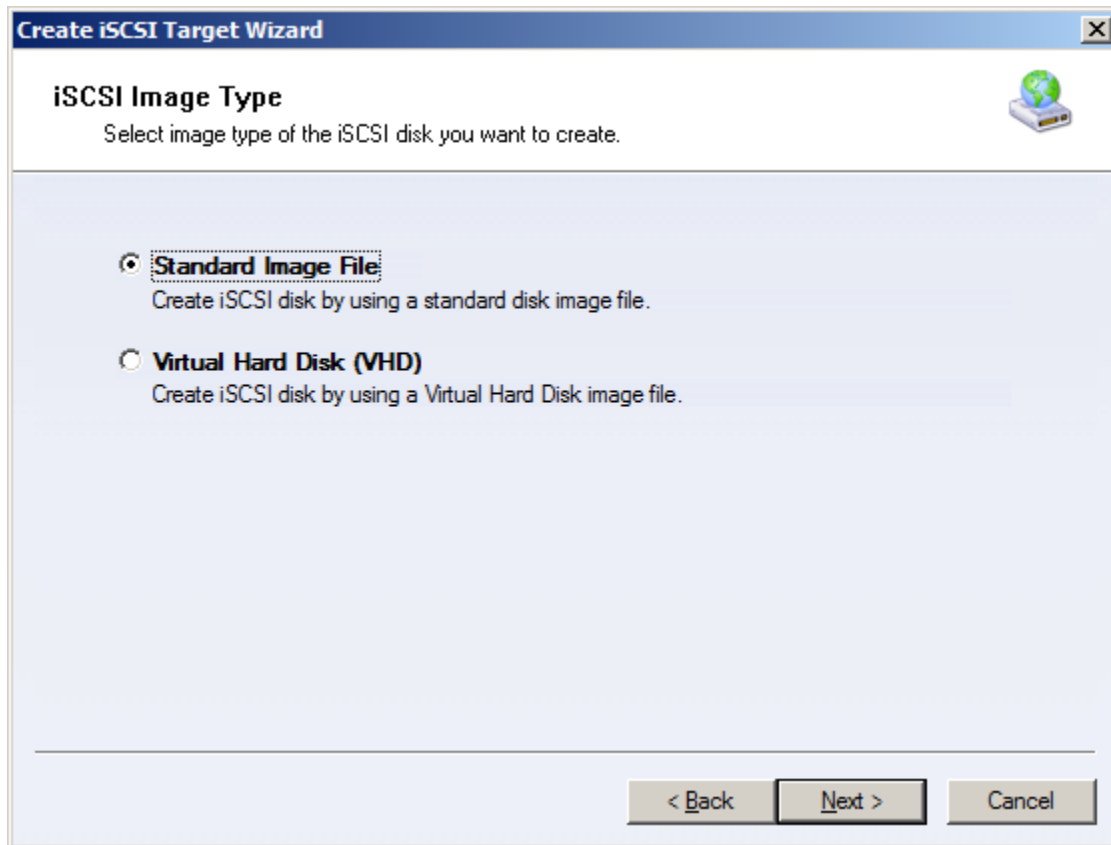
☐ **Disk Partition**
Create iSCSI target by using a disk partition.

☐ **Physical Disk**
Create iSCSI target by using physical disk.

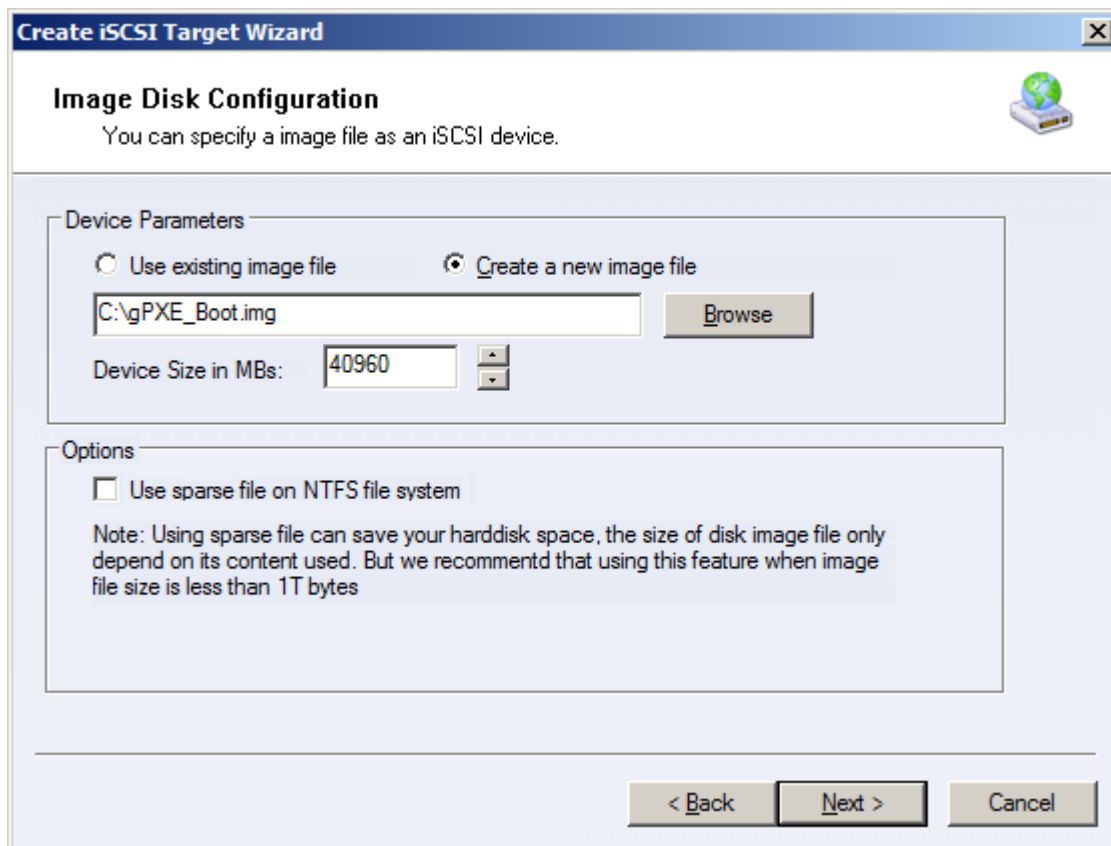
Choose **Image File** in **iSCSI Medium Type** page.

Press the **Next** button to continue.



Choose **Standard Image File** in **iSCSI Image Type**.

Press the **Next** button to continue.



The image shows a Windows-style wizard window titled "Create iSCSI Target Wizard". The current step is "Image Disk Configuration", which includes a sub-header "Image Disk Configuration" and a description: "You can specify a image file as an iSCSI device." There is a small globe icon in the top right corner. The main area is divided into two sections: "Device Parameters" and "Options". In "Device Parameters", there are two radio buttons: "Use existing image file" (unselected) and "Create a new image file" (selected). Below these is a text box containing "C:\gPXE_Boot.img" and a "Browse" button. Below the text box is a "Device Size in MBs:" label followed by a text box containing "40960" and a small spinner control. The "Options" section has a checkbox labeled "Use sparse file on NTFS file system" which is unchecked. Below the checkbox is a note: "Note: Using sparse file can save your harddisk space, the size of disk image file only depend on its content used. But we recommend that using this feature when image file size is less than 1T bytes". At the bottom of the wizard are three buttons: "< Back", "Next >", and "Cancel".

Create iSCSI Target Wizard

Image Disk Configuration
You can specify a image file as an iSCSI device.

Device Parameters

☐ Use existing image file ☒ Create a new image file

C:\gPXE_Boot.img **Browse**

Device Size in MBs: 40960

Options

☐ Use sparse file on NTFS file system

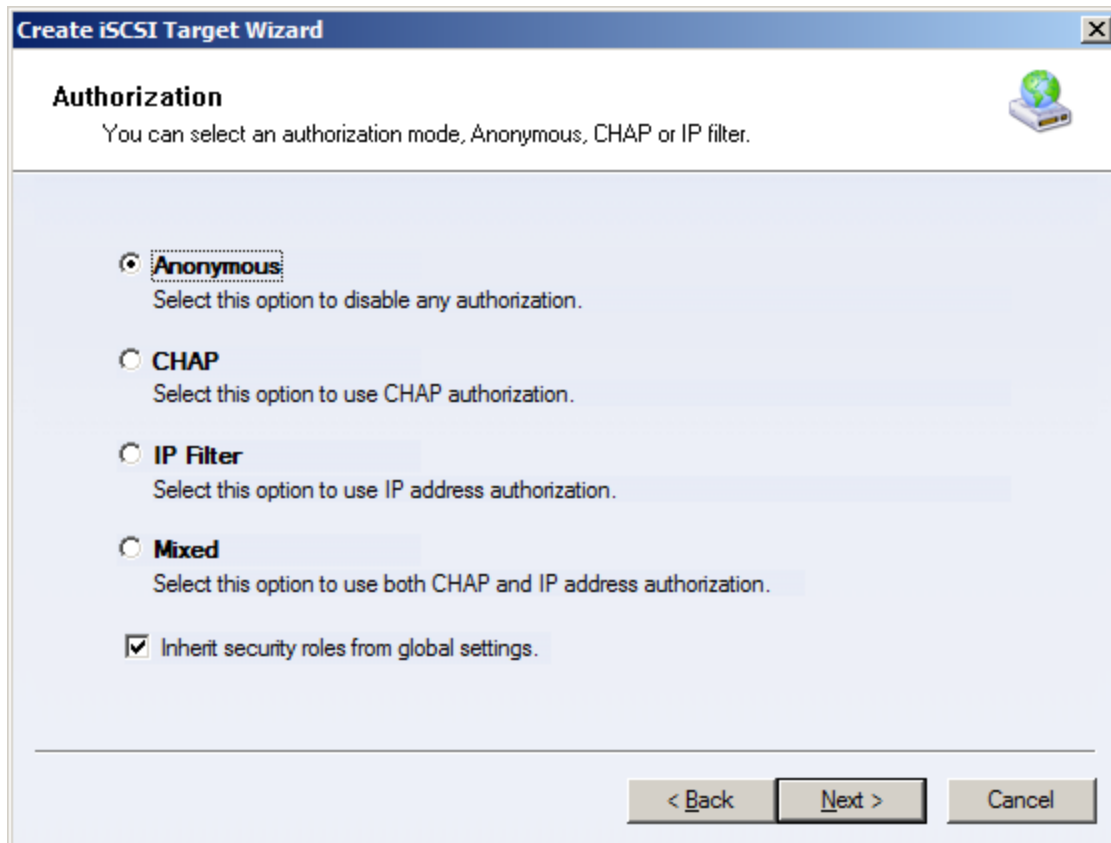
Note: Using sparse file can save your harddisk space, the size of disk image file only depend on its content used. But we recommend that using this feature when image file size is less than 1T bytes

< Back **Next >** Cancel

Select **Create a new image file** or **Use existing image file** if you already have one. Then specify the device size.

Please **don't** check **Use sparse file on NTFS file system**, otherwise you may encounter some problems with detecting iSCSI target.

Press the **Next** button to continue.



Choose the Authentication Mechanism. Decide which authentication mechanisms you would want to use: **Anonymous**, **CHAP**, **IP Filter** or **Mixed** authentication.

1) Anonymous

All initiators will get full access permission without any authorization required.

2) CHAP (Challenge-handshake authentication protocol)

All initiators need to specify a CHAP user and secret to connect to the target. iStorage Server has a built-in user called "Guest", which is used for initiators without CHAP secret specified.

3) IP Filters

All initiators will be authorized by the incoming IP address defined by IP Filter roles.

4) Mixed

Security policy is determined by both CHAP and IP Filters.

If you check **Inherit security roles from global settings**, all client security roles are from global settings, otherwise, each client will have its own permission.

Note:

For network diskless boot it is preferable to set it up as **Anonymous** authorization.

Press the **Next** button to continue.

Installation of tFTP server

Download and install tFTP server of your choice (SolarWinds TFTP Server for example).

Go to this page <http://rom-o-matic.net/gpxe/gpxe-1.0.1/contrib/rom-o-matic/>

From the output format list choose **PXE bootstrap loader keep [KEEP PXE stack method 1] (.kpxe)**, from the NIC type list choose **all-drivers**, press **Get Image** button to download the file.

To create an image:

1. Choose an output format: PXE bootstrap loader keep [Keep PXE stack method 1] (.kpxe) ▼
2. Choose a NIC type: all-drivers ▼

3. (optional — for binary ROM image format only)

If you choose *Binary ROM image* as your output format, you must enter **4 hex digits** below for *PCI VENDOR CODE* and *PCI DEVICE CODE* that match the NIC device for which you are making this image.

Information on how to determine NIC PCI IDs may be found [here](#).

PCI VENDOR CODE: PCI DEVICE CODE:

Please note for ROM images:

- If you enter PCI IDs, we will attempt to determine the correct driver to support them, and will ignore any NIC type entered above.
- gPXE does not support all possible PCI IDs for supported NICs.

4. Generate and download an image:

5. (optional) Customize image configuration options:

Copy that file to root directory of your tFTP server. (Default root directory for SolarWinds TFTP server is C:\TFTP-Root.)

In that directory, create new file with **.gpxe** extension and copy below script:

```
#!/gpxe
set keep-san 1
sanboot ${root-path}
```

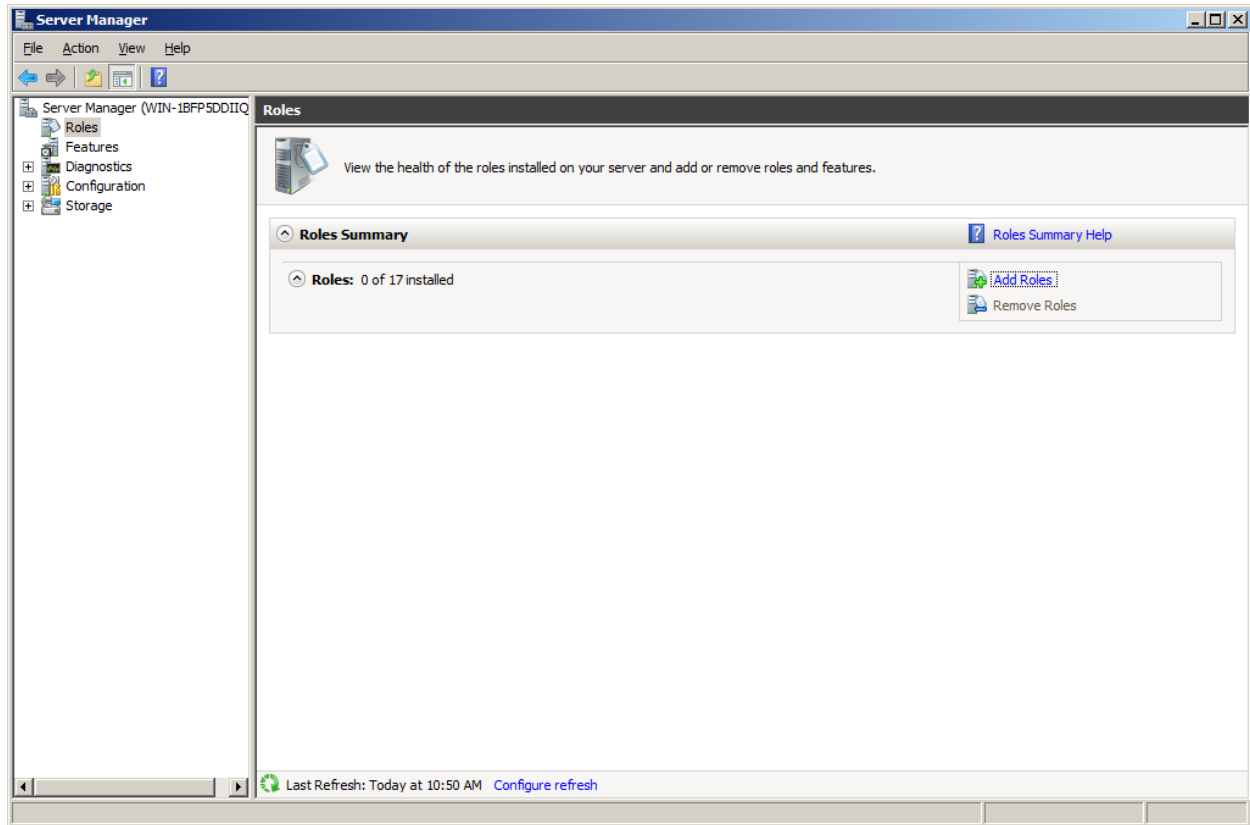
Save it, and you may proceed with starting installation of DHCP server.

Installation of DHCP server on Windows Server 2008 R2

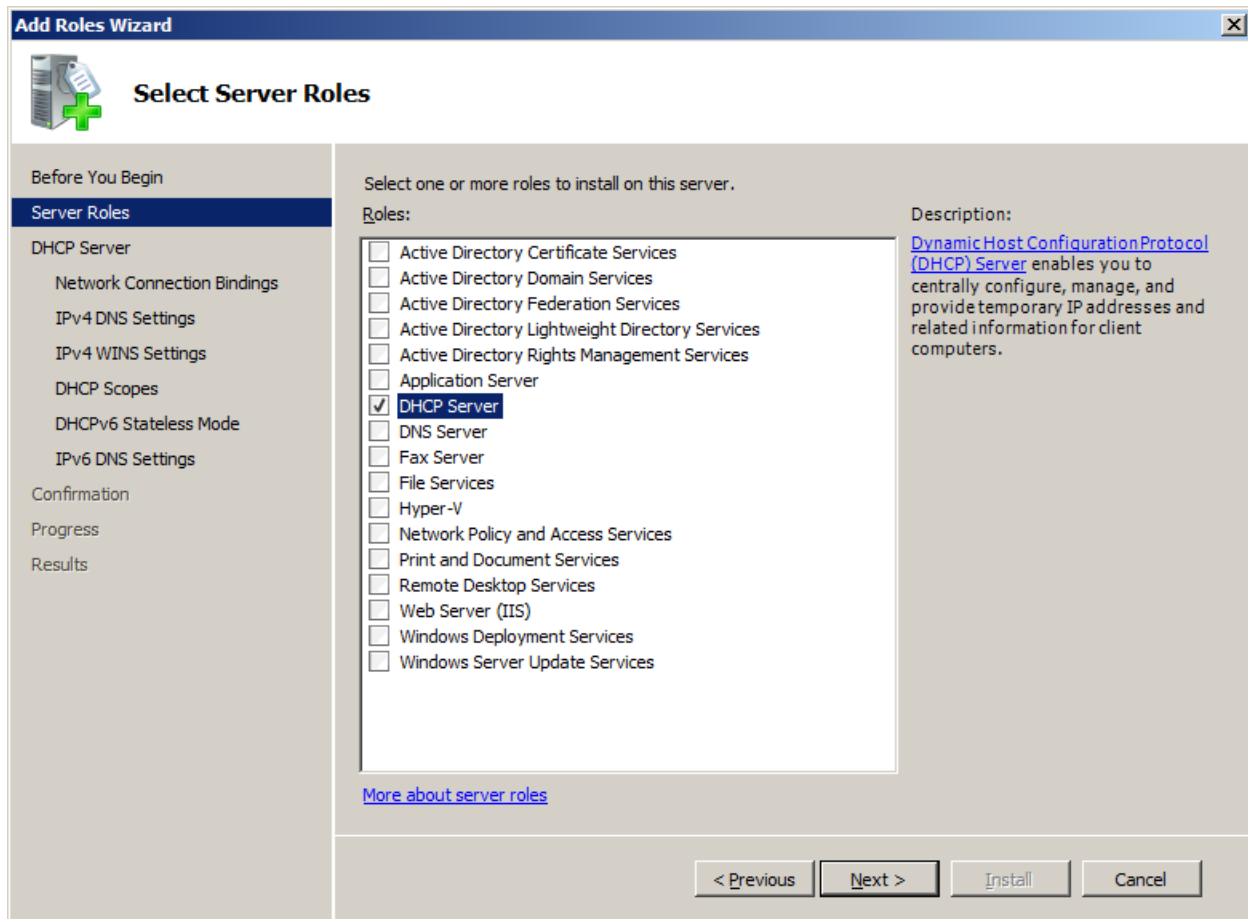
To install DHCP server on Windows Server 2008 R2, please open **Server Manager**.

Note:

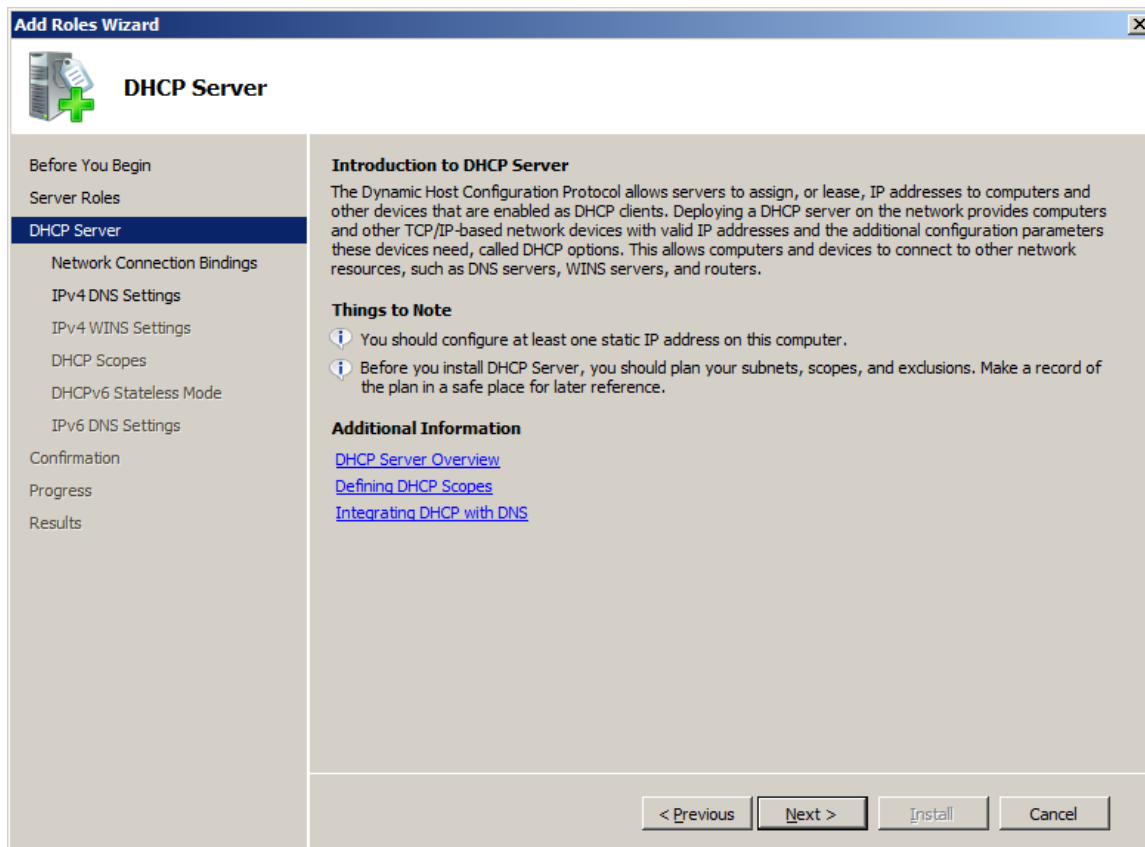
Before installing DHCP server, please make sure you have a static IP assigned to this server machine.



Click on **Add Roles** button.




From list, please select **DHCP Server** and click **Next** button to continue.



Click **Next** button to continue.

Add Roles Wizard

 **Select Network Connection Bindings**

Before You Begin
Server Roles
DHCP Server
Network Connection Bindings
IPv4 DNS Settings
IPv4 WINS Settings
DHCP Scopes
DHCPv6 Stateless Mode
IPv6 DNS Settings
Confirmation
Progress
Results

One or more network connections having a static IP address were detected. Each network connection can be used to service DHCP clients on a separate subnet.

Select the network connections that this DHCP server will use for servicing clients.

Network Connections:

IP Address	Type
<input checked="" type="checkbox"/> 192.168.0.32	IPv4

Details


Name: Local Area Connection
Network Adapter: Local Area Connection
Physical Address: 00-0C-29-52-E6-8A

< Previous Next > Install Cancel

Choose static IP address that will be assigned to DHCP.

Press **Next** button to continue.

Add Roles Wizard

 **Specify IPv4 DNS Server Settings**

Before You Begin
Server Roles
DHCP Server
 Network Connection Bindings
IPv4 DNS Settings
 IPv4 WINS Settings
 DHCP Scopes
 DHCPv6 Stateless Mode
 IPv6 DNS Settings
Confirmation
Progress
Results

When clients obtain an IP address from the DHCP server, they can be given DHCP options such as the IP addresses of DNS servers and the parent domain name. The settings you provide here will be applied to clients using IPv4.

Specify the name of the parent domain that clients will use for name resolution. This domain will be used for all scopes you create on this DHCP server.

Parent domain:

Specify the IP addresses of the DNS servers that clients will use for name resolution. These DNS servers will be used for all scopes you create on this DHCP server.

Preferred DNS server IPv4 address:

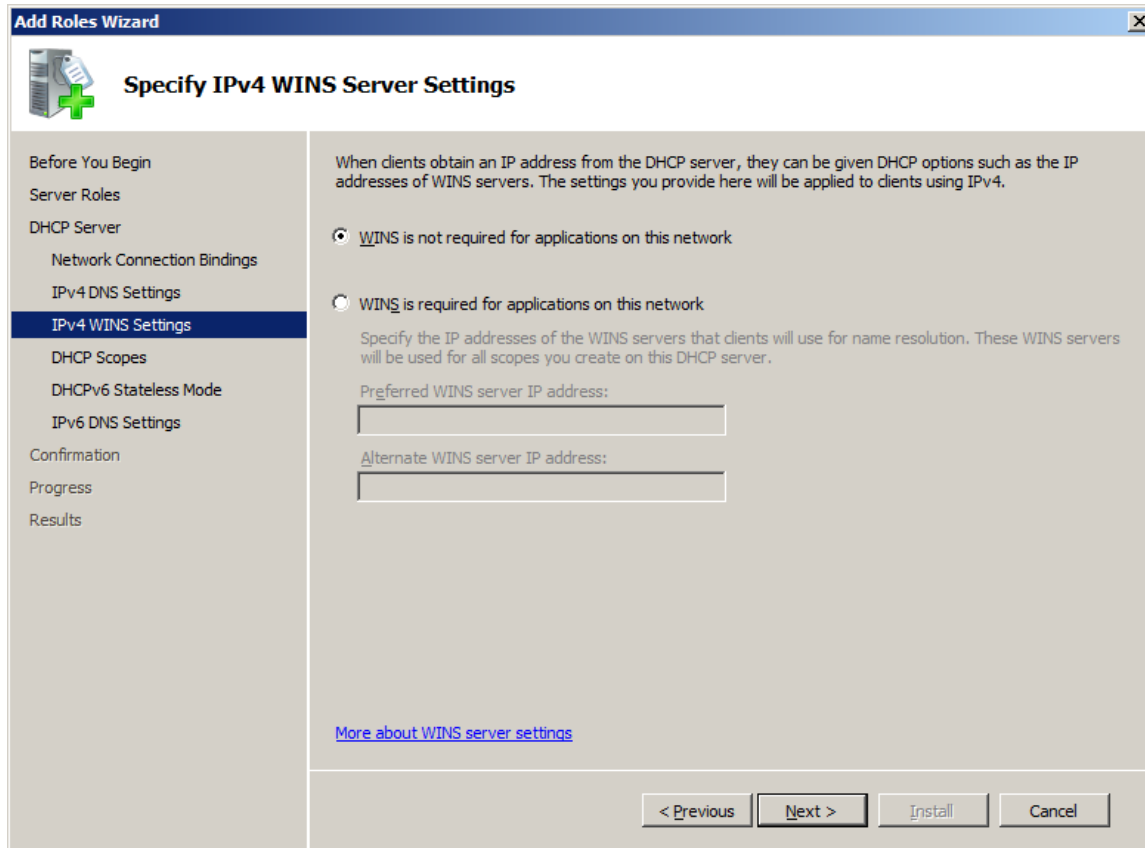
Alternate DNS server IPv4 address:

[More about DNS server settings](#)

< Previous Next > Install Cancel

Type your **domain name** and **preferred DNS server IPv4 address**.

Press **Next** button to continue.



Add Roles Wizard

Specify IPv4 WINS Server Settings

Before You Begin
Server Roles
DHCP Server
 Network Connection Bindings
 IPv4 DNS Settings
IPv4 WINS Settings
 DHCP Scopes
 DHCPv6 Stateless Mode
 IPv6 DNS Settings
Confirmation
Progress
Results

When clients obtain an IP address from the DHCP server, they can be given DHCP options such as the IP addresses of WINS servers. The settings you provide here will be applied to clients using IPv4.

☒ **WINS is not required for applications on this network**

☐ WINS is required for applications on this network

Specify the IP addresses of the WINS servers that clients will use for name resolution. These WINS servers will be used for all scopes you create on this DHCP server.

Preferred WINS server IP address:

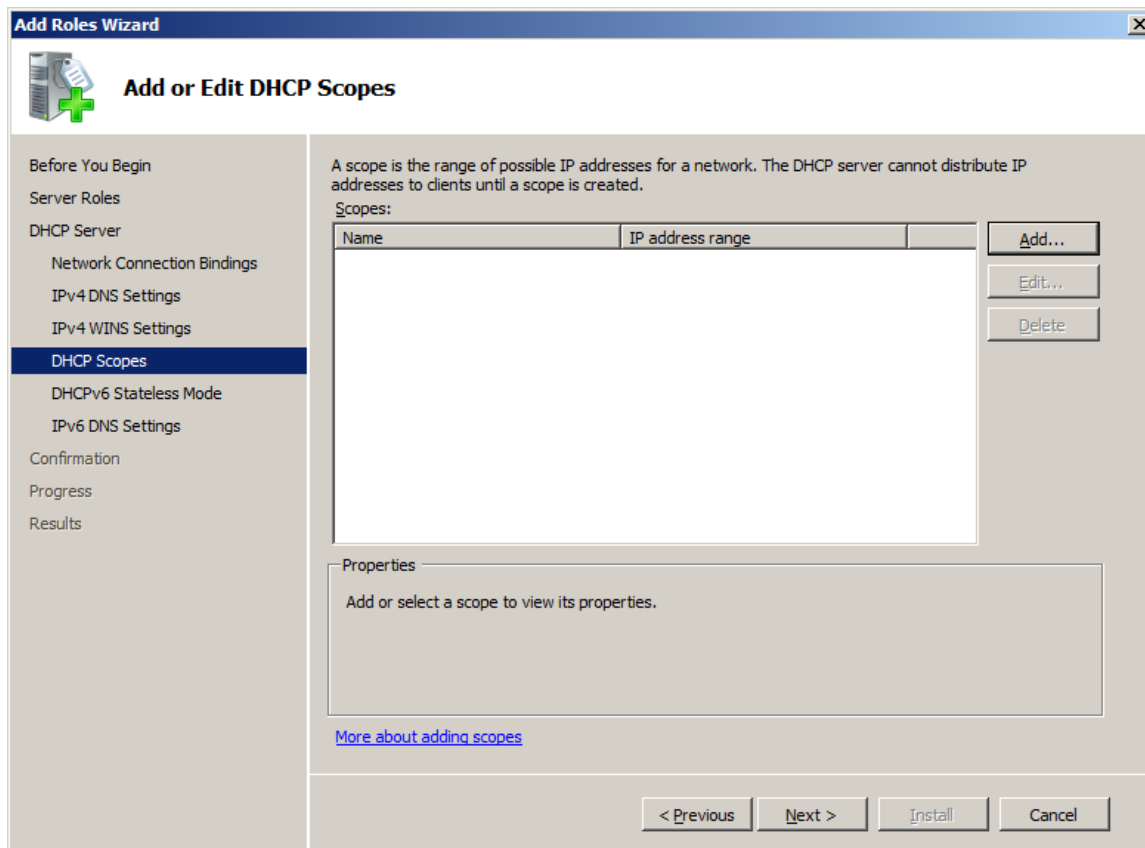
Alternate WINS server IP address:

[More about WINS server settings](#)

< Previous Next > Install Cancel

Select **WINS is not required for applications on this network**, and press **Next** button to continue.

Add scope from which IP address will be distributed.



Add Roles Wizard

Add or Edit DHCP Scopes

Before You Begin
Server Roles
DHCP Server
 Network Connection Bindings
 IPv4 DNS Settings
 IPv4 WINS Settings
DHCP Scopes
 DHCPv6 Stateless Mode
 IPv6 DNS Settings
Confirmation
Progress
Results

A scope is the range of possible IP addresses for a network. The DHCP server cannot distribute IP addresses to clients until a scope is created.

Scopes:

Name	IP address range
------	------------------

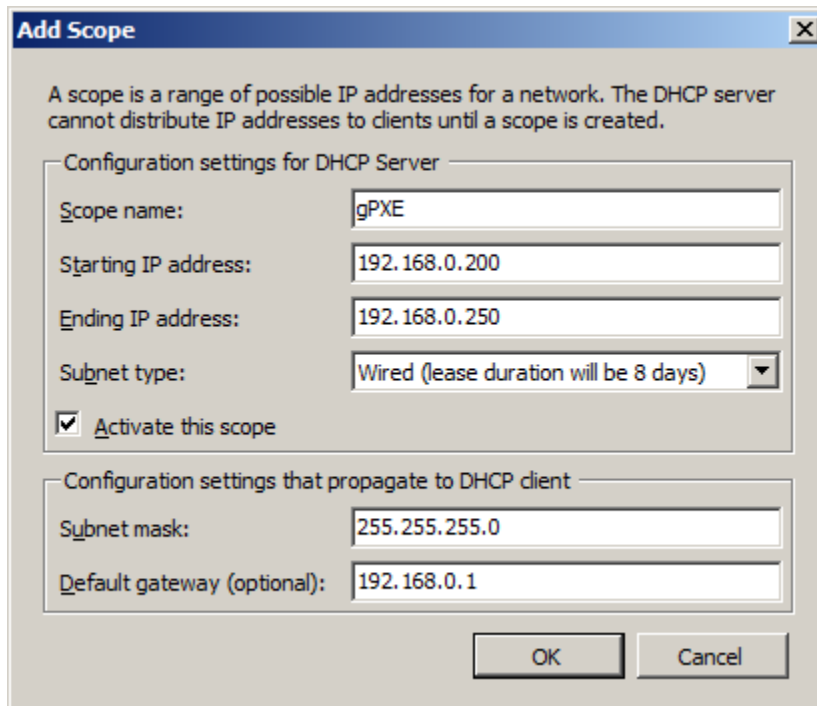
Add...
Edit...
Delete

Properties
Add or select a scope to view its properties.

[More about adding scopes](#)

< Previous Next > Install Cancel

Press **Add** button to add scope.



Add Scope

A scope is a range of possible IP addresses for a network. The DHCP server cannot distribute IP addresses to clients until a scope is created.

Configuration settings for DHCP Server

Scope name: gPXE

Starting IP address: 192.168.0.200

Ending IP address: 192.168.0.250

Subnet type: Wired (lease duration will be 8 days)

☒ Activate this scope

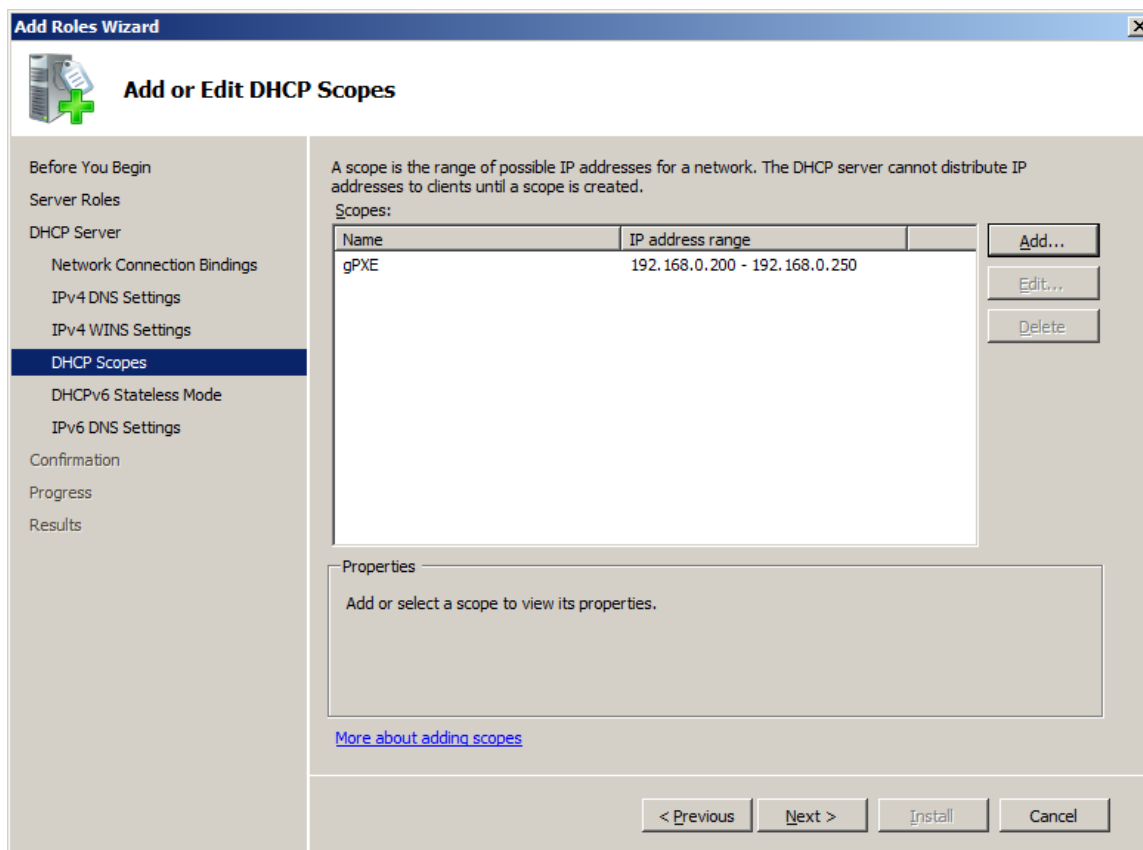
Configuration settings that propagate to DHCP client

Subnet mask: 255.255.255.0

Default gateway (optional): 192.168.0.1

OK Cancel

Type your scope information and press **OK** to continue.



Add Roles Wizard

Add or Edit DHCP Scopes

Before You Begin

Server Roles

DHCP Server

- Network Connection Bindings
- IPv4 DNS Settings
- IPv4 WINS Settings
- DHCP Scopes**
- DHCPv6 Stateless Mode
- IPv6 DNS Settings

Confirmation

Progress

Results

A scope is the range of possible IP addresses for a network. The DHCP server cannot distribute IP addresses to clients until a scope is created.

Scopes:

Name	IP address range
gPXE	192.168.0.200 - 192.168.0.250

Add... Edit... Delete

Properties


Add or select a scope to view its properties.

[More about adding scopes](#)

< Previous Next > Install Cancel

Press **Next** button to continue.

Add Roles Wizard

 **Configure DHCPv6 Stateless Mode**

Before You Begin
Server Roles
DHCP Server
 Network Connection Bindings
 IPv4 DNS Settings
 IPv4 WINS Settings
 DHCP Scopes
DHCPv6 Stateless Mode
Confirmation
Progress
Results

DHCP Server supports the DHCPv6 protocol for servicing IPv6 clients. Using DHCPv6, clients can automatically configure their own IPv6 addresses using stateless mode, or they can acquire IPv6 addresses in stateful mode from the DHCP server. If routers on your network are configured to support DHCPv6, verify that your selection below matches the router configuration.

Select the DHCPv6 stateless mode configuration for this server.

☐ Enable DHCPv6 stateless mode for this server
IPv6 clients will be automatically configured without using this DHCP server.


☒ **Disable DHCPv6 stateless mode for this server**
After installing DHCP Server, you can configure the DHCPv6 mode using the DHCP Management console.

[More about DHCPv6 stateless mode](#)

< Previous Next > Install Cancel


Choose **Disable DHCPv6 stateless mode for this server**, and press **Next** button to continue.


Add Roles Wizard


 **Confirm Installation Selections**

Before You Begin
Server Roles
DHCP Server
 Network Connection Bindings
 IPv4 DNS Settings
 IPv4 WINS Settings
 DHCP Scopes
 DHCPv6 Stateless Mode
Confirmation
Progress
Results

To install the following roles, role services, or features, click Install.

 1 informational message below

 This server might need to be restarted after the installation completes.

 **DHCP Server**

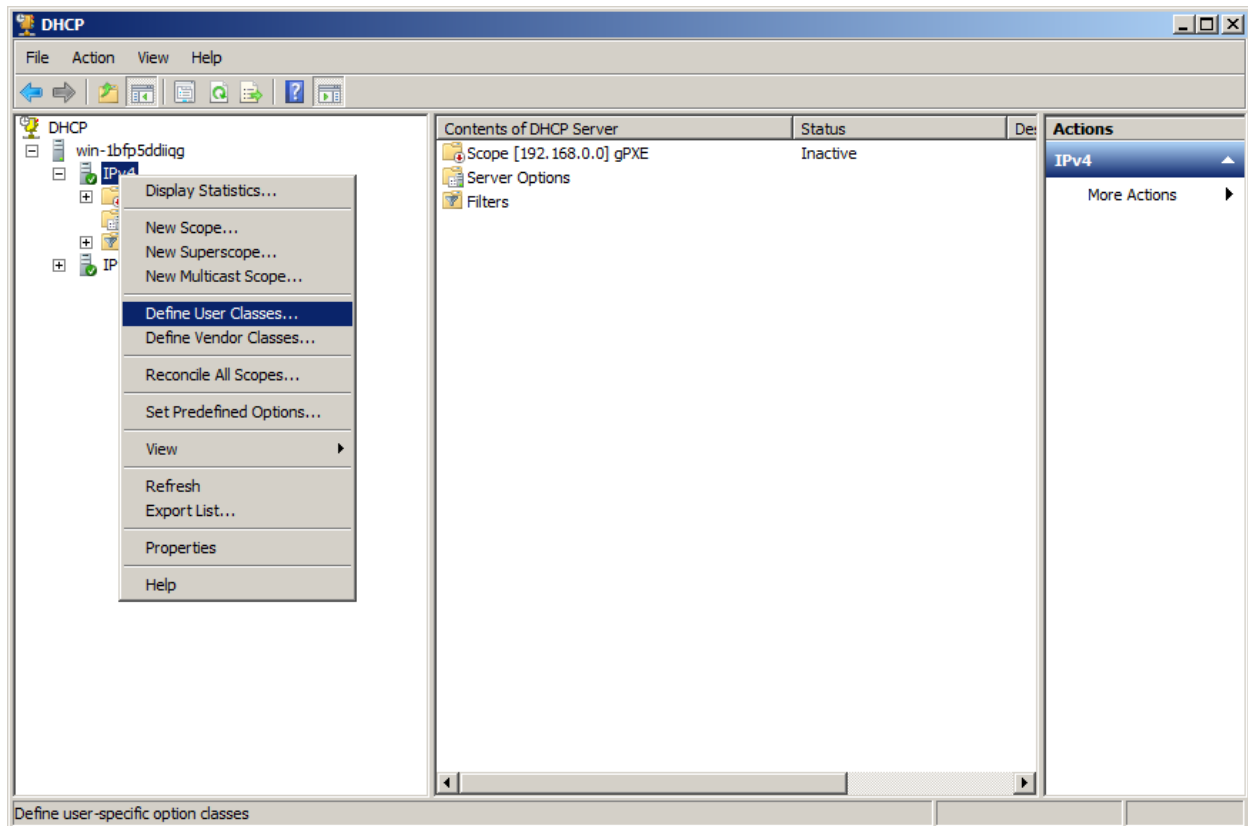
Network Connection Bindings :	192.168.0.32 (IPv4)
IPv4 DNS Settings	
DNS Parent Domain :	dhcp.local
DNS Servers :	192.168.0.1
WINS Servers :	None
Scopes	
Name :	gPXE
Default Gateway :	192.168.0.1
Subnet Mask :	255.255.255.0
IP Address Range :	192.168.0.200 - 192.168.0.250
Subnet Type :	Wired (lease duration will be 8 days)
Activate Scope :	Yes
DHCPv6 Stateless Mode :	Disabled

[Print, e-mail, or save this information](#)

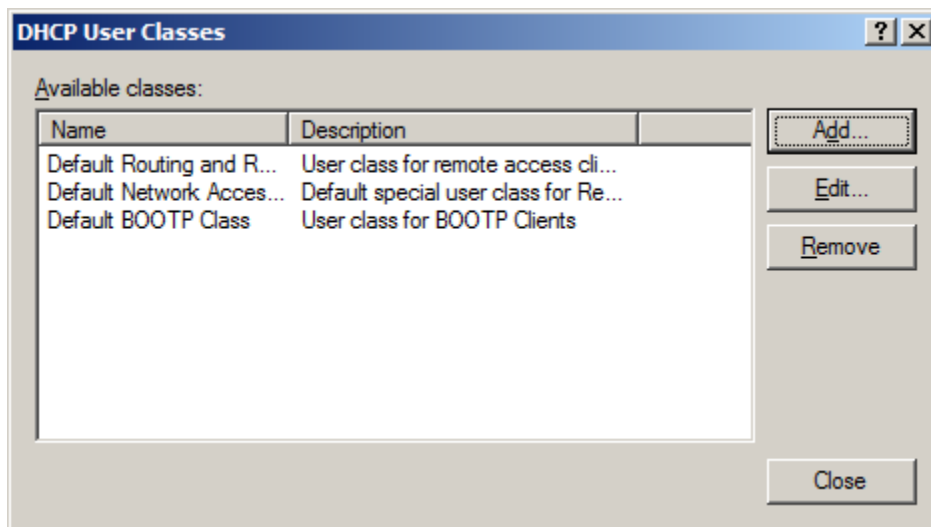
< Previous Next > Install Cancel

Check if all of your settings are correct, and proceed with installation of DHCP server.

Open **DHCP server**.



Right click on **IPv4** and choose **Define User Classes...**



Click on **Add** button do add new user class.

Edit Class

Display name:

Description:

ID:	Binary:	ASCII:
0000	67 50 58 45	gPXE

OK Cancel

Fill it according to the picture above.

Display name: **gPXE**

Description: **gPXE Clients**

ASCII: **gPXE**

Press **OK**, and close **DHCP User Classes** window.

DHCP

File Action View Help

win-1bfp5ddiag

- IPv4
 - Scope [192.168.0.0] gPXE
 - Address Pool
 - Address Leases
 - Reservations
 - Scope Options
 - Server Options
 - Filters
 - IPv6

Option Name	Vendor	Value
006 DNS Servers	Standard	192.168.0.1
015 DNS Domain Name	Standard	dhcp.local

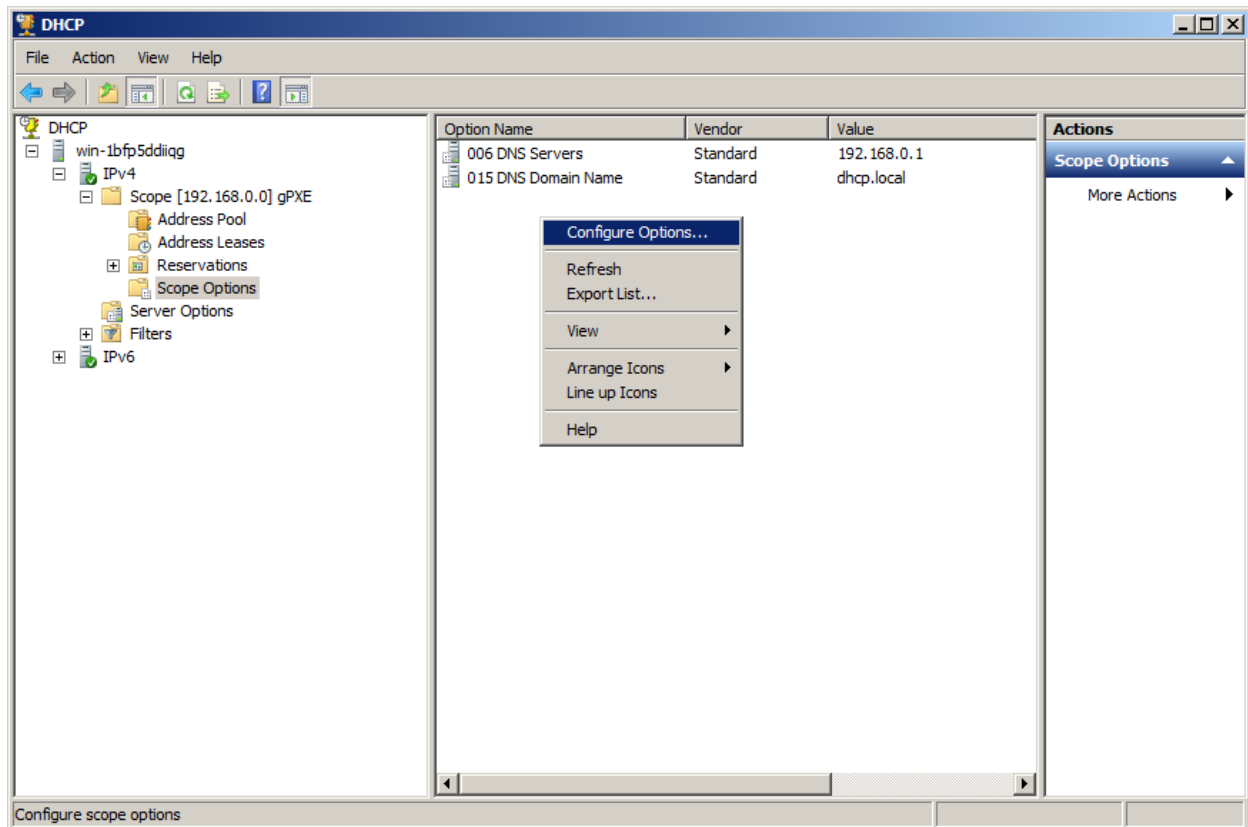
Actions

Scope Options

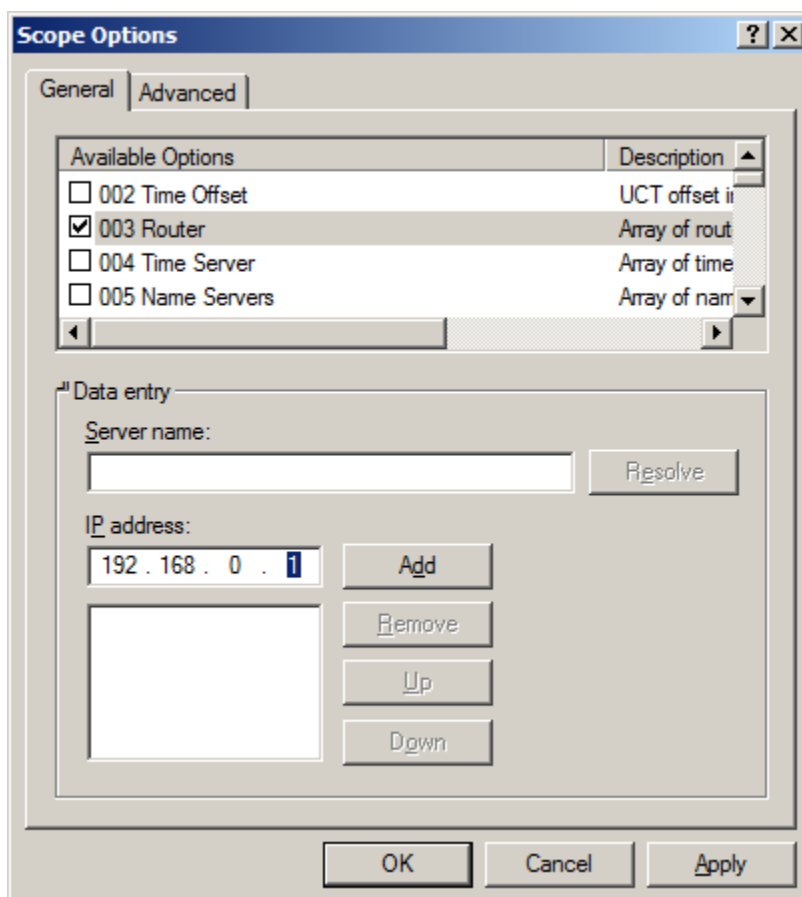
More Actions

From **DHCP** server main window, choose **Scope Options** in your new **Scope**.

Here you will to add options for your gPXE boot. To do it, please click with your **right mouse button** on empty space and choose **Configure Options**.

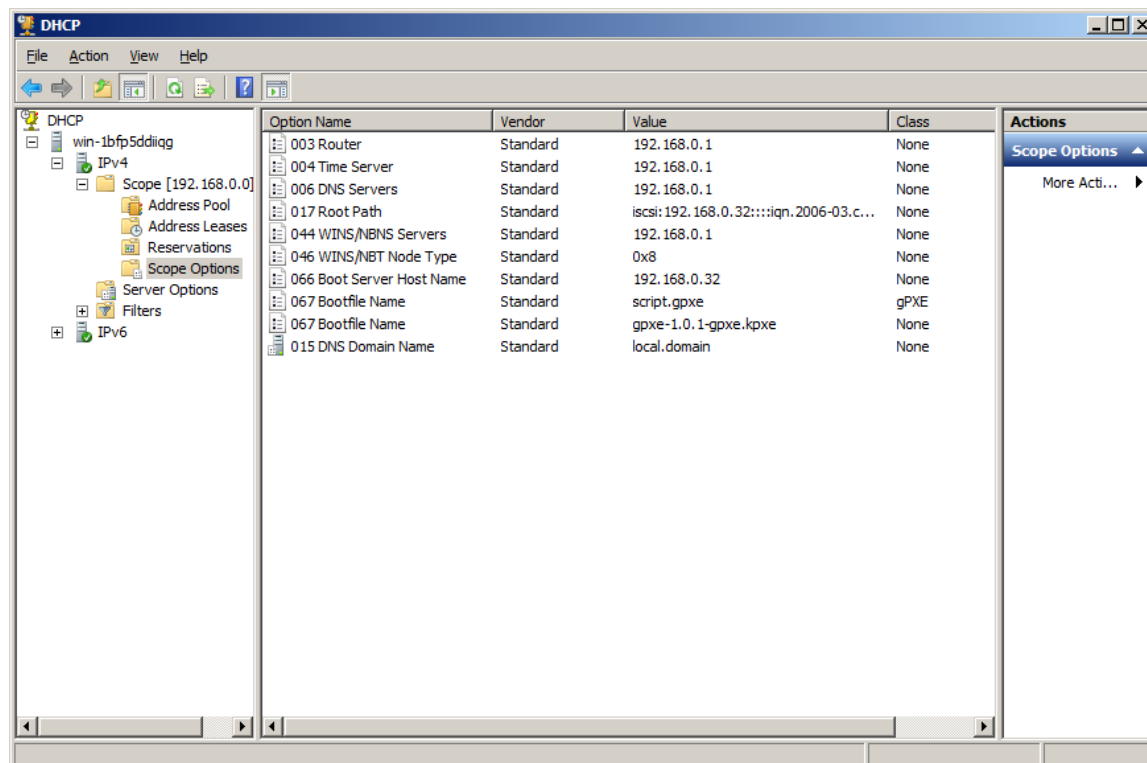


In this window, you will need to set up several options.

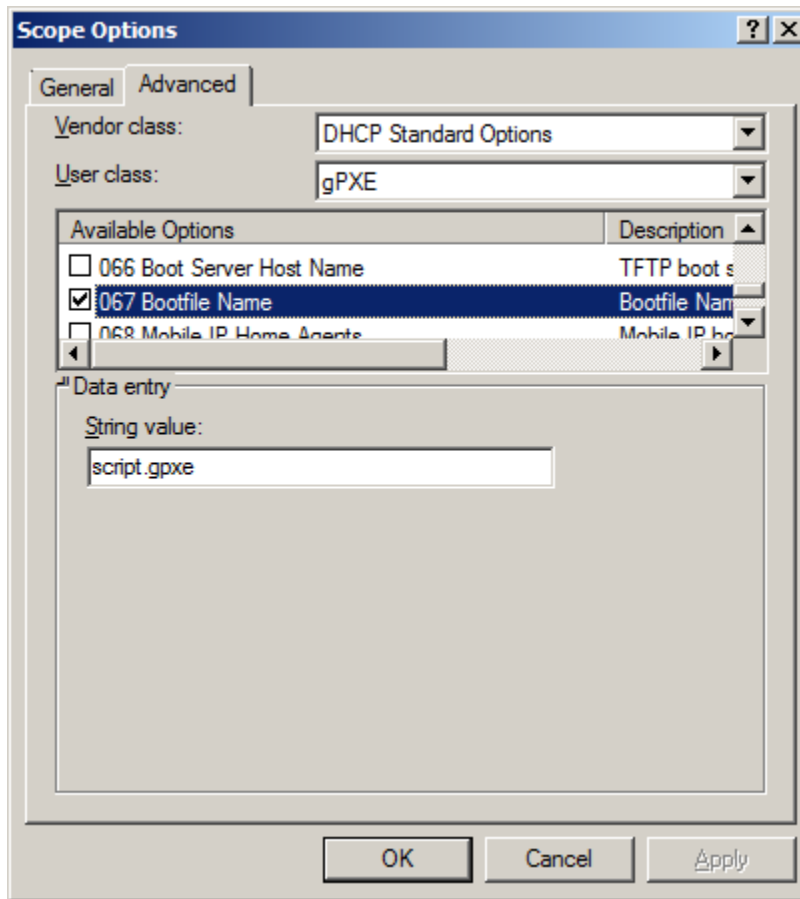


Please do them as described below.

Option Name	Vendor	Value	Class	Option Name
003 Router	Standard	Yours router IP	None	003 Router
004 Time Server	Standard	Yours time server IP	None	004 Time Server
006 DNS Servers	Standard	Yours DNS server IP	None	006 DNS Servers
Your IP address and IQN of iSCSI target				
017 Root Path	Standard	<i>iscsi:192.168.0.32:::iqn.2006-03.com.kernsafe:gppe.boot</i>	None	017 Root Path
044 WINS/NBNS Servers	Standard	Yours WINS/NBNS server IP	None	044 WINS/NBNS Servers
046 WINS/NBT Node Type	Standard	0x8	None	046 WINS/NBT Node Type
066 Boot Server Host Name	Standard	Yours boot server IP (machine with tFTP server installed)	None	066 Boot Server Host Name
067 Bootfile Name	Standard	script.gpxe	gPXE	067 Bootfile Name
067 Bootfile Name	Standard	gppe-1.0.1-gppe.kppe	None	067 Bootfile Name
015 DNS Domain Name	Standard	Yours DNS domain name	None	015 DNS Domain Name



To add option **067 Bootfile Name** with class **gPXE**, please switch to **Advanced** tab and chose **gPXE** from **User class** list.



Option **17 Root path** need to be set up using below scheme:

iscsi:XXX.XXX.XXX.XXX:::YYY.YYY-YY.YYY.YYY:YYY

where **XXX.XXX.XXX.XXX** is IP address off your iStorage Server
and **YYY.YYY-YY.YYY.YYY:YYY** is IQN of iSCSI target

For the target I set up earlier in iStorage Server, correct configuration is:

iscsi:192.168.0.32:::iqn.2006-03.com.kernsafe:gpxe.boot

After checking every option and making sure that iStorage Server and tFTP are running, you may switch to client machine and turn it on using network diskless boot.

If you set up every option correctly, your network booting screen should look like this:

```
gPXE 1.0.1 -- Open Source Boot Firmware -- http://etherboot.org
Features: AoE HTTP iSCSI DNS TFTP bzImage COMBOOT ELF Multiboot NBI PXE PXEXT

net0: 00:0c:29:3e:54:92 on PCI02:00.0 (open)
  [Link:up, TX:0 TXE:0 RX:0 RXE:0]
DHCP (net0 00:0c:29:3e:54:92).... ok
net0: 192.168.0.200/255.255.255.0 gw 192.168.0.1
Booting from filename "script.gpxe"
tftp://192.168.0.32/script.gpxe. ok
Registered as BIOS drive 0x80
Booting from BIOS drive 0x80
Boot failed
Preserving connection to SAN disk
Could not boot from iscsi:192.168.0.32:::iqn.2006-03.com.kernsafe:gpxe.boot: No
t an executable image (0x2e852001)
Could not boot from filename "script.gpxe": Error 0x00000001
No more network devices

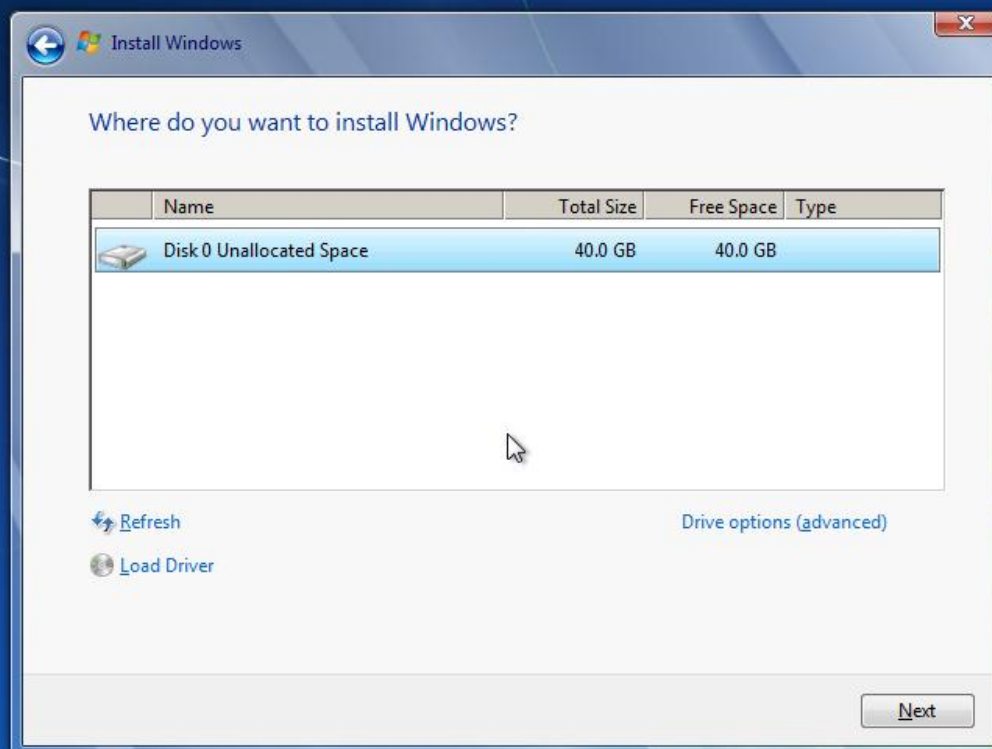
gPXE> _
```

Installing Operating System on the network hard drive

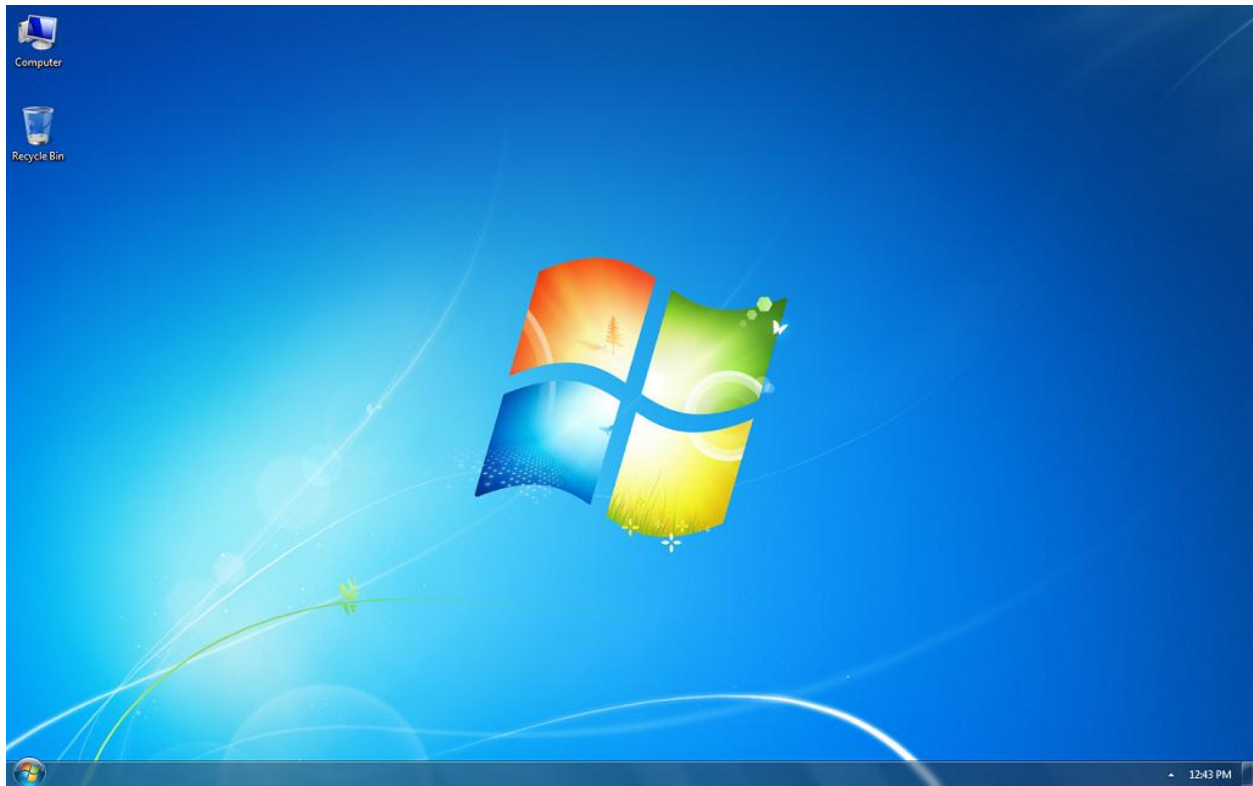
Installing Operating System, such as Windows, on the network hard drive is as simple as it would be on normal physical hard drive. After placing the CD/DVD into the Optical Drive, and setting it up as a second device from where to boot from, just follow the instructions and choose the network drive as a disk on which you want to install OS.

NOTE: Older operating systems such as Windows XP or Windows Server 2003 may require additional drivers to successfully perform installation of OS.

Follow Windows 7 installation steps to install OS on iSCSI Target Device.



iSCSI Target Device looks just like a normal disk, you may format it or partition it, just like a normal physical hard drive.



After successfully installing OS, you may boot to Windows and start using it as a normal OS, every network task will be performed transparently to the user.

Contact

Support: support@kernsafe.com
Sales: sales@kernsafe.com
Marketing: marketing@kernsafe.com
Home Page: <http://www.kernsafe.com>
Product Page: <http://www.kernsafe.com/product/istorage-server.aspx>
Licenses <http://www.kernsafe.com/product/istorage-server/license-compares.aspx>
Forum: <http://www.kernsafe.com/forum>



KernSafe Technologies, Inc.

www.kernsafe.com

Copyright © KernSafe Technologies 2006-2011. All right reserved.