

VirtualSAN: HA and Hyper-Converged iSCSI SAN for Citrix XenServer

Wednesday, Dec 7, 2016



KernSafe Technologies, Inc.

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Overview

The Virtual SAN is native version of KernSafe iSCSI SAN cross-platform which can work in the VMWare cSphere (ESX, ESXi) and Citrix XenServer host machine. It quickly brings the benefits are:

1. Build Hyper-Converged Infrastructure or high availability visualization server with only two servers (two nodes high availability).
2. Convert VMWare vSphere and Citrix XenServer into hyper converged servers, allows it can provide both compute and storage service.

Citrix Xen Server™ is the only enterprise-class, cloud-proven virtualization platform that delivers the critical features of live migration and centralized multi-server management at no cost. Xen Server is an open and powerful server virtualization solution that radically reduces datacenter costs by transforming static and complex datacenter environments into more dynamic, easy to manage IT service delivery centers.

High availability is the implementation of technology so that if a component fails, another can take over for it. By using highly available platforms, the downtime for a system can be reduced, and, in many cases, it can be reduced to a short enough time that the users of the system do not see the failure.

Now, assume you have two servers want to run XenServer, have IP address as follows:

Name	IP Address	OS	Usage
Manage Node	Any	Windows	Management
Node1	192.168.0.231	Bare or Linux	Compute and storage
Node2	192.168.0.232	Bare or Linux	Compute and storage

Install XenServer

You need two servers which running XenServer. XenServer must first be installed on to a suitable machine that will be used to create the virtual environment. For how to obtain or install Citrix Xen Server, please contact the Citrix supplier.

Install Virtual Native SAN

Logon to XenServer nodes to console by local server machine or ssh:

```
#ssh root@192.168.0.231
```

Download KernSafe Virtual Native SAN:

```
#wget http://www.kernsafe.com/download/virtual-native-san.5.30.tar.gz
```

Note the version number can be changed if new version available.

```
#tar -zxvf virtual-native-san.5.30.tar.gz
```

Enter the VirtualSAN directory:

```
[root@localhost package]# ls
asyncplugin.so      install.sh           partitionplugin.so  target_common.so
autosnapplugin.so   iscsisvc.so         smtpplugin.so       userplugin.so
cdpplugin.so        logplugin.so        snapshot.so         Users.db
failoverplugin.so   memdiskplugin.so    supersan            vhdplugin.so
imageplugin.so       mirrorplugin.so     supersand           ximageplugin.so
[root@localhost package]# _
```

Install it

```
#./install
```

```
[root@localhost package]# ./install.sh
Stopping KernSafe SuperSAN OK
Starting KernSafe SuperSAN OK
[root@localhost package]# _
```

Now the VirtualSAN has been installed to XenServer host machine, redo the work on another node.

Configure firewall

You need add TCP port 3260 and 3261 to be opened in firewall, or just disable if you are running in testing mode:

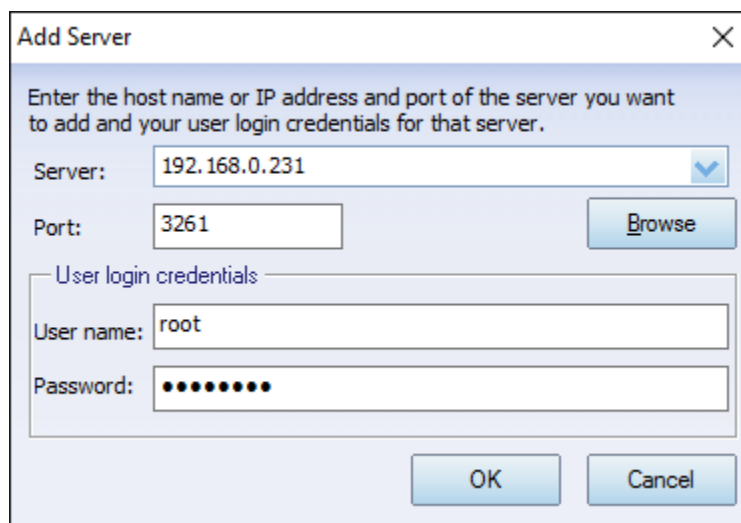
```
#service iptables stop
```

Configuring on Management Node

The same as XenServer, VirtualSAN does also need Windows based machine as management node, in Windows:

Launch **KernSafe iSCSI SAN Management Console**.

Click Server->Add another server menu item, the Add Server dialog shows.



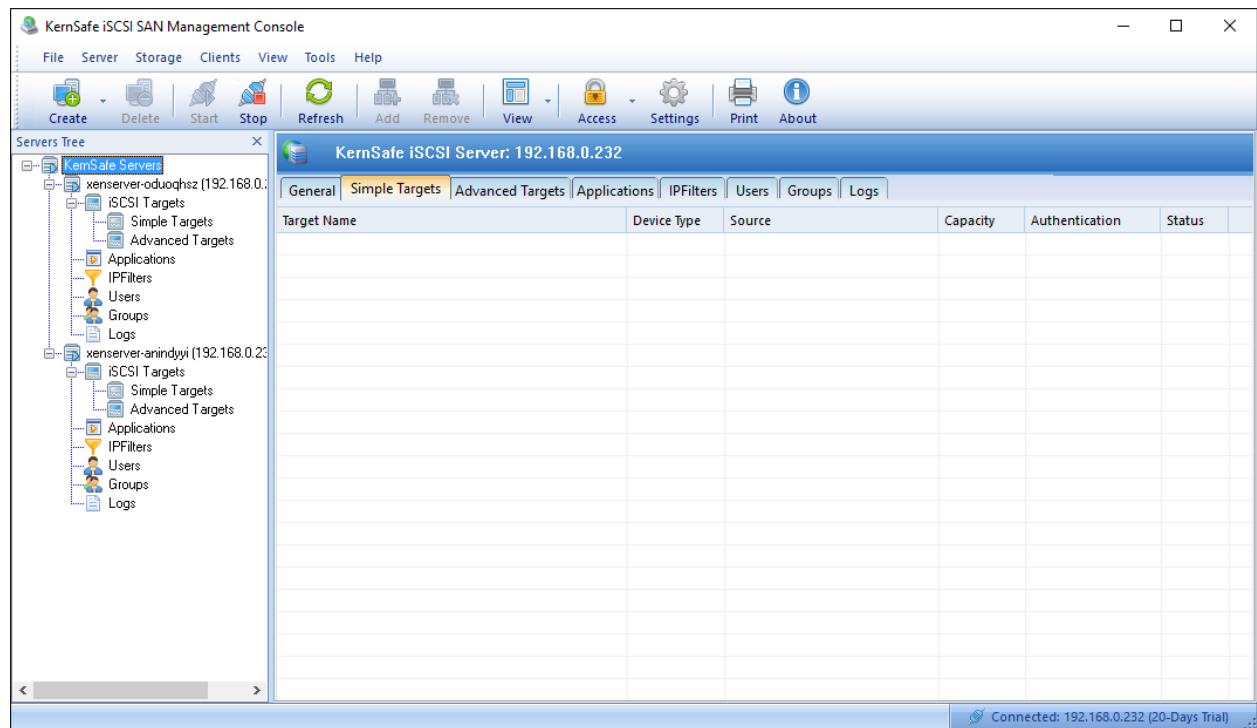
The image shows a Windows-style dialog box titled "Add Server" with a close button (X) in the top right corner. The dialog contains the following fields and controls:

- A text box labeled "Server:" containing the IP address "192.168.0.231".
- A text box labeled "Port:" containing the number "3261".
- A "Browse" button next to the Port field.
- A section titled "User login credentials" containing:
 - A text box labeled "User name:" containing the text "root".
 - A text box labeled "Password:" containing ten black dots.
- "OK" and "Cancel" buttons at the bottom right.

Fulfill the dialog with the credential of remote KernSafe VirtualSAN server, then click the OK button to add.

Do the same way with the second server.

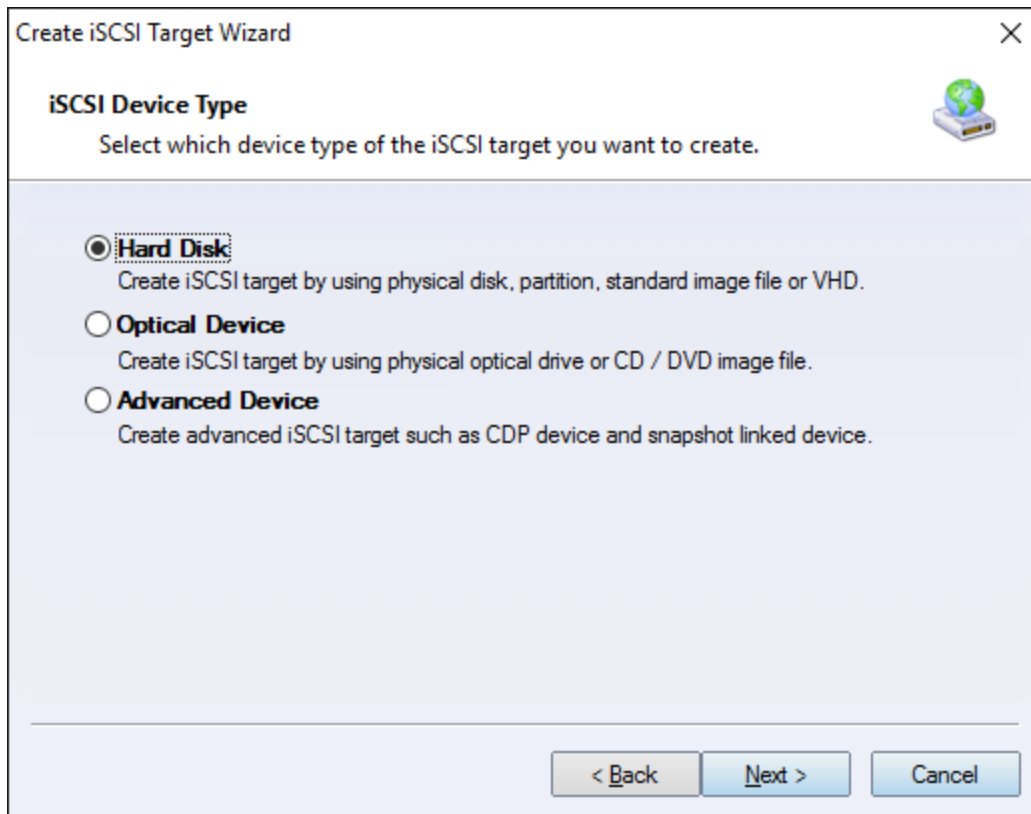
Note: if you are running **trial** mode, you need click the "Start" button to manually start iSCSI service.



Create Target on Node1

Launch the **iStorage Server Management Console**, press the **Create** button on the toolbar of iStorage Server management console, the **Create Device Wizard** is shown.

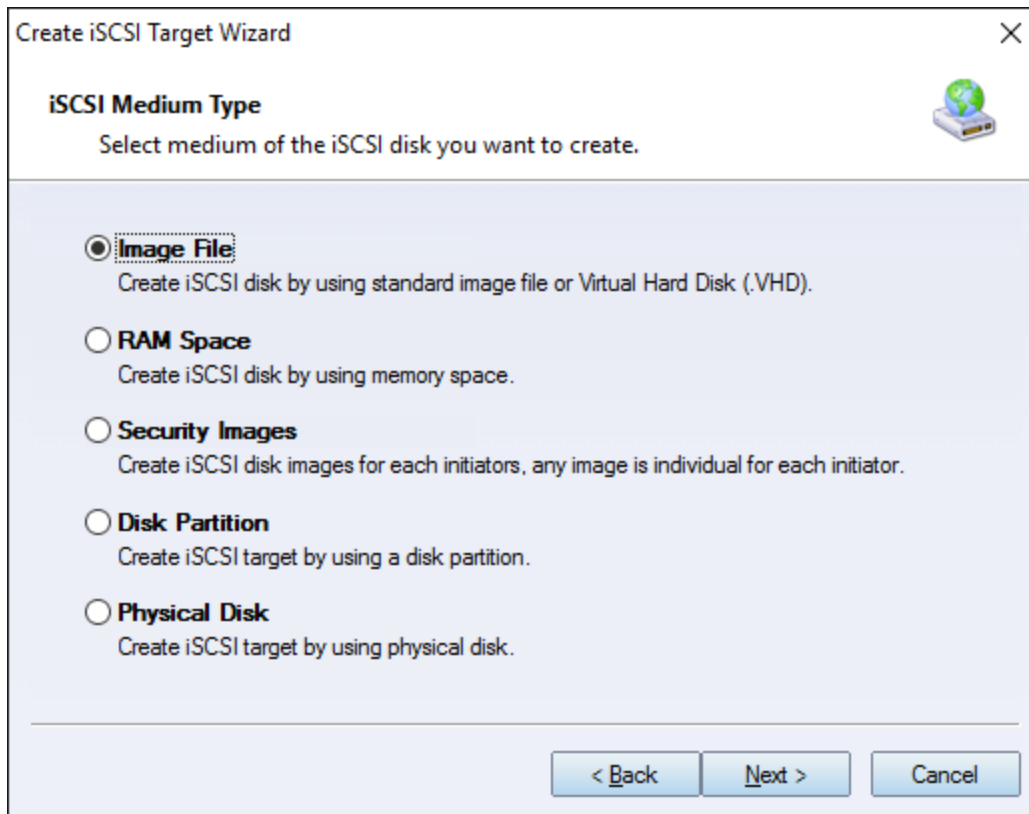
Select a device type



Choose **Hard Disk**.

Press the **Next** button to continue.

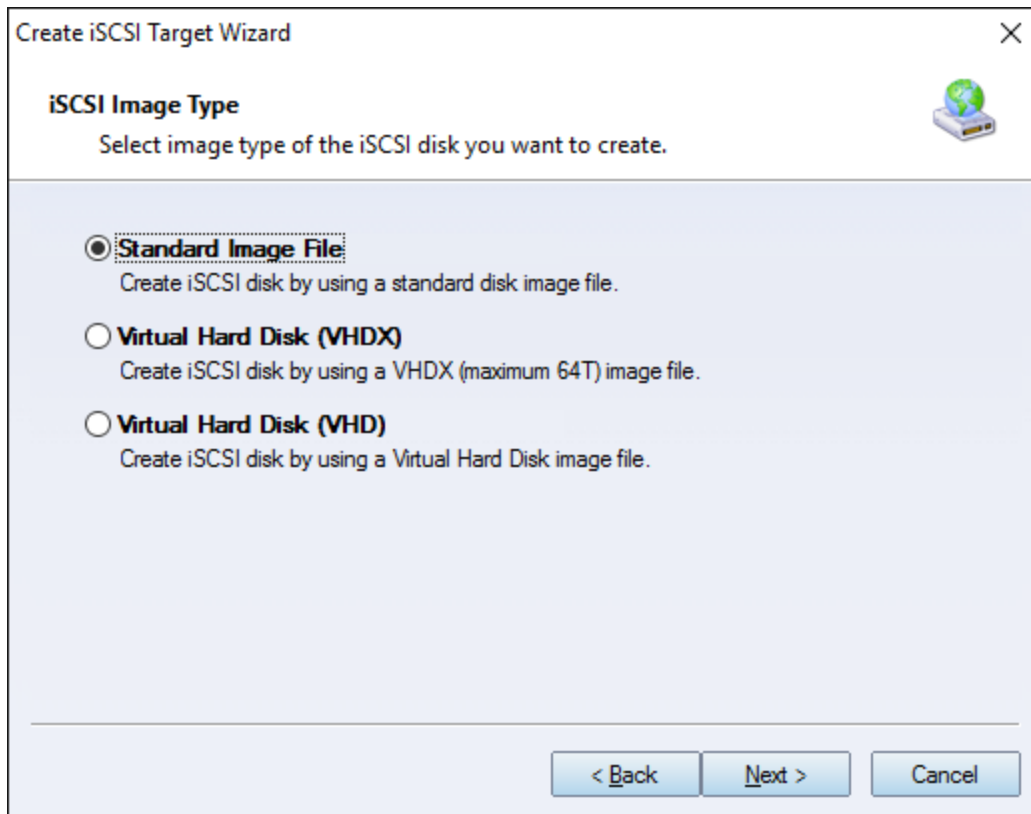
Select a medium type.



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

Then press **Next** button to continue.

Select an Image type.



Choose **Standard Image File**.

Press the **Next** button to continue.

Specify image file path and size.

Create iSCSI Target Wizard

Virtual Image Disk Configuration

Specify a image file full path and parameters.

Image file parameters

☒ Create a new image file ☐ Use existing image file

Full path and name of the image file:

Device Size in MBs:

☐ Fill with zeros ☐ Enable windows cache

File system options

☐ Sparse file (Recommended for image files smaller then 1TB)

☐ Compressed (Enable file system compress feature)

☐ Encrypted (Enable NTFS encryption feature)

< Back Next > Cancel


Specify the image file.

Specify the device size.

Press the **Next** button to continue.

Set authorization mode.

Create iSCSI Target Wizard ✕

Authorization 

You can select an authorization mode, Anonymous, CHAP or IP filter.

☒ **Anonymous**
Select this option to disable any authorization.

☐ **CHAP**
Select this option to use CHAP authorization.

☐ **IP Filter**
Select this option to use IP address authorization.

☐ **Mixed**
Select this option to use both CHAP and IP address authorization.

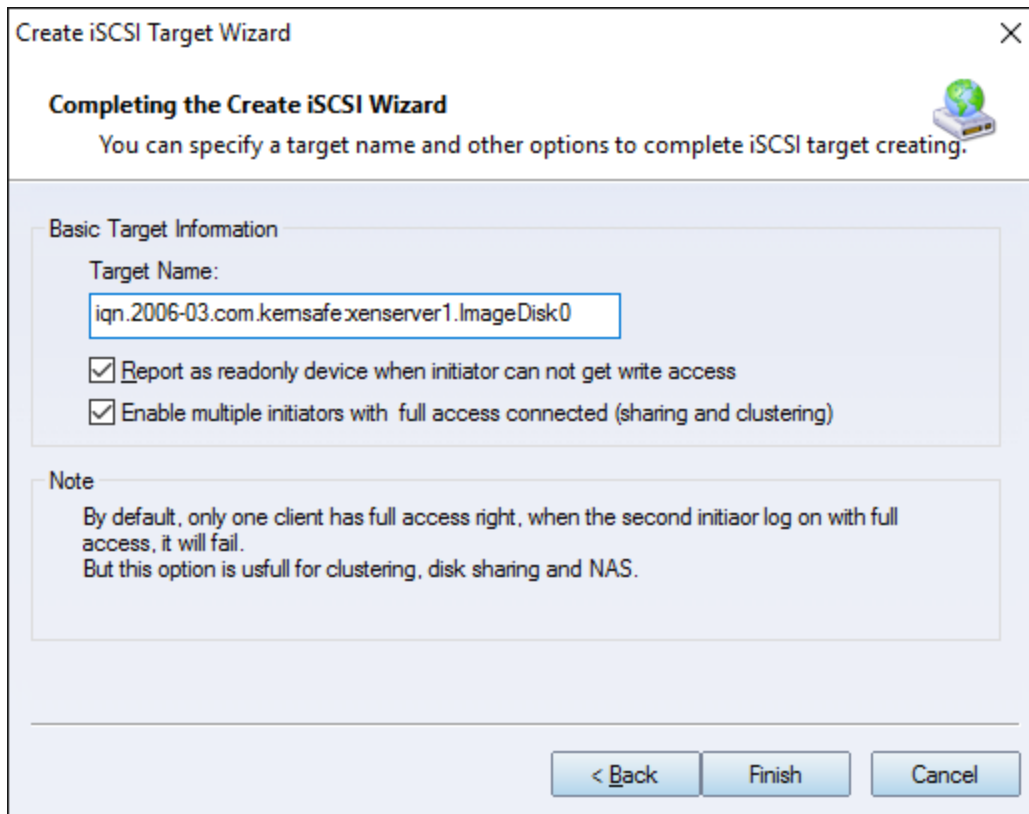
☒ Inherit security roles from global settings.

< Back Next > Cancel

Choose **Anonymous** authorization.

Press the **Next** button to continue.

Finish creating iSCSI Target



Type a target name in the Target Name field, we use **iqn.2006-03.com.kernsafe:xenserver1.ImageDisk0** as an example.

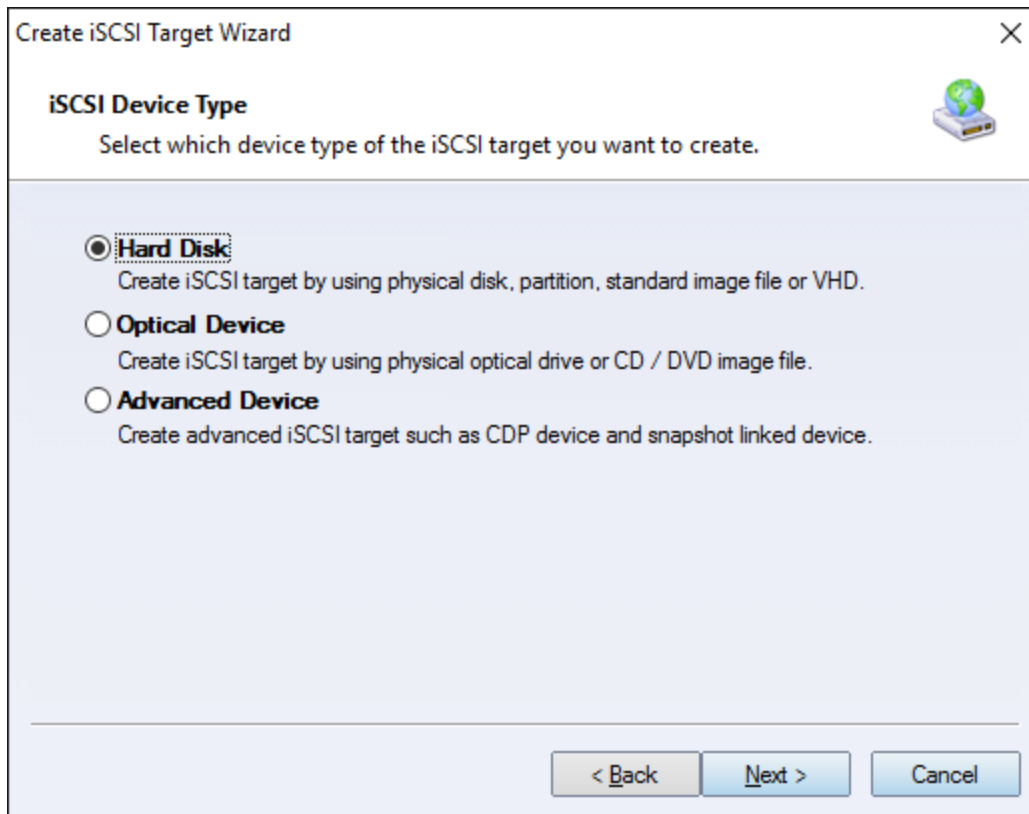
Check the **Enable multiple initiators with full access connected (sharing and clustering)** check box.

Press the **Finish** button to complete create target.

Create Target on Node2

Launch the **iStorage Server management console**, press the **Create** button on the toolbar of iStorage Server management console, the **Create Device Wizard** is shown.

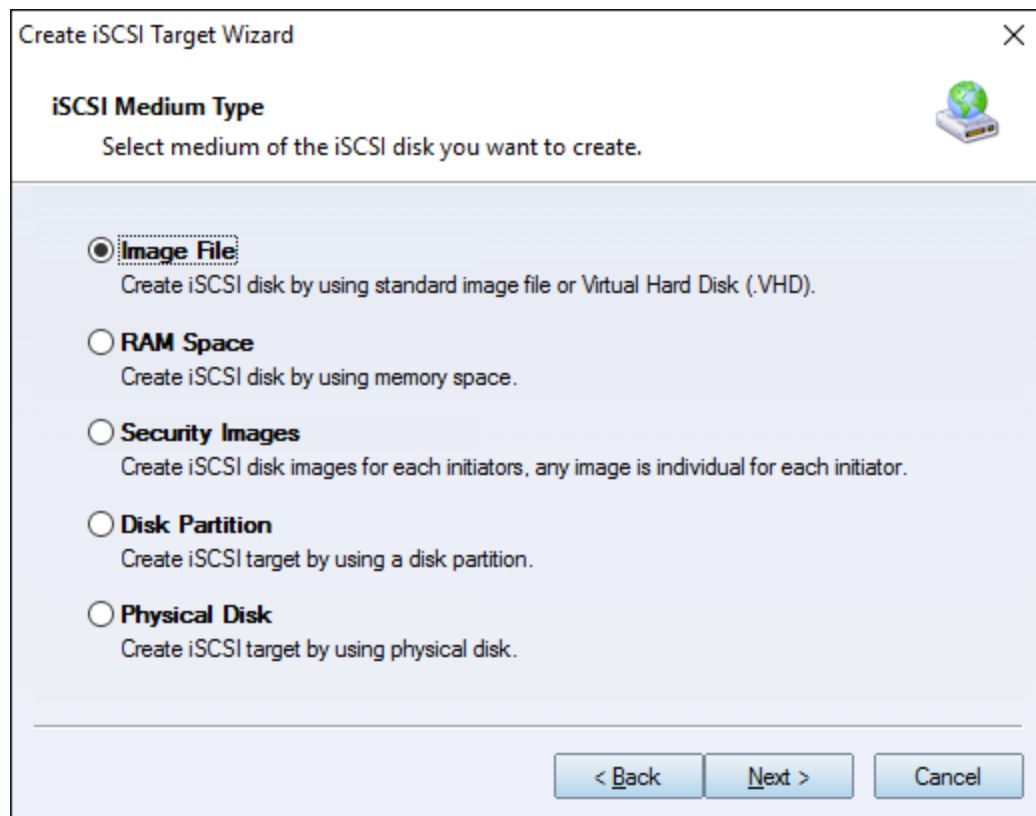
Select a device type



Choose **Hard Disk**.

Press the **Next** button to continue.

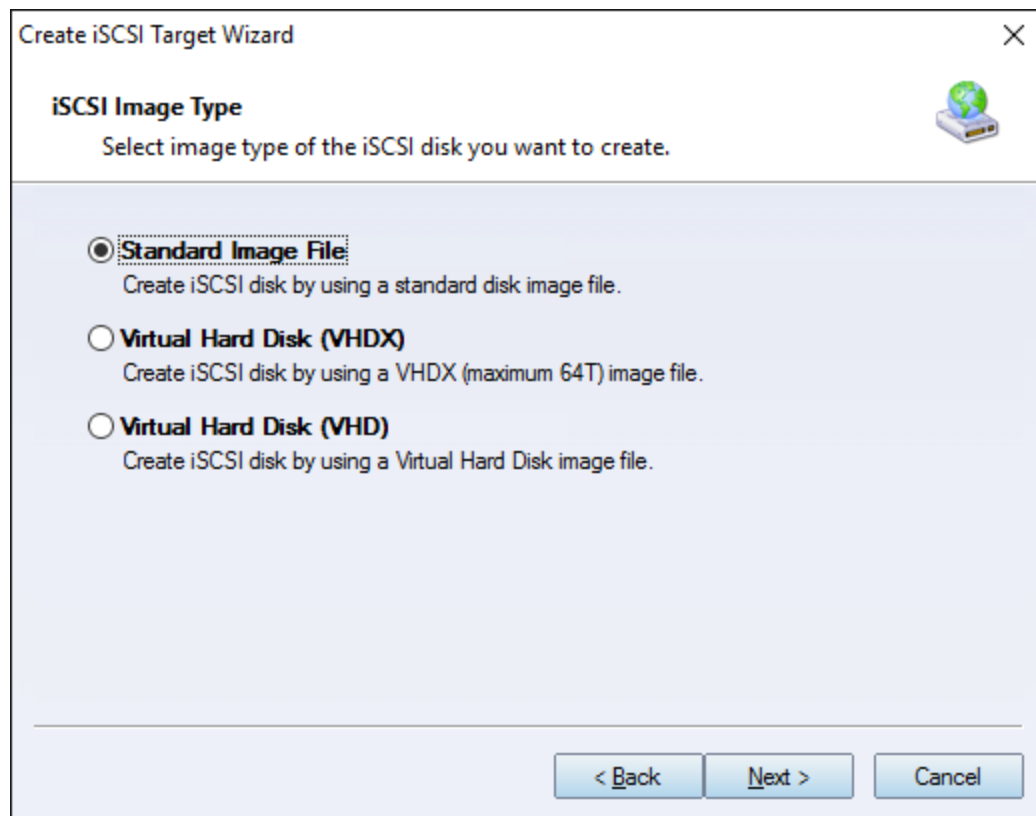
Select a medium type.



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

Then press **Next** button to continue.

Select an Image type.



Choose **Standard Image File**.

Press the **Next** button to continue.

Specify image file path and size.

Create iSCSI Target Wizard

Virtual Image Disk Configuration

Specify a image file full path and parameters.

Image file parameters

☒ Create a new image file ☐ Use existing image file

Full path and name of the image file:

Device Size in MBs:

☐ Fill with zeros ☐ Enable windows cache

File system options

☐ Sparse file (Recommended for image files smaller then 1TB)

☐ Compressed (Enable file system compress feature)

☐ Encrypted (Enable NTFS encryption feature)

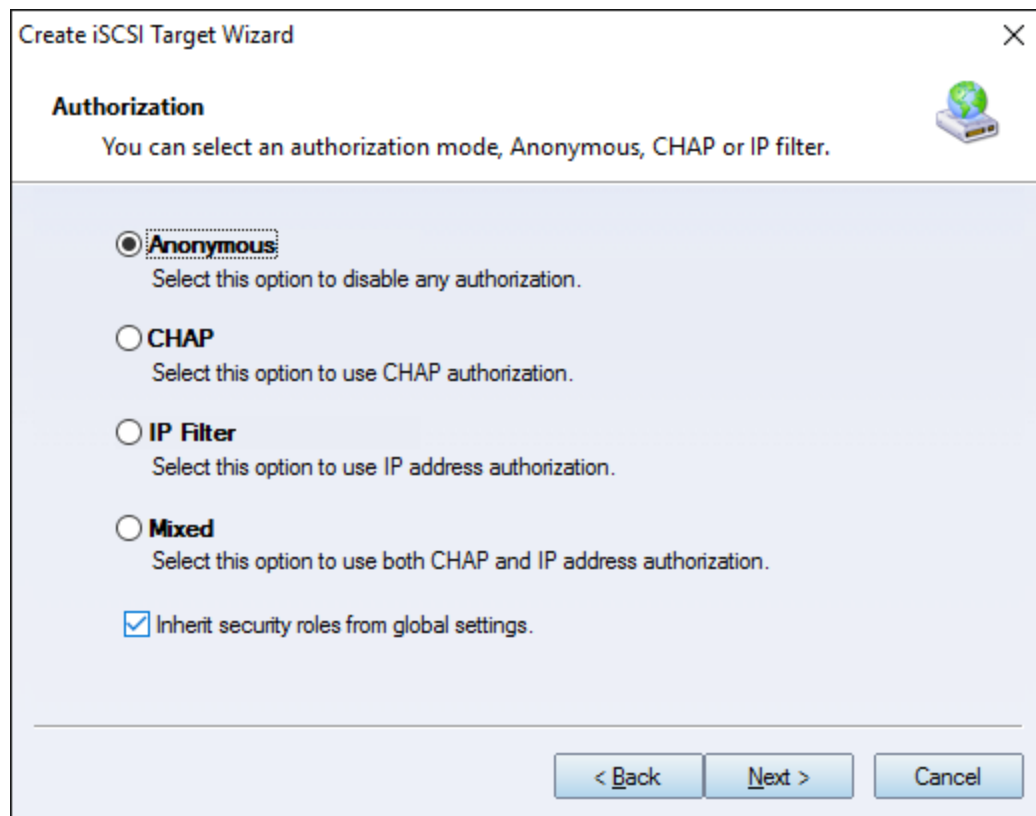
< Back Next > Cancel

Specify the image file.

Specify the device size.

Press the **Next** button to continue.

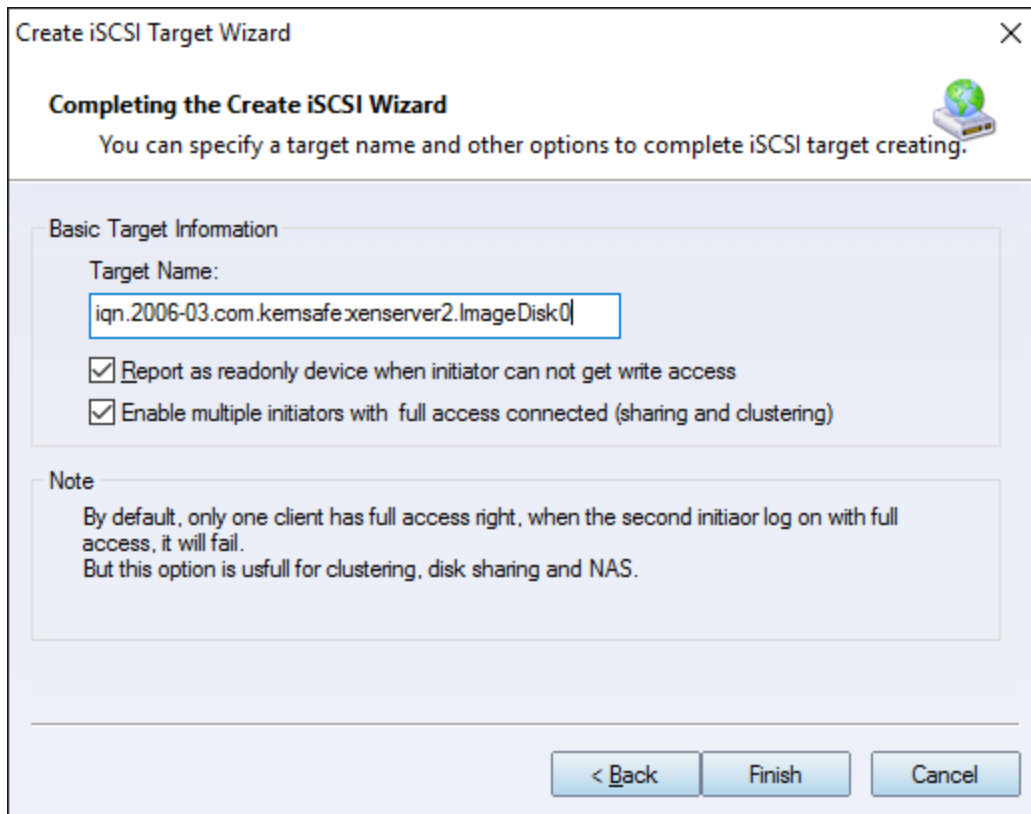
Set authorization mode.



Choose **Anonymous** Authorization.

Press the **Next** button to continue.

Finish creating iSCSI Target



Type a target name in the Target Name field.

Check the **Enable multiple initiators with full access connected (sharing and clustering)** check box.


Press the **Finish** button to complete create target.

Creating Application on Node1

On Server1, right click **Applications** on the left tree of the main interface, choose **Create Application** on the pop-up menu, the **Create Application Wizard** widow will be shown.

Create Application Wizard ✕

Application Type
Select which type application that you want to create.



☐ **Synchronous Replication**
Create real-time remote synchronous replication to iSCSI target or image file.

☐ **Asynchronous Replication**
Create real-time remote asynchronous replication to iSCSI target or image file.

☒ **High Availability Node**
Create a high-availability iSCSI SAN node or synchronizing with other iSCSI targets.

< Back Next > Cancel

Choose **High Availability Node**.

Then press **Next** to continue.

Create Application Wizard

Failover Configuration

You can specify two servers to fail over each other.

Base Target

Target Name	Device Type
<input checked="" type="checkbox"/> iqn.2006-03.com.kemsafe.xenserver1.ImageDisk0	Disk

Partner Target

< Back Next > Cancel

Check the **iqn...xenserver1.ImageDisk0** storage and click **Edit** to find the mirror target.

Select iSCSI Target

iSCSI Source

Host Name: Port:

CHAP

☐ Use CHAP to logon

User Name:

Secret:

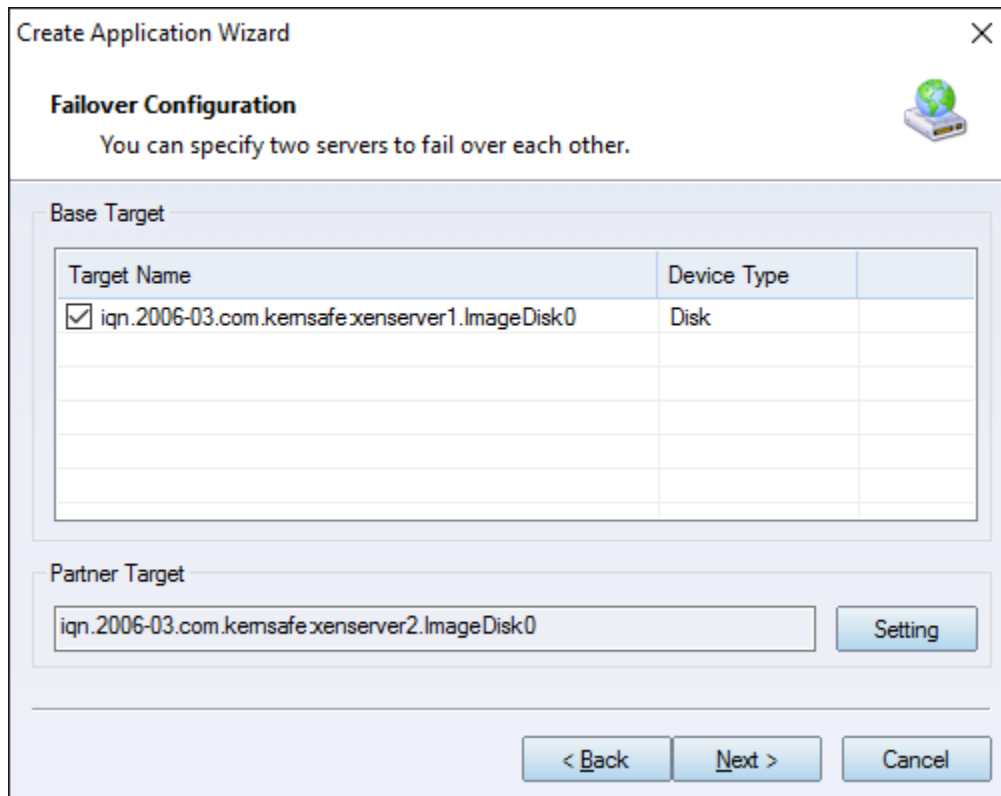
Target

Target:

Input the IP and port of server2 in **iSCSI Source** tab, and then click **Discovery** on the bottom of the window to find the mirror target, choose the **iqn...xenserver2.ImageDisk0** in the down-list.

Press **OK** button to continue.

Note: If the target needs CHAP authorization, you should provide User name and secret to logon.



The image shows a 'Create Application Wizard' window with a 'Failover Configuration' tab. The window has a title bar with a close button (X) and a small globe icon. The main content area is divided into two sections: 'Base Target' and 'Partner Target'. The 'Base Target' section contains a table with columns 'Target Name' and 'Device Type'. The first row is checked and contains the text 'iqn.2006-03.com.kemsafe.xenserver1.ImageDisk0' and 'Disk'. The 'Partner Target' section contains a text box with the text 'iqn.2006-03.com.kemsafe.xenserver2.ImageDisk0' and a 'Setting' button. At the bottom of the window are three buttons: '< Back', 'Next >', and 'Cancel'.

Create Application Wizard

Failover Configuration

You can specify two servers to fail over each other.

Base Target

Target Name	Device Type
<input checked="" type="checkbox"/> iqn.2006-03.com.kemsafe.xenserver1.ImageDisk0	Disk

Partner Target


iqn.2006-03.com.kemsafe.xenserver2.ImageDisk0 Setting

< Back Next > Cancel

The mirror target will be added to the window, then click **Next** button to continue.

Create Application Wizard [X]

Synchronization Settings
You can specify parameters for synchronization.



Sync

Local Address: Any [v] Local Port: Any [v]
Remote Address: 192.168.0.232 [v] Remote Port: 3260

Alternative Sync 1

Local Address: Any [v] Local Port: Any [v]
Remote Address: [v] Remote Port: 0

Alternative Sync 2

Specify a folder to save temporary data dump (folder must exist):

/tmp [Browse]

< Back Next > Cancel

Specify local interface, port for Sync interface and Heartbeat interface, if you have two NIC for each server, you can specify different address-pair for Sync interface and Heartbeat interface, if you have only one NIC for synchronous, you can use same address for Sync and Heartbeat.


Specify the portal and port.

Press **Next** to continue

Mirror Synchronization [X]

Synchronization Type

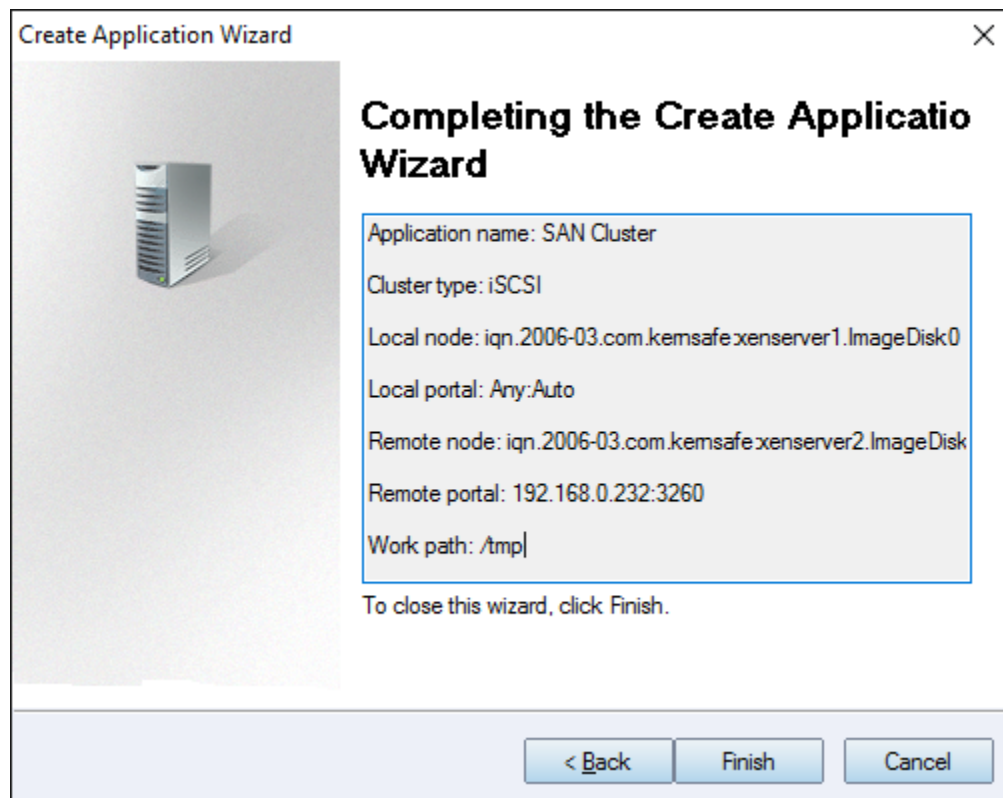
☐ Create mirror device with full synchronization from base iSCSI target
☒ Create mirror device without synchronization (Manual Initialization)

 Warning: all data on the mirror device will be destroyed after synchronization.

OK Cancel

Now, the mirror target should be synchronized to the base target, if the two targets are both the new one and do not be initialized, we can choose **Create mirror device without synchronization (Manual Initialization)**, otherwise, we must choose **Create mirror device with full synchronization from base iSCSI target**.

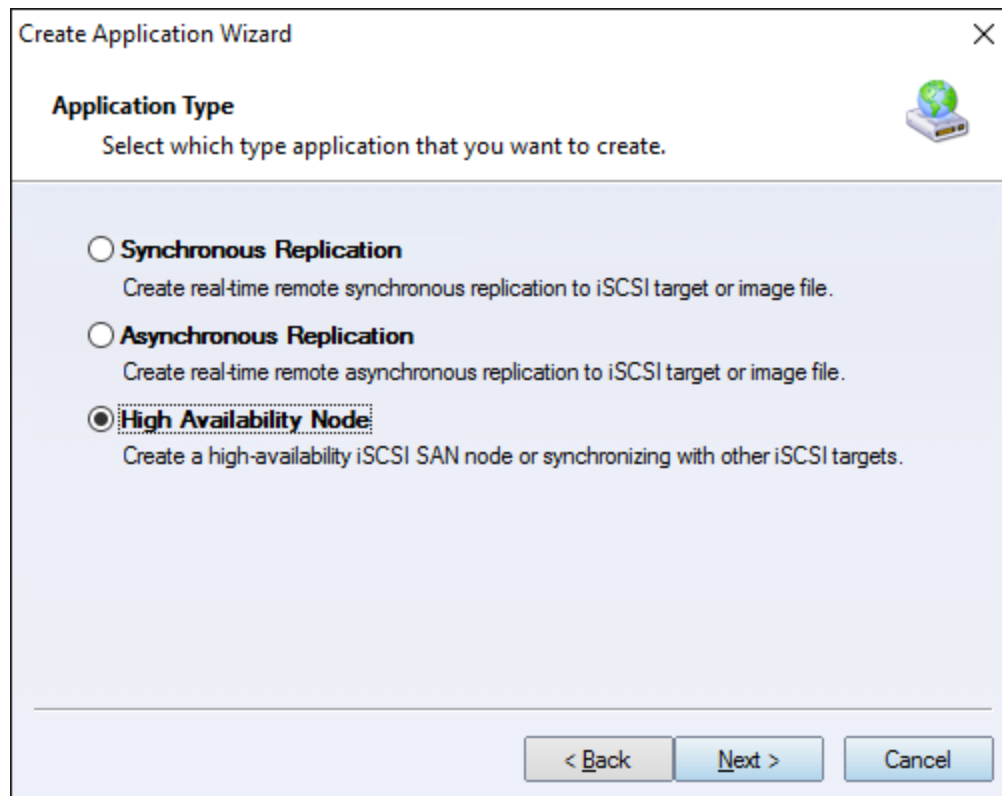
Press **OK** button to continue.



Click **Finish** button to complete the application creation.

Creating Application on Node2

On server node2, right click **Applications** on the left tree of the main interface, choose **Create Application** on the pop-up menu, the **Create Application Wizard** widow will be shown.



Choose **High Availability Node**.

Then press **Next** to continue.

Create Application Wizard

Failover Configuration

You can specify two servers to fail over each other.

Base Target

Target Name	Device Type
<input checked="" type="checkbox"/> iqn.2006-03.com.kemsafe.xenserver2.ImageDisk0	Disk

Partner Target

Setting

< Back Next > Cancel

Check the **iqn...xenserver2.ImageDisk0** storage and click **Setting** to find the partner target.

Select iSCSI Target

iSCSI Source

Host Name: Port:

CHAP

☐ Use CHAP to logon

User Name:

Secret:

Target

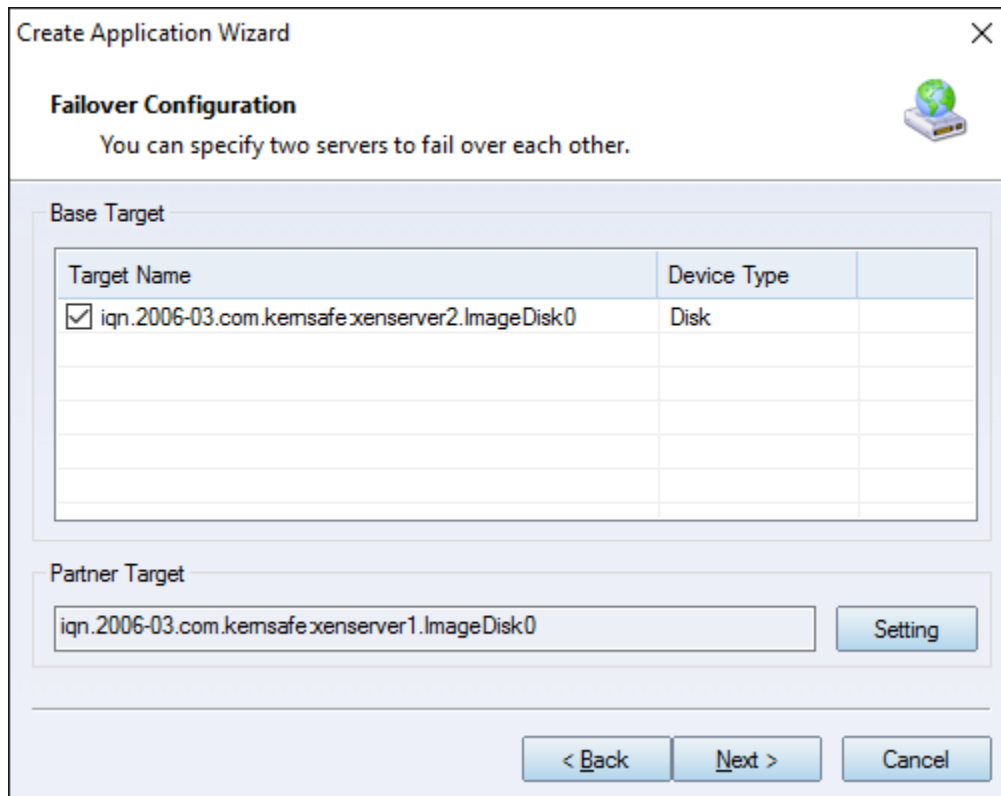
Target: ▼

Discovery OK Cancel

Input the IP and port of server1 in **iSCSI Source** tab, and then click **Discovery** on the bottom of the window to find the mirror target, choose the **iqn...xenserver2.ImageDisk0** in the down-list.

Press **OK** button to continue.

Note: If the target needs CHAP authorization, you should provide User name and secret to logon.



The image shows a 'Create Application Wizard' window with a 'Failover Configuration' tab. The window has a title bar with a close button (X) and a small globe icon. Below the title bar, the text 'You can specify two servers to fail over each other.' is displayed. The main area is divided into two sections: 'Base Target' and 'Partner Target'. The 'Base Target' section contains a table with columns 'Target Name' and 'Device Type'. The first row is checked and contains the text 'iqn.2006-03.com.kemsafe.xenserver2.ImageDisk0' and 'Disk'. The 'Partner Target' section contains a text box with the text 'iqn.2006-03.com.kemsafe.xenserver1.ImageDisk0' and a 'Setting' button. At the bottom of the window are three buttons: '< Back', 'Next >', and 'Cancel'.

Target Name	Device Type
<input checked="" type="checkbox"/> iqn.2006-03.com.kemsafe.xenserver2.ImageDisk0	Disk

Partner Target

iqn.2006-03.com.kemsafe.xenserver1.ImageDisk0 Setting

< Back Next > Cancel

The mirror target will be added to the window, then click **Next** button to continue.

Create Application Wizard

Synchronization Settings
You can specify parameters for synchronization.

Sync

Local Address: Any Local Port: Any

Remote Address: 192.168.0.231 Remote Port: 3260

Alternative Sync 1

Local Address: Any Local Port: Any

Remote Address: Remote Port: 0

Alternative Sync 2

Specify a folder to save temporary data dump (folder must exist):

/tmp Browse

< Back Next > Cancel

Specify Sync and Heartbeat interface.


Press the Next button to continue.

Mirror Synchronization

Synchronization Type

☐ Create mirror device with full synchronization from base iSCSI target

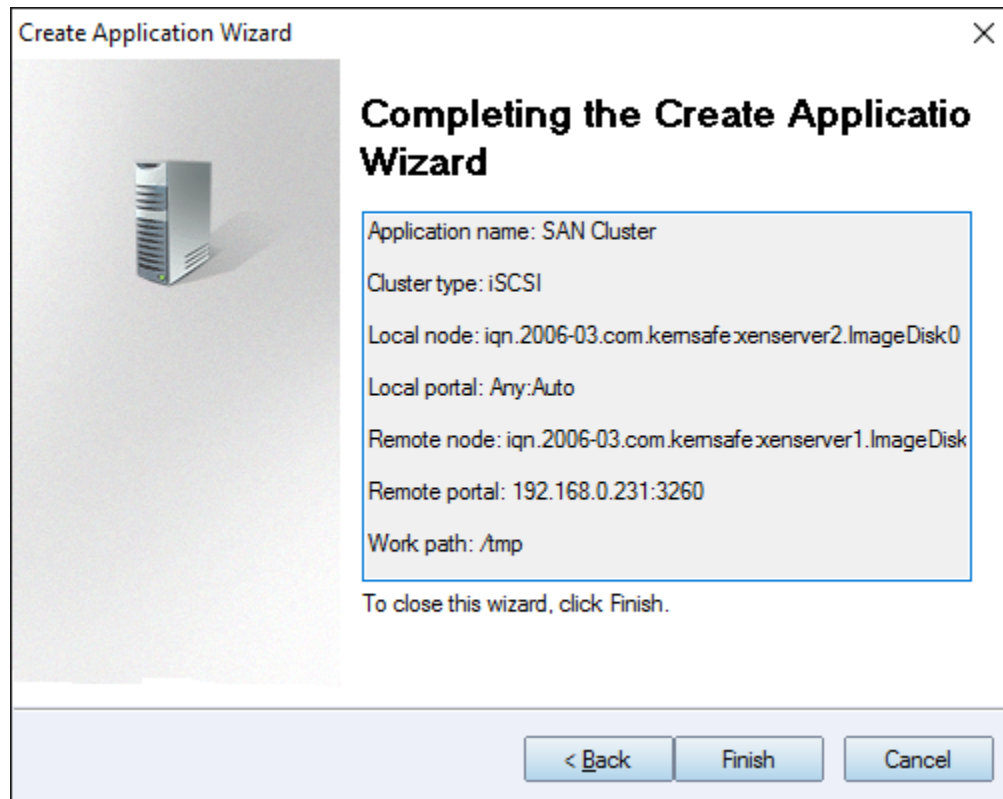
☒ Create mirror device without synchronization (Manual Initialization)

 Warning: all data on the mirror device will be destroyed after synchronization.

OK Cancel

Now, the mirror target should be synchronized to the base target, if the two targets are both the new one and do not be initialized, we can choose **Create mirror device without synchronization (Manual Initialization)**, otherwise, we must choose **Create mirror device with full synchronization from base iSCSI target**.

Press **OK** button to continue.

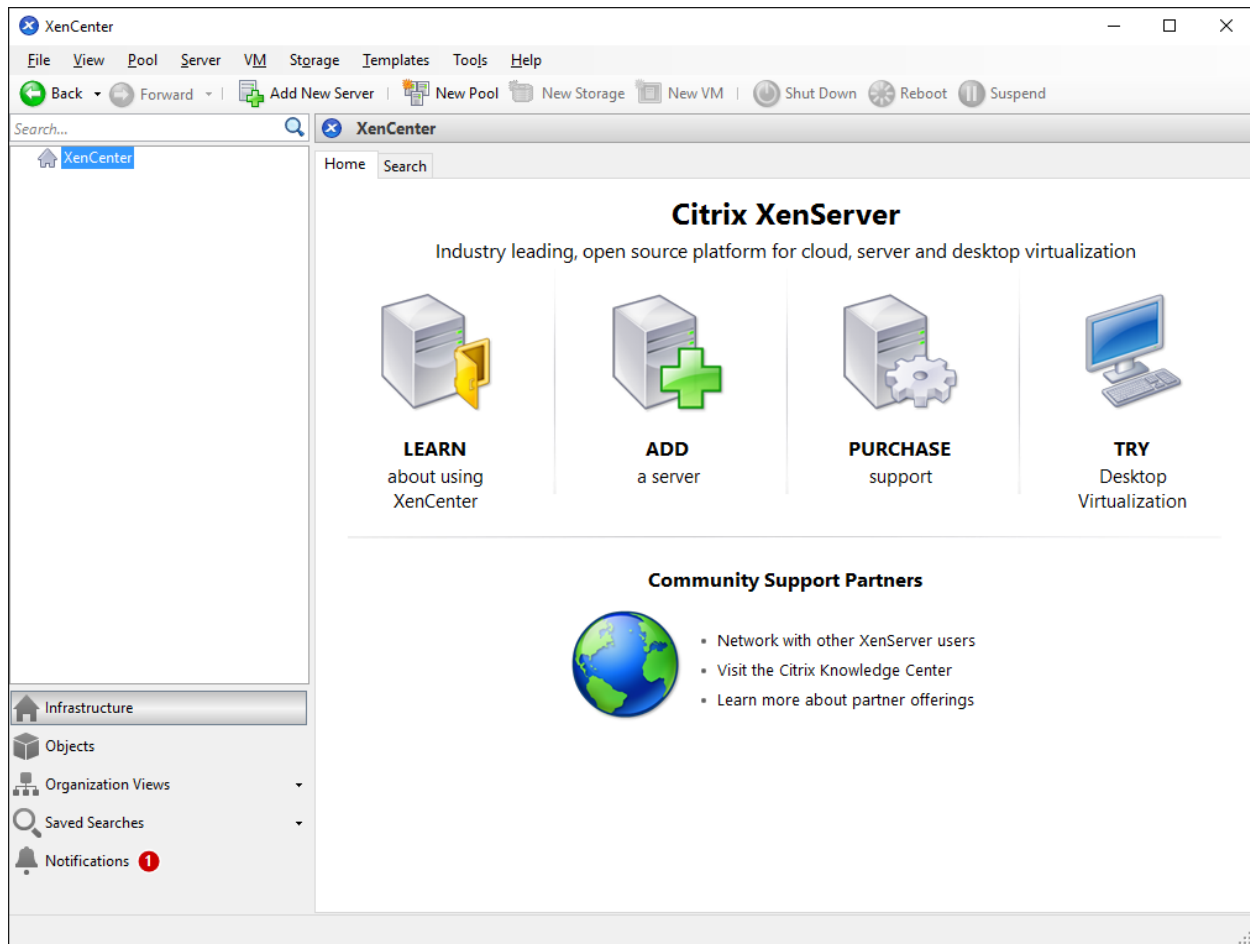


Click **Finish** button to complete the application creation.

Configuring XenServer

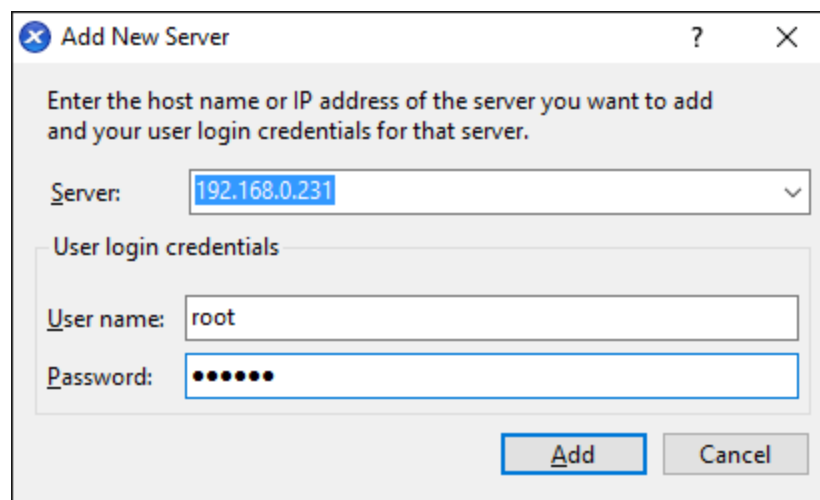
Log On to XenServer

Open XenCenter.



Click **Add New Server** in the tool bar.

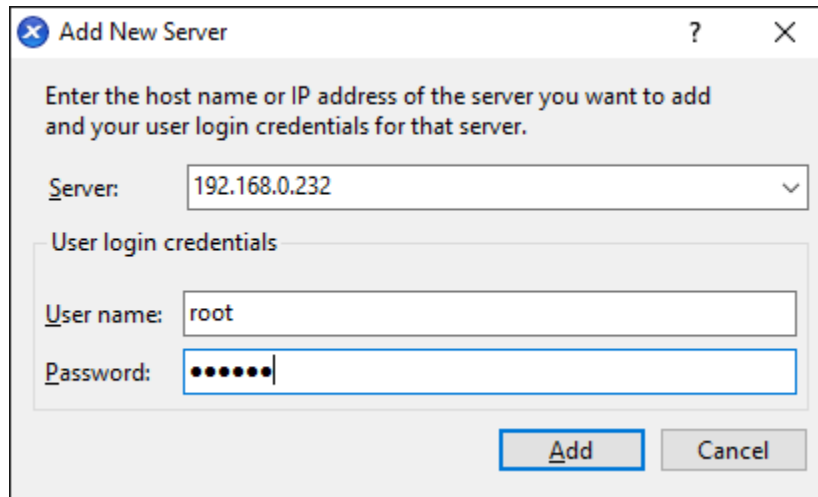
Add New Server dialog is shown.



Input IP address / Name with which running Xen Server, User name and password.

Press the **Add** button to continue.

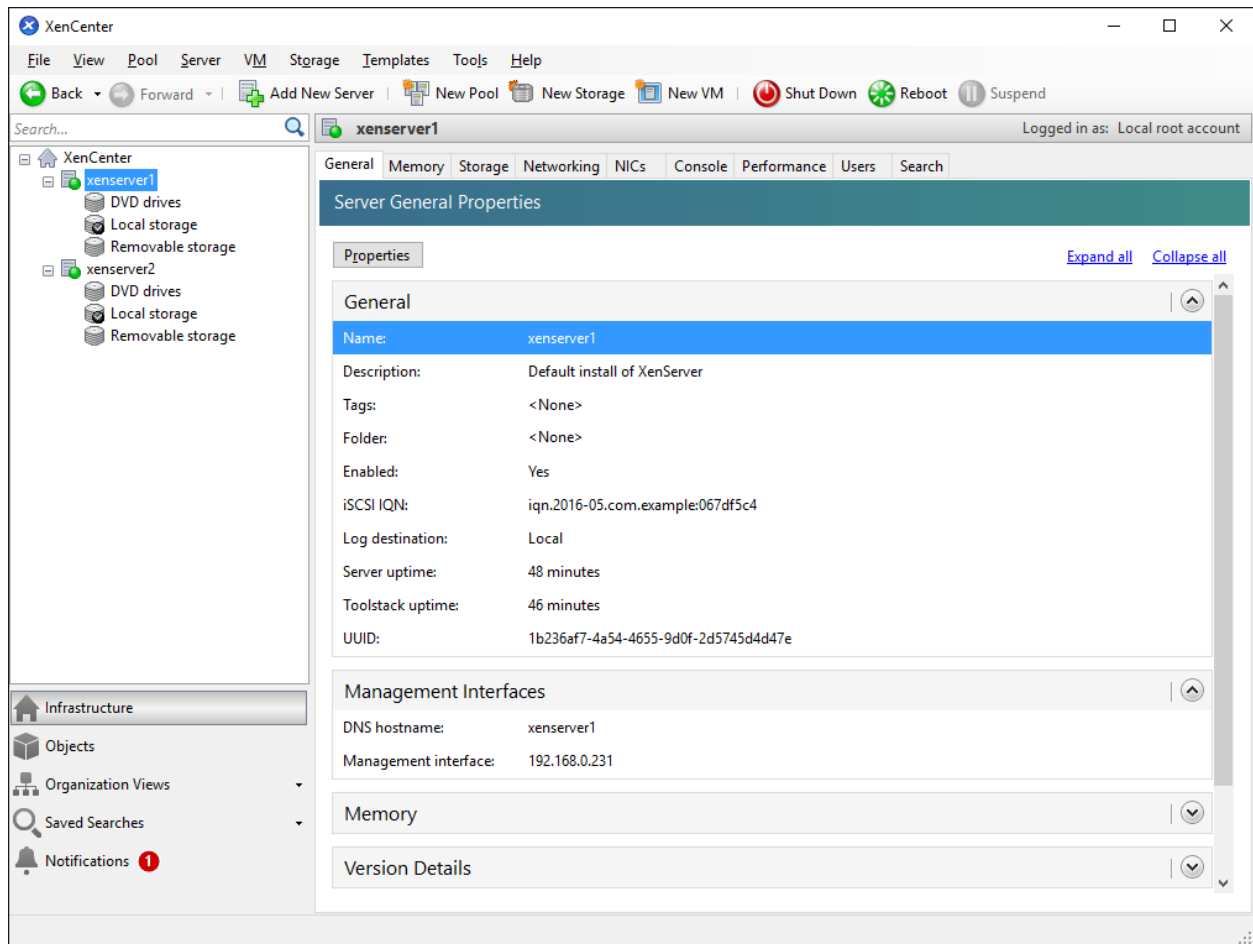
Repeat the steps to add another server.



The screenshot shows a dialog box titled "Add New Server" with a close button (X) and a help button (?). The dialog contains the following fields and buttons:

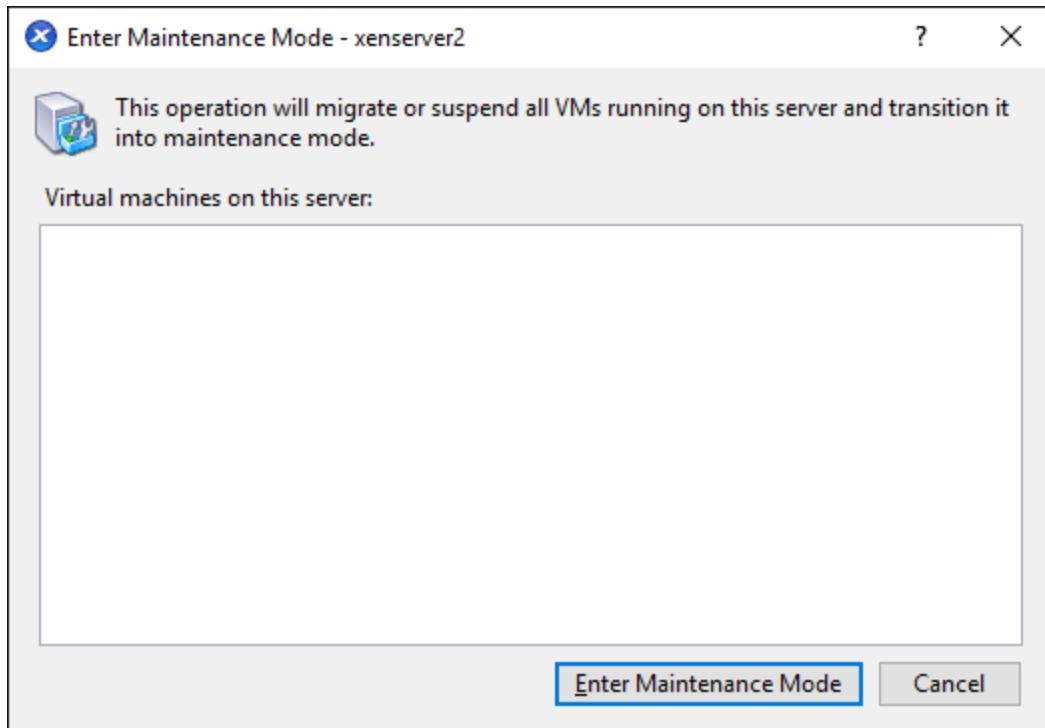
- Instruction: "Enter the host name or IP address of the server you want to add and your user login credentials for that server."
- Server field: A dropdown menu with the value "192.168.0.232".
- User login credentials section:
 - User name field: Contains the text "root".
 - Password field: Contains seven dots, indicating a masked password.
- Buttons: "Add" and "Cancel".

The XenCenter which is connected by XenServers is shown as follows.



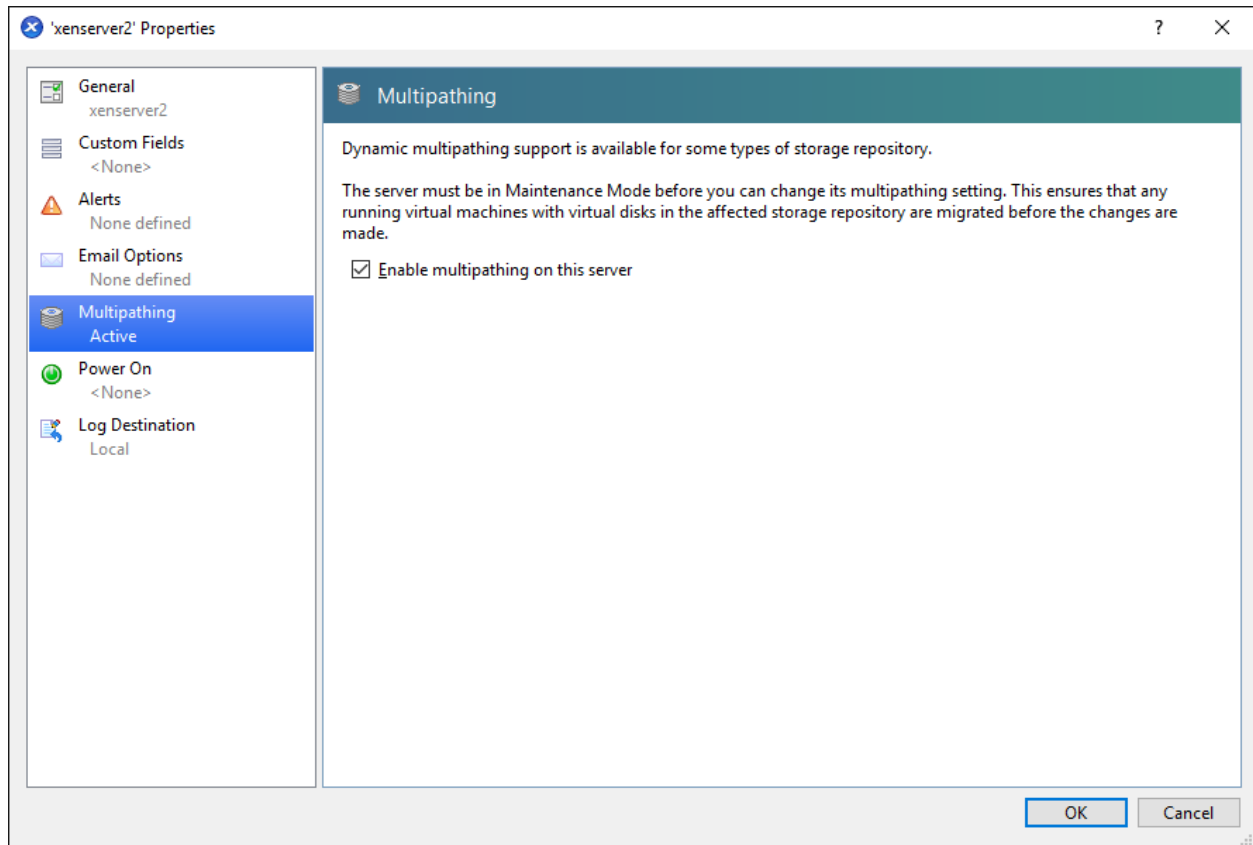
Enable Multipathing

Before to add storage, we must ensure that the Xen Server have enabled multipathing, we should to this by entering maintenance mode and change this property, click **Server->Enter Maintenance mode**, the following window is shown.



Click **Enter Maintenance** button, the server will enter maintenance mode.

Click **Server->properties**, click **Multipathing** on the left panel of the pop-up window, the following window is shown.





Check **Enable multipathing on this server** and press **OK** button to exit, this server has now enabled multipathing.

Repeat the same setups on another xenserver node.

Add iSCSI storage device into XenServer

Click **New Storage**, **New Storage Repository** dialog is shown.

New Storage Repository - xenserver1

 **Choose the type of new storage** 

Type	
Name	
Location	

Virtual disk storage

☐ NFS

☒ iSCSI

☐ Hardware HBA

☐ Software FCoe

ISO library


☐ Windows File Sharing (SMB/CIFS)

☐ NFS ISO

iSCSI

iSCSI or Fibre Channel access to a shared LUN can be configured using LVM.



Using an LVM for a shared SR provides the same performance benefits as a unshared LVM for local disk storage but also enables VM agility.



< Previous Next > Cancel

Select **iSCSI**, press the **Next** button to continue.

New Storage Repository - xenserver1


 **What do you want to call this Storage Repository?** 

Type	Provide a name and a description (optional) for your SR.
Name	
Location	

Name:

☒ Autogenerate description based on SR settings (e.g., IP address, LUN etc.)



Description:



< Previous Next > Cancel

Type storage **Name** and press the **Next** button to continue.

New Storage Repository - xenserver1

 **Enter a path for your iSCSI storage** 

Type
Name
Location

Provide a target host for your iSCSI storage, indicating your target IQN and your target LUN before proceeding.

Target host name/IP address: :

☐ Use CHAP


CHAP username:

CHAP password:

iSCSI target

Target IQN:

Target LUN:



Input IP address and port (if not 3260) of the two servers, If the target you want to connect to has CHAP Authentication, check **Use CHAP** and input user name and secret.

Press the **Scan Target Hosts** button, a list of Targets in drop-down control is shown.

New Storage Repository - xenserver1

Enter a path for your iSCSI storage

Type
Name
Location

Provide a target host for your iSCSI storage, indicating your target IQN and your target LUN before proceeding.

Target host name/IP address: 192.168.0.231, 192.168.0.232 : 3260

☐ Use CHAP

CHAP username:

CHAP password:

✓

iSCSI target

Target IQN: *(192.168.0.231, 192.168.0.232:3260) ✓

Target LUN: LUN 0: 01D25063698D0680: 78.1 GB (KernSafe) ✓

CITRIX

< Previous Finish Cancel

Select *(192.168.0.231, 192.168.0.232:3260) and LUN 0: ... **Target LUN** in the list.

Press the **Finish** button to continue.

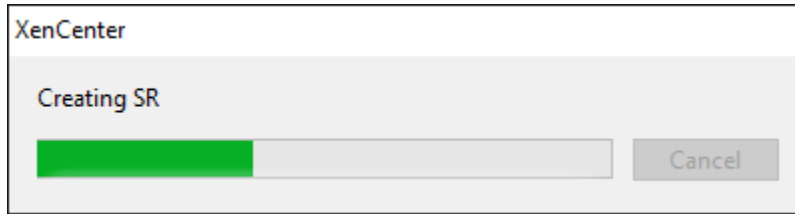
The following dialog is shown, press the **Yes** button to proceed.

Location

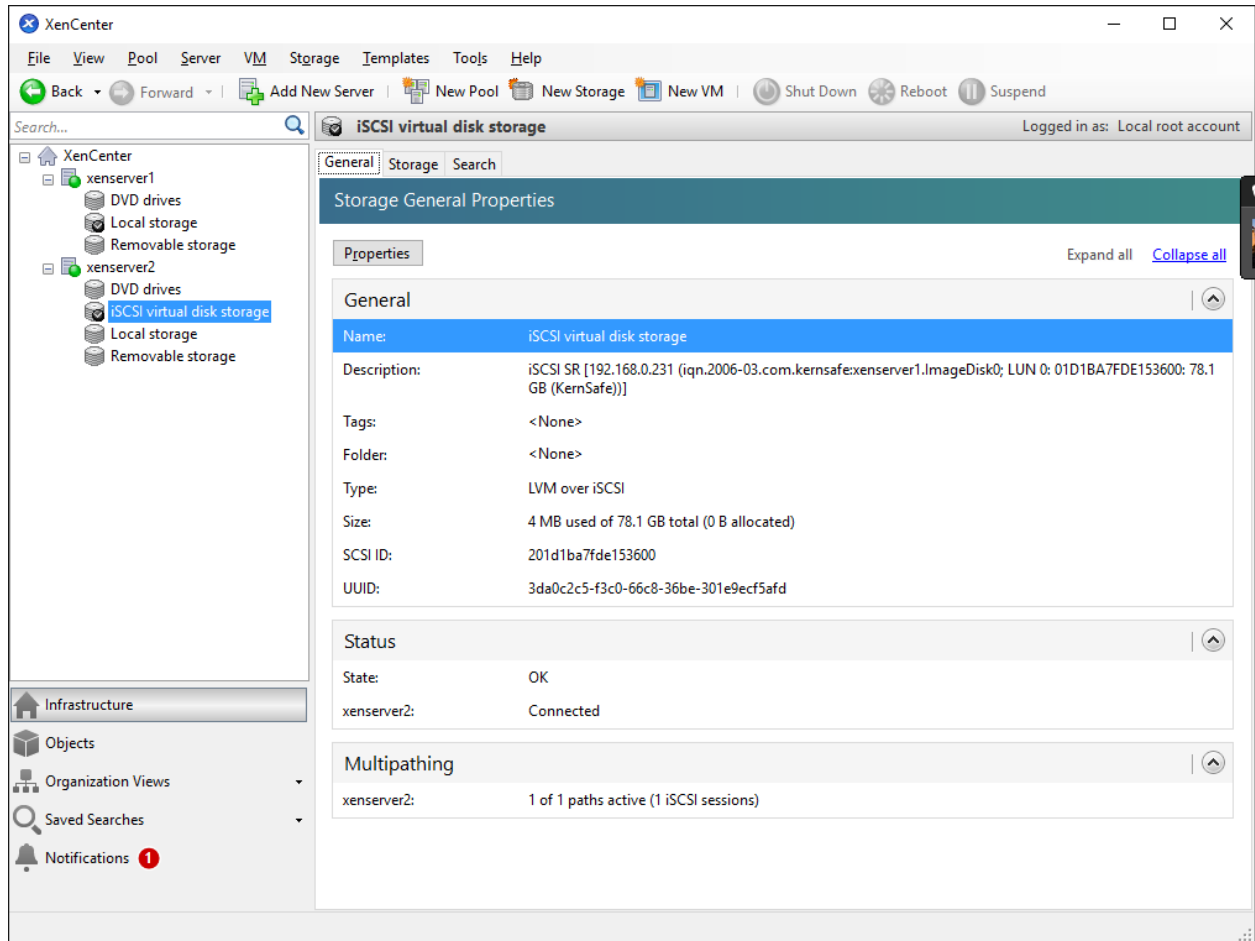
⚠ Creating a new virtual disk on this LUN will destroy any data present. You must ensure that no other system is using the LUN, including any XenServers, or the virtual disk may become corrupted while in use.

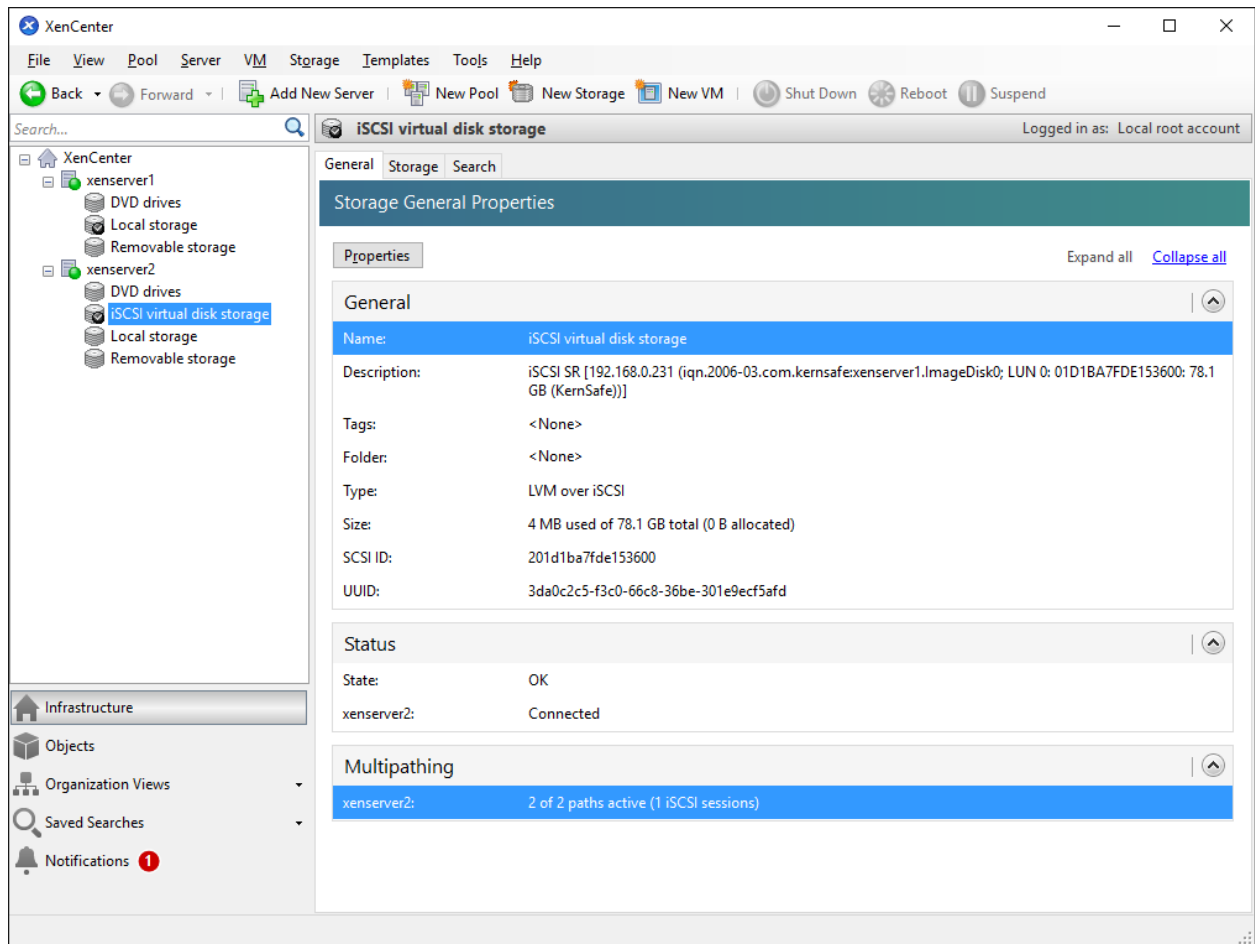
Do you wish to format the disk?

Now Xen Server is carrying on a series of operations, such as **Creating SR**, to create data structures required by data repositories.



Sorted! You now see an iSCSI storage device successfully added into Xen Server.





At the bottom of this interface you can see there are 2 of 2 paths active.

If by some reasons you will see only 1 path active, go back to your server console and type:

/opt/xensource/sm/mpathcount.py

This causes to refresh multipath status in virtual storage.

```
[root@localhost etc]# /opt/xensource/sm/mpathcount.py
[root@localhost etc]#
```

After you will do it, you should be able to see proper 2 out of 2 paths active.

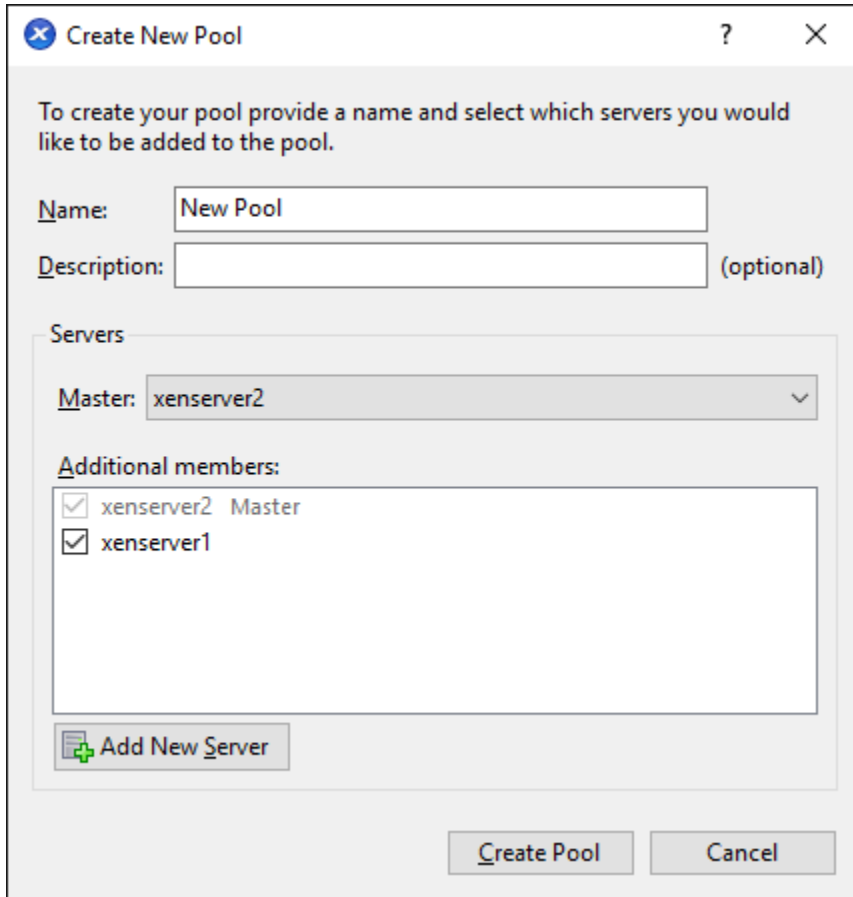
You can type:

#multipath -ll

```
[root@xenserver2 ~]# multipath -ll
May 31 13:36:25 | multipath.conf line 12, invalid keyword: polling_interval_10
201d1ba7fde153600 dm-1 KernSafe,iSCSI Adapter
size=78G features='0' hwhandler='0' wp=rw
|-+- policy='round-robin 0' prio=1 status=enabled
|  `- 12:0:0:0 sdc 8:32 active ready running
`-+- policy='round-robin 0' prio=1 status=enabled
   `- 13:0:0:0 sdd 8:48 active ready running
[root@xenserver2 ~]#
```


Create Pool in XenServers

Click on the Pool->New Pool... menu item then Create New Pool dialog shows.



Create New Pool

To create your pool provide a name and select which servers you would like to be added to the pool.

Name:

Description: (optional)

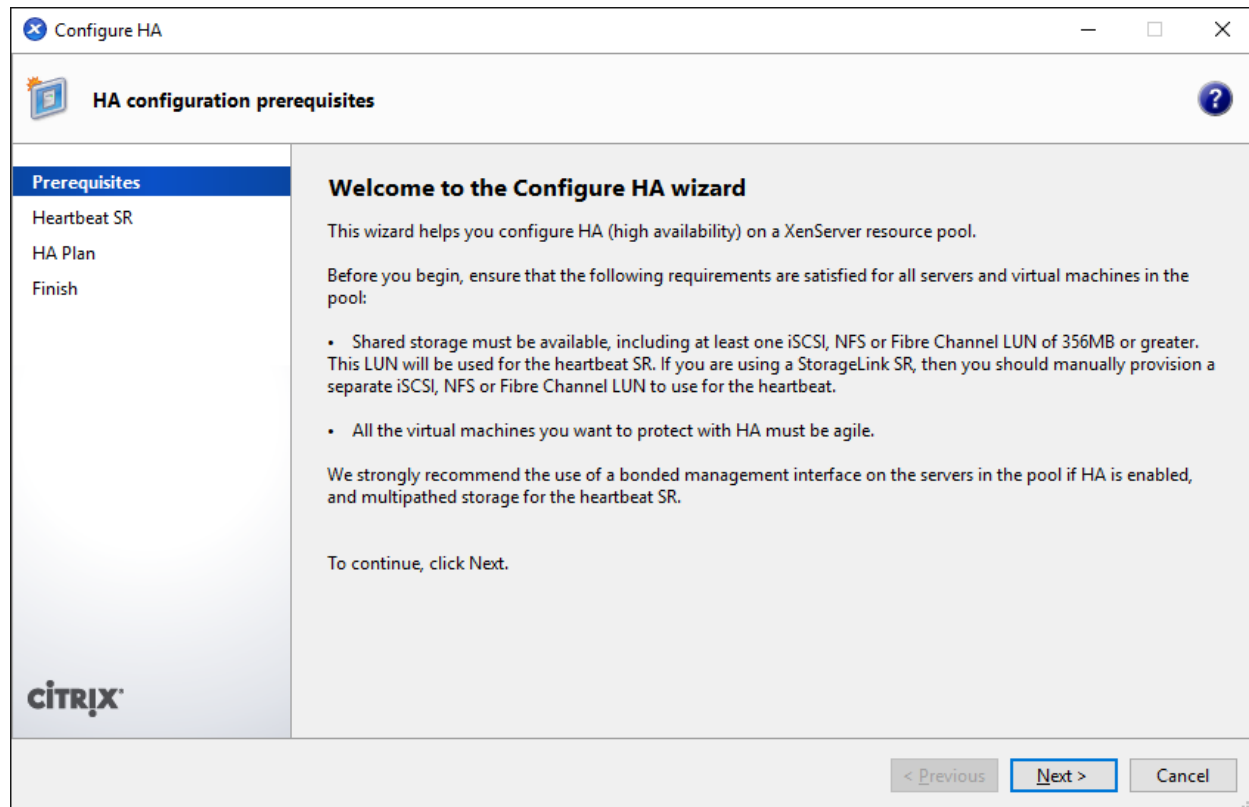
Servers

Master:

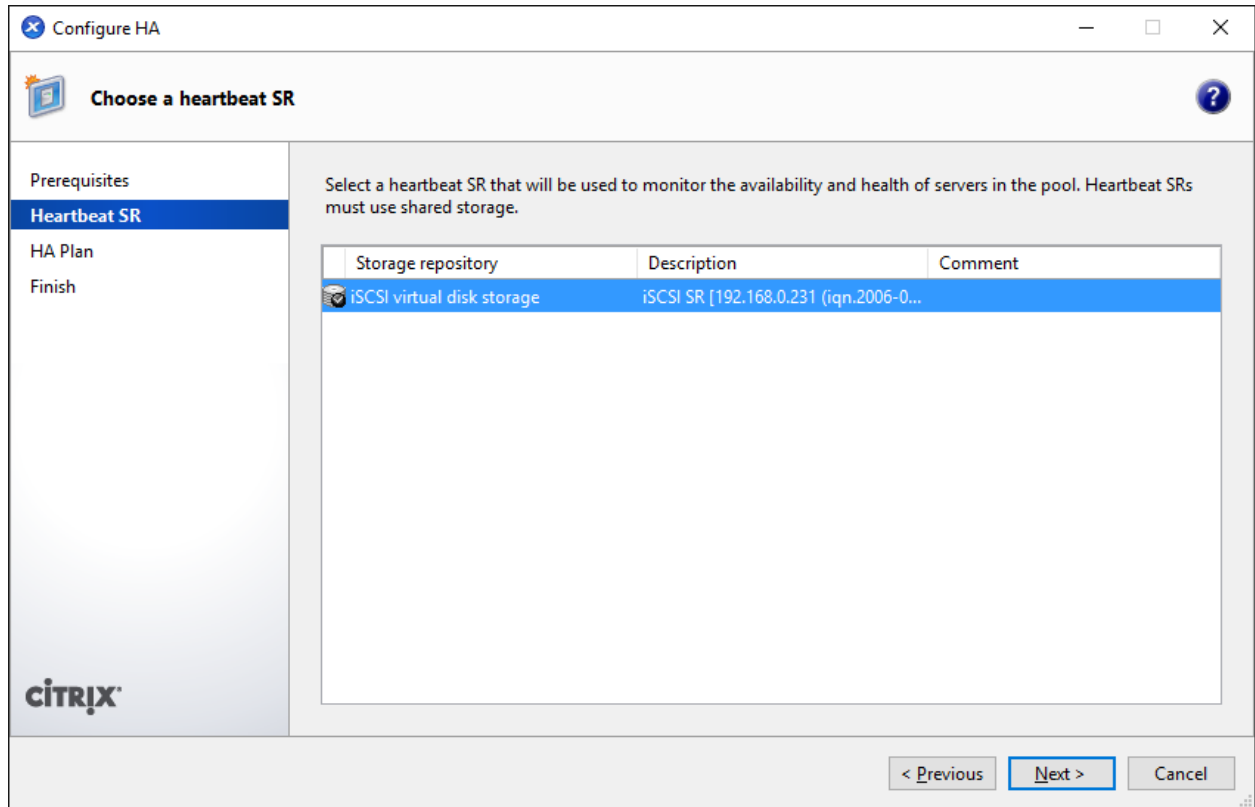
Additional members:

- ☒ xenserver2 Master
- ☒ xenserver1

Type Name and Description and select the both server, then click the Create Pool button to create pool.



Press the **Next** button to continue.



Select the iSCSI storage as heartbeat SR and press the **Next** button to continue.

Configure HA

Configure the HA restart priority, restart order and delay interval for the VMs in this pool

Prerequisites
Heartbeat SR
HA Plan
Finish

HA restart priority:

Start order:

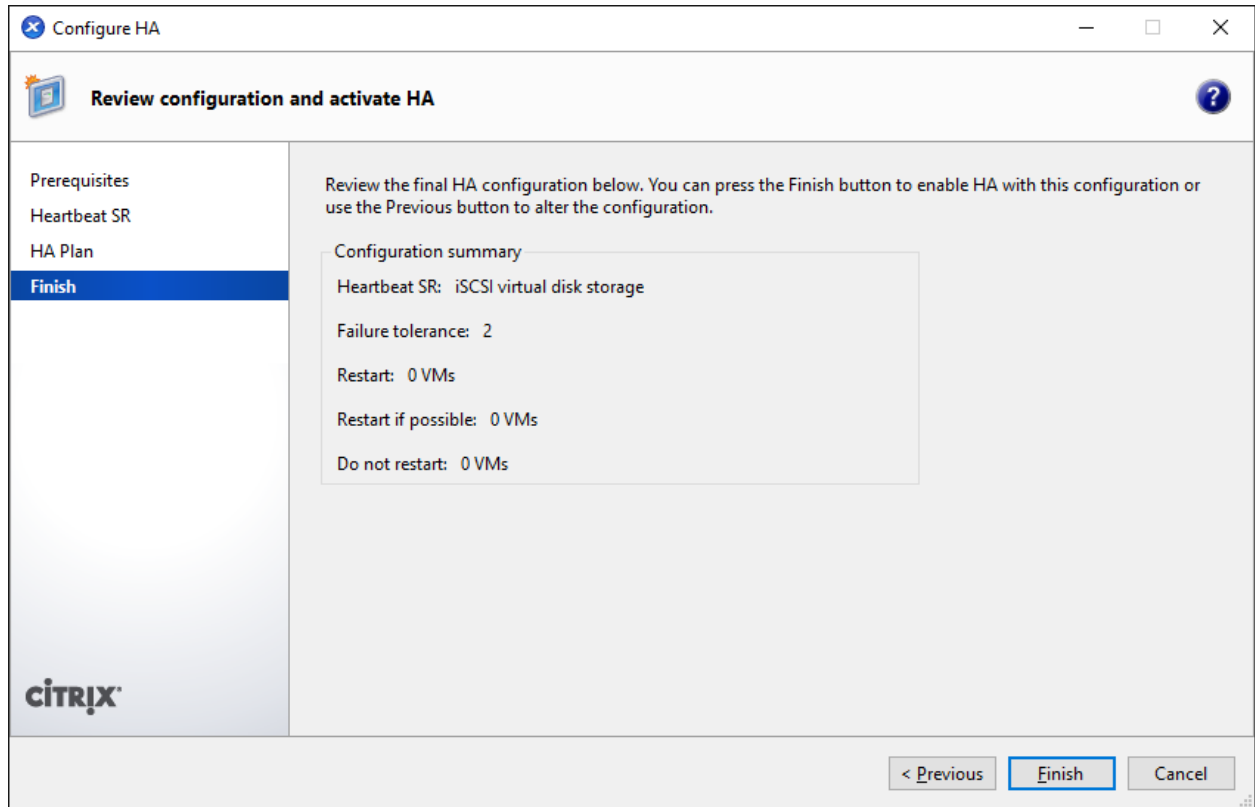
Attempt to start next VM after: seconds

Server failure limit
You can specify the number of server failures you need to be able to tolerate in the pool.
Failures tolerated: (max = 2)

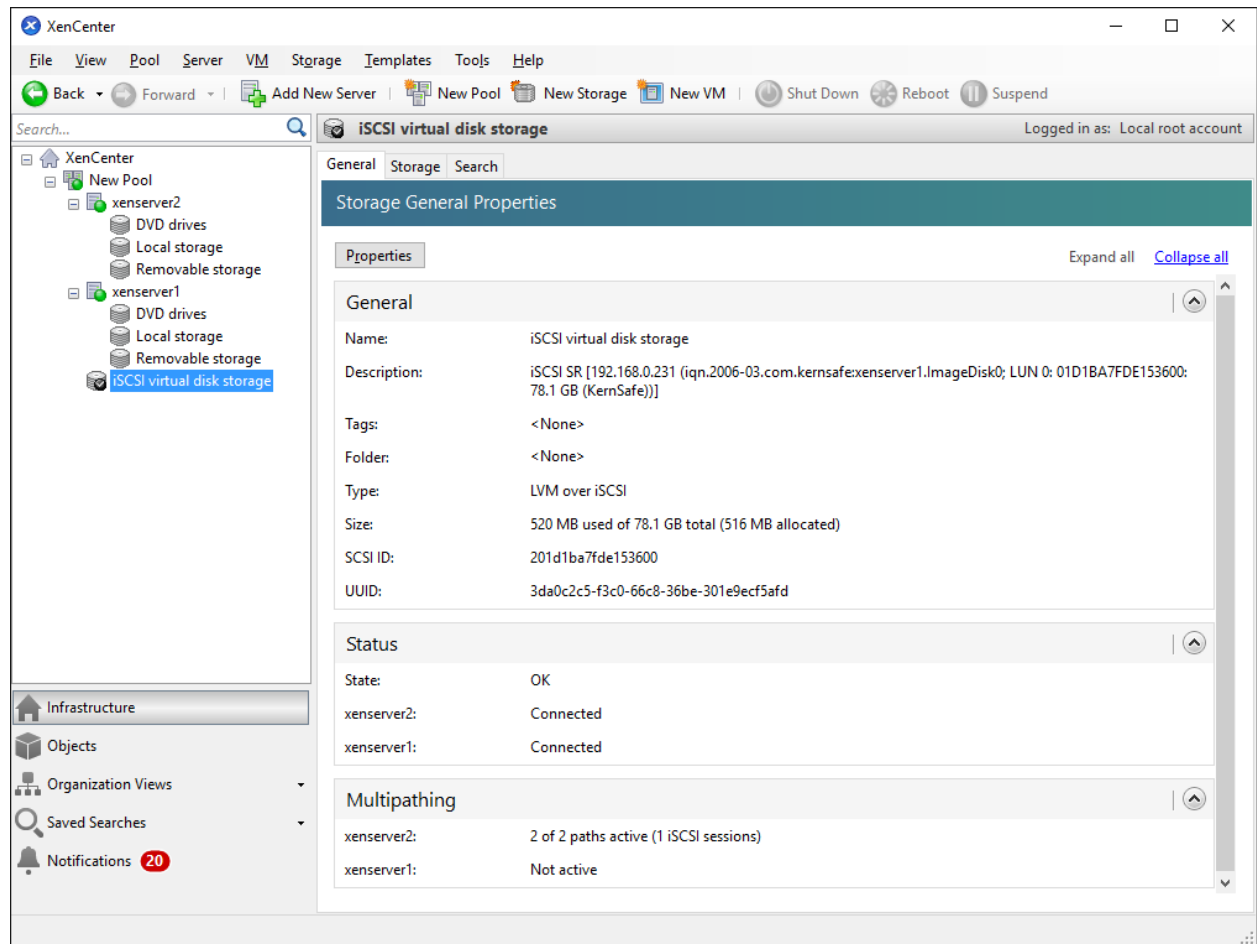
[How can I increase the maximum failover capacity?](#)

< Previous Next > Cancel

Specify HA settings, and press the **Next** button to continue.



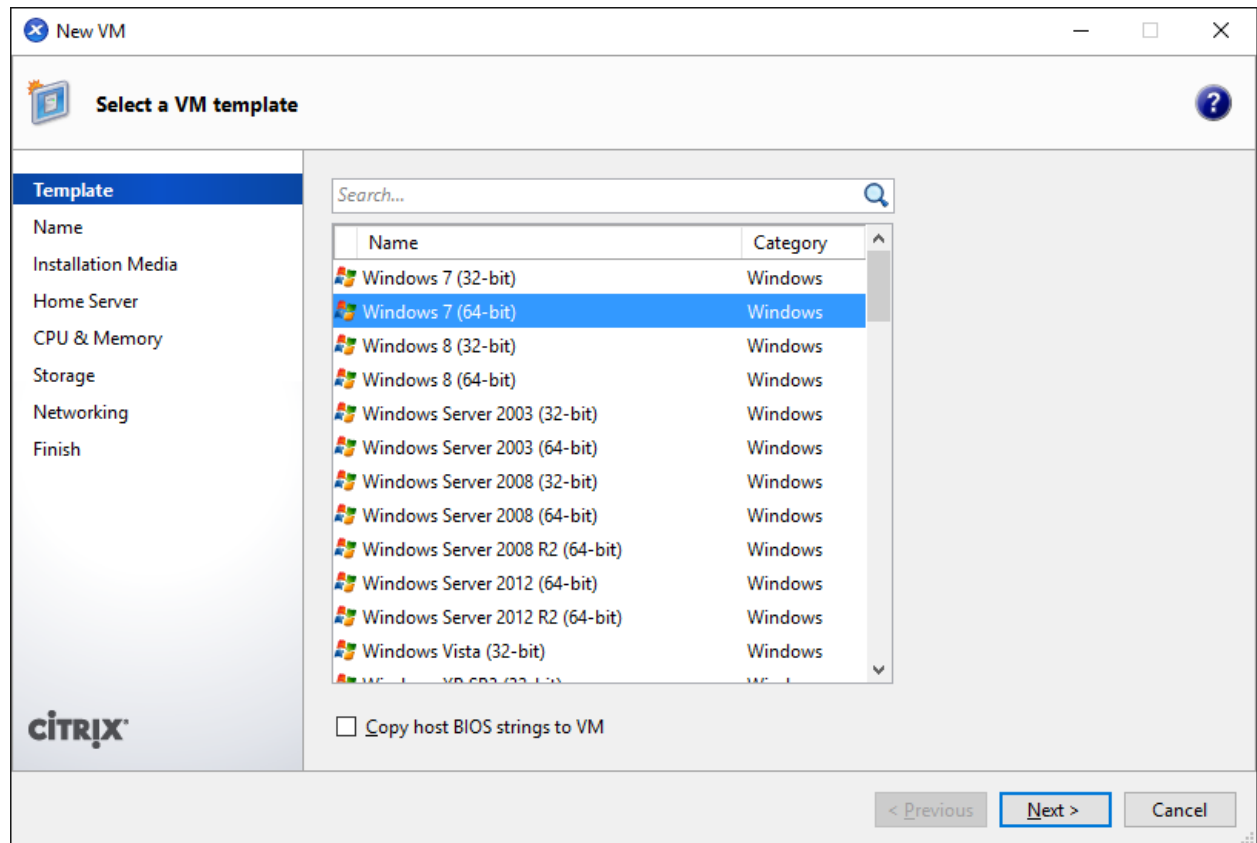
Press the **Finish** button to finish creating pool.



Create a virtual machine



Click **New VM** on Xen Server console.

Select **Windows 7 x64** in the following wizard.



Input the desired name and description.

New VM

 **Name the new virtual machine** 

Template

Name

Installation Media

Home Server

CPU & Memory

Storage

Networking


Finish

Enter a name that will help you to identify the virtual machine later. This could be a name that describes its software and hardware such as RHEL DHCP Server, Win2K3 XenApp Server or Exchange 2007 Client Access Server. This name will also be displayed in XenCenter's Resources pane and can be changed later.

You can also add a more detailed description of the VM, if you wish.

Name:

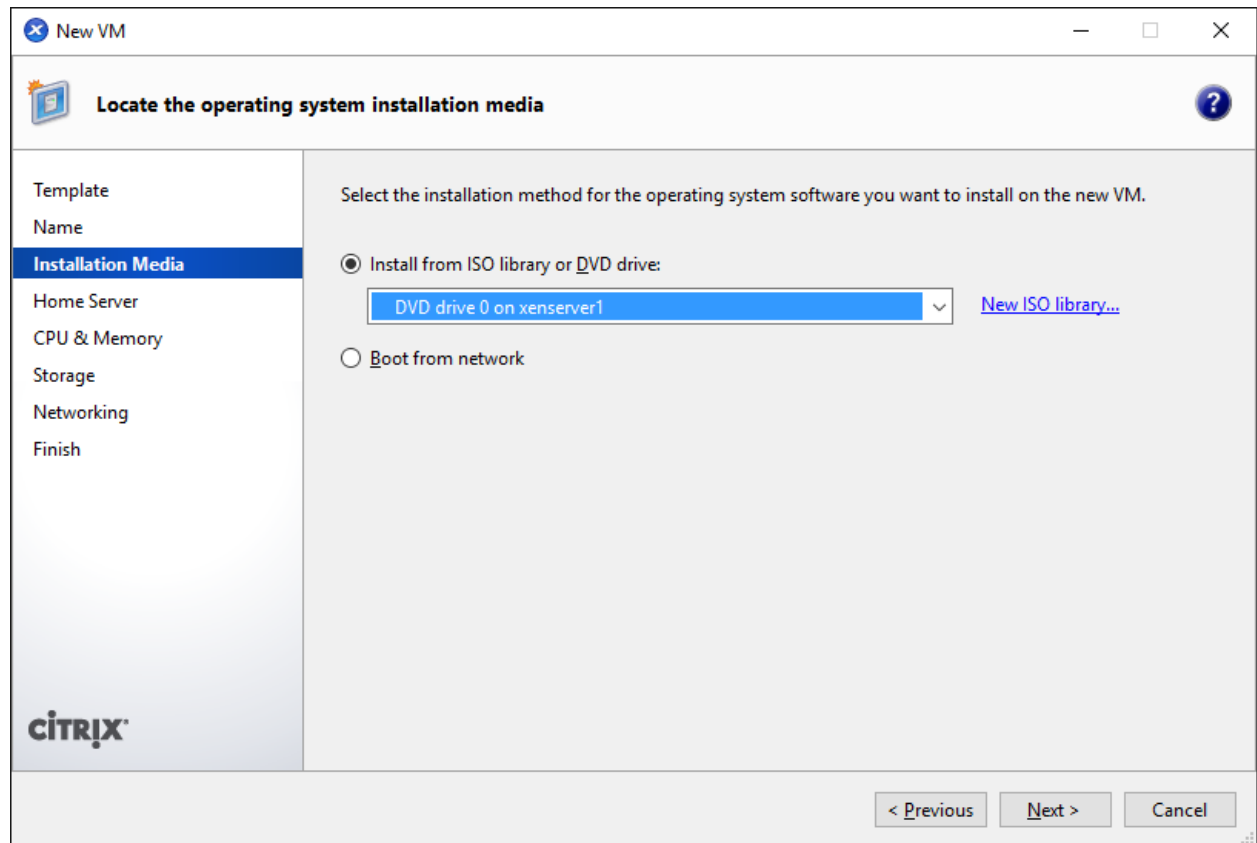
Description:



< Previous Next > Cancel

Press the **Next** to continue.

Select installation media for operating system.




Choose **physical DVD Drive** on XenServer.

Press the **Next** button to continue.

Specify the number of CPUs and memory size.

New VM

 **Allocate processor and memory resources**

Template

Name

Installation Media

Home Server

CPU & Memory

Storage

Networking


Finish

Specify the number of virtual CPUs, their topology and the amount of memory that will be initially allocated to the new virtual machine.

Number of vCPUs:

Topology:

Memory: MB



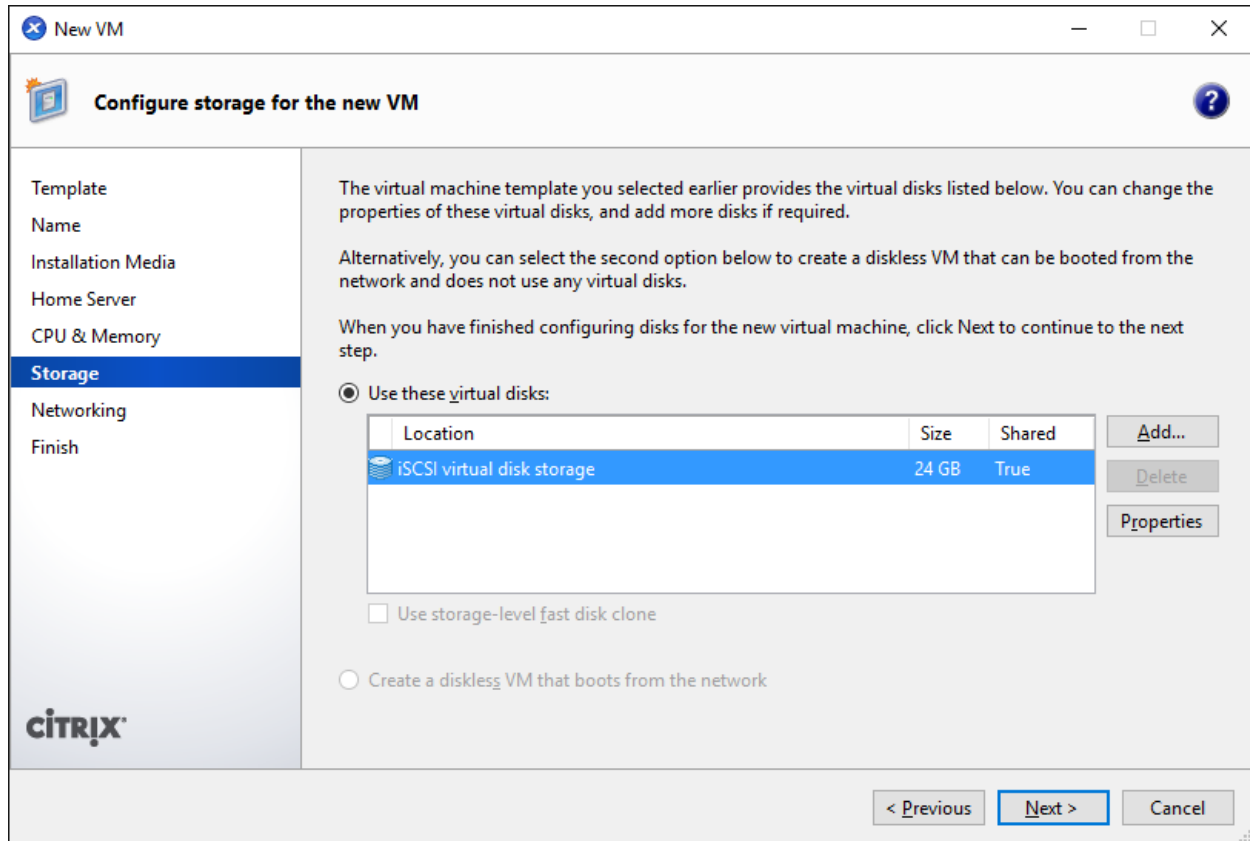
[< Previous](#) [Next >](#) [Cancel](#)

Select number of vCPUs.

Specify initial memory size.

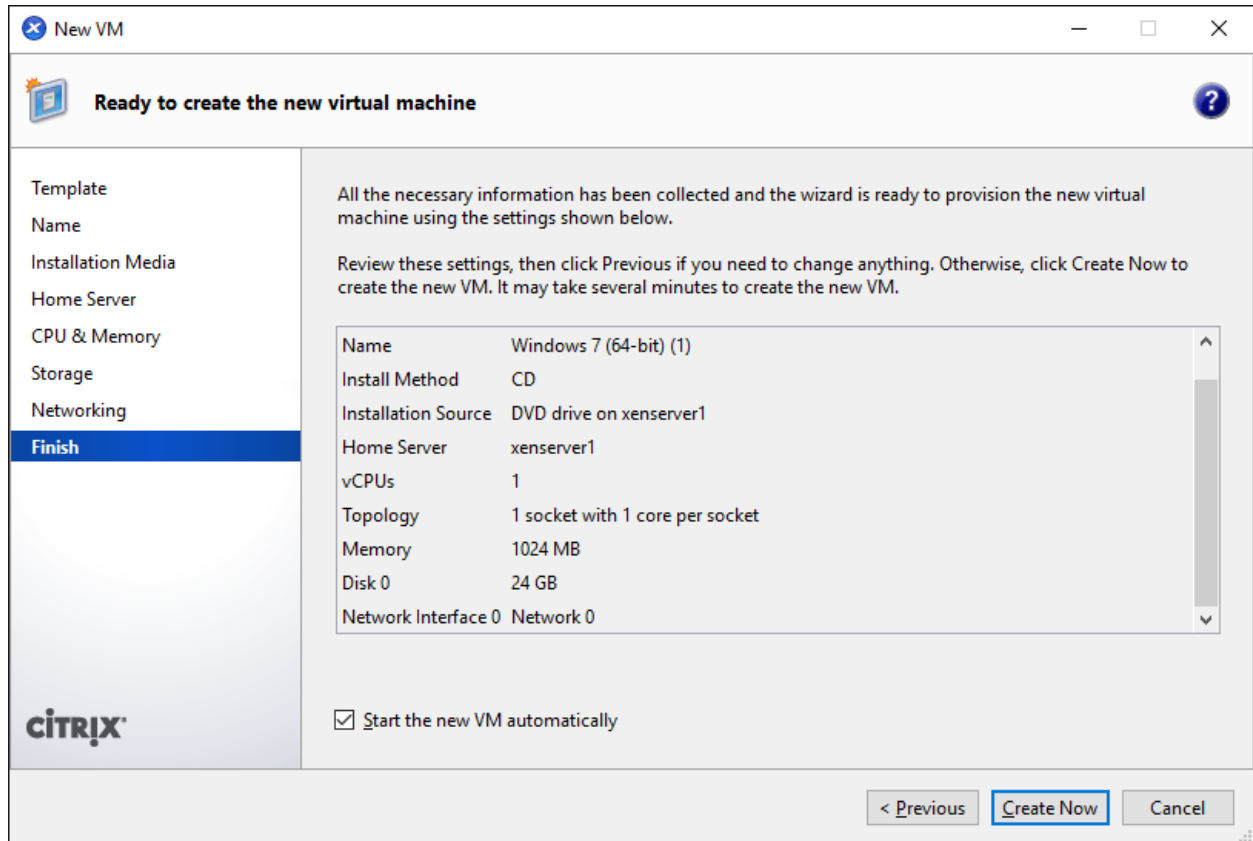
Press the **Next** button to continue.

Select storage device.



First you see an **iSCSI Virtual disk storage** device, which is previously create. It is Xen Server's default storage device. If you want to add other virtual disk, press the **Add** button.

Select **iSCSI virtual disk storage...** and then press the **Next** button, the **Disk Settings dialog** is shown.



Specify the size of the new virtual disk.

Press the **OK** button to finish the wizard.

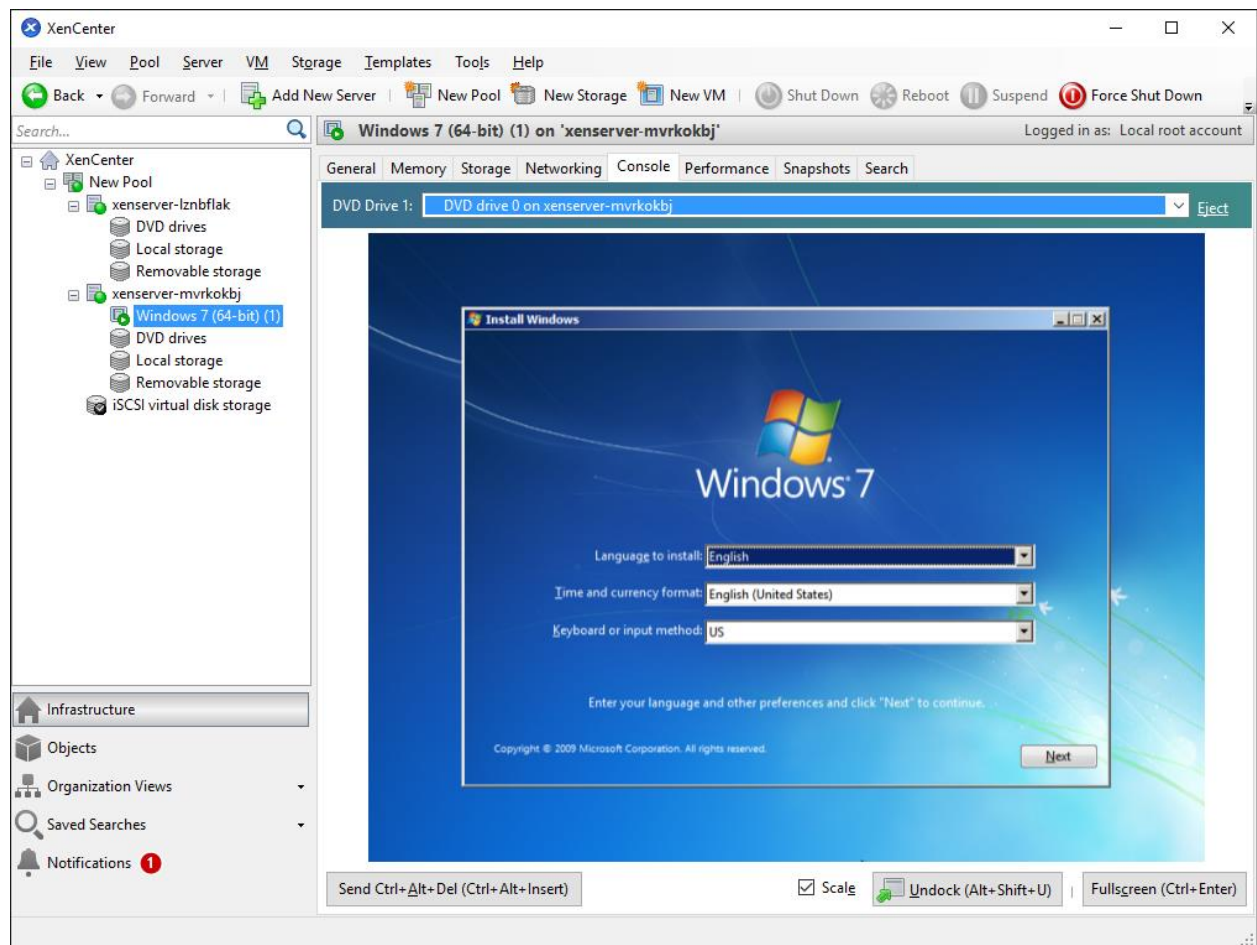
A virtual machine is built.

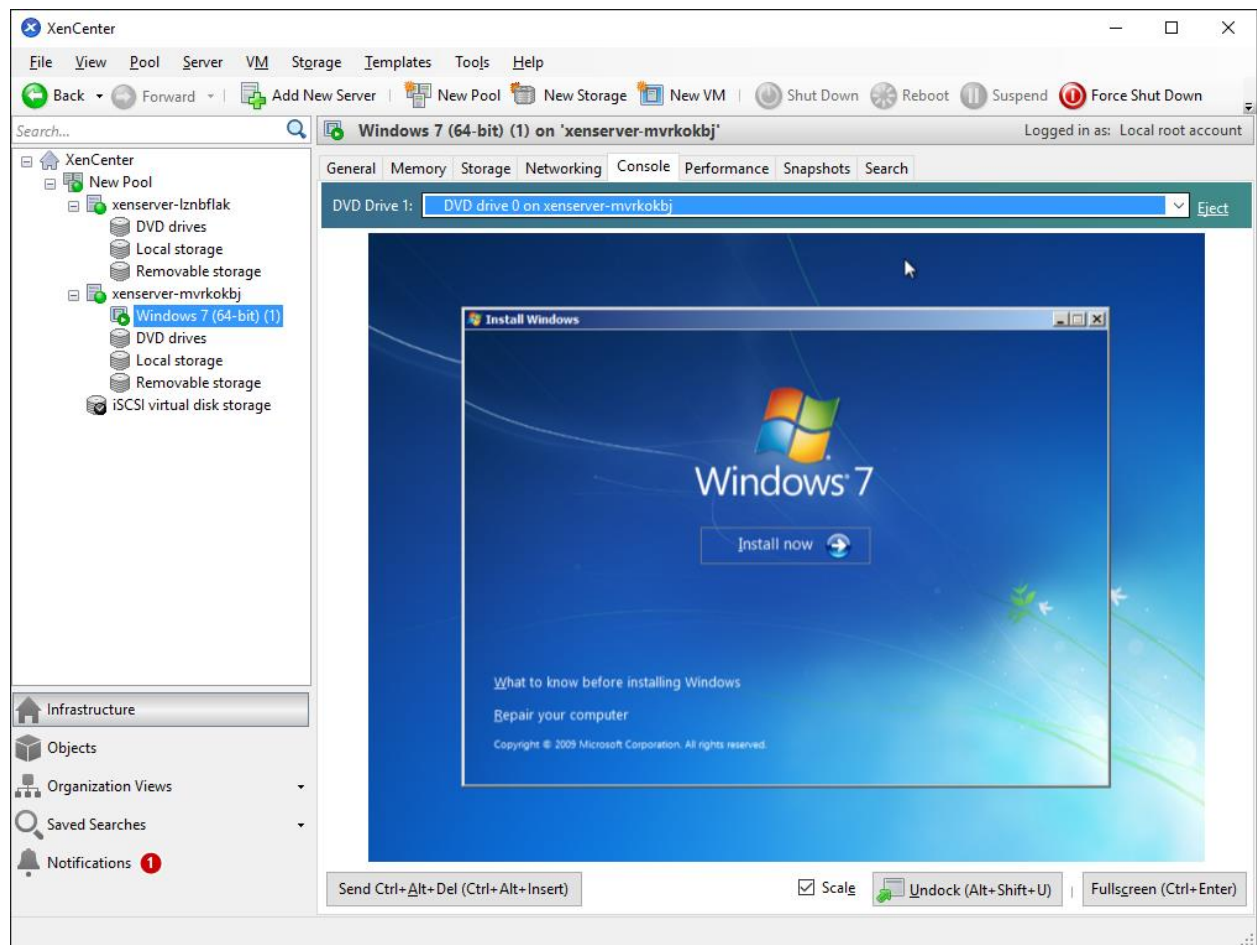
Note that before Version 6.5 in the Storage labels of your virtual machine, you need to exchange the position of iSCSI Virtual Storage and Local Storage (make sure iSCSI Virtual Storage at position 0) so that the operating system can be installed on this iSCSI device.

Install Operating system

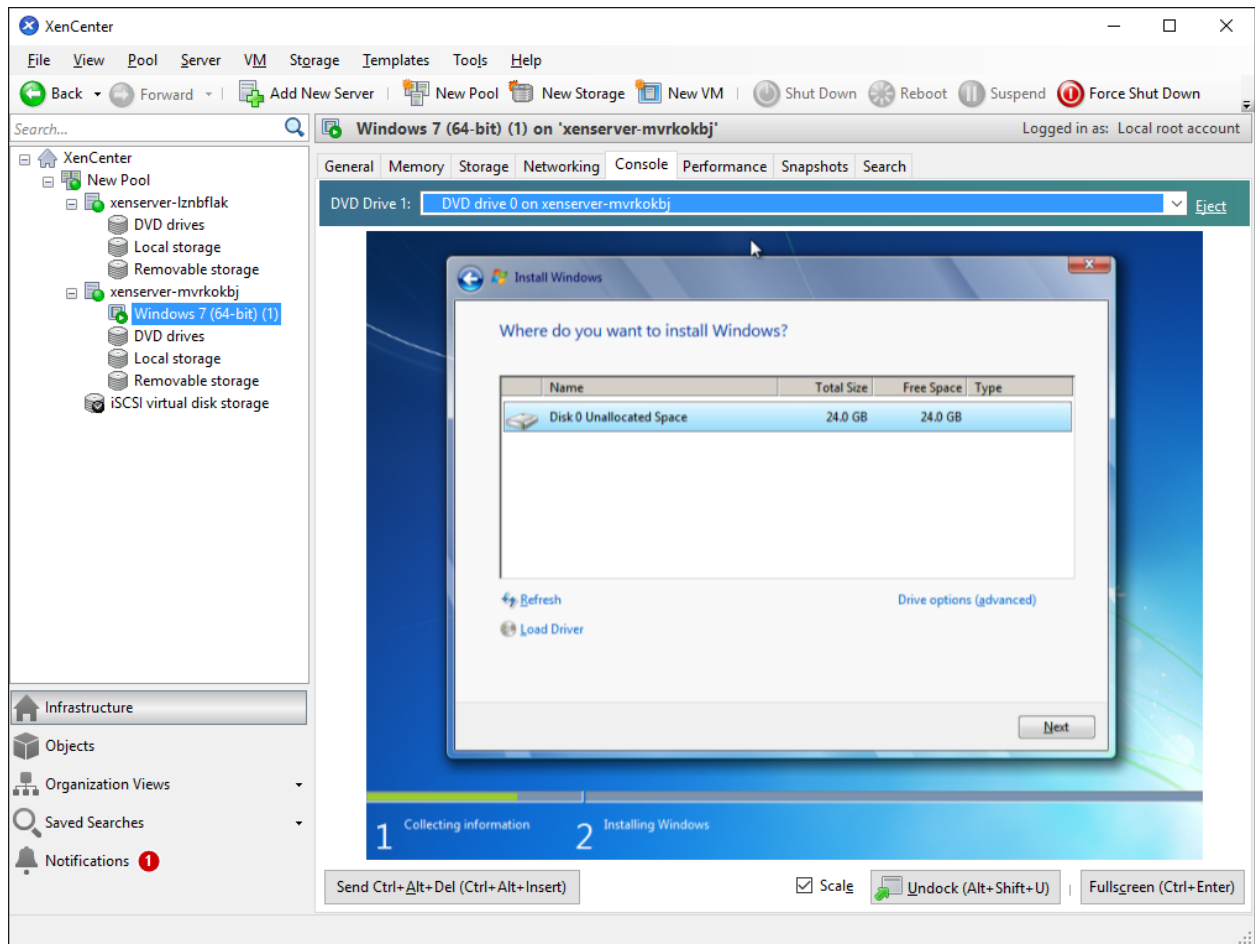
Run the virtual machine and set up the operating system.

The process is just like that on real machine.



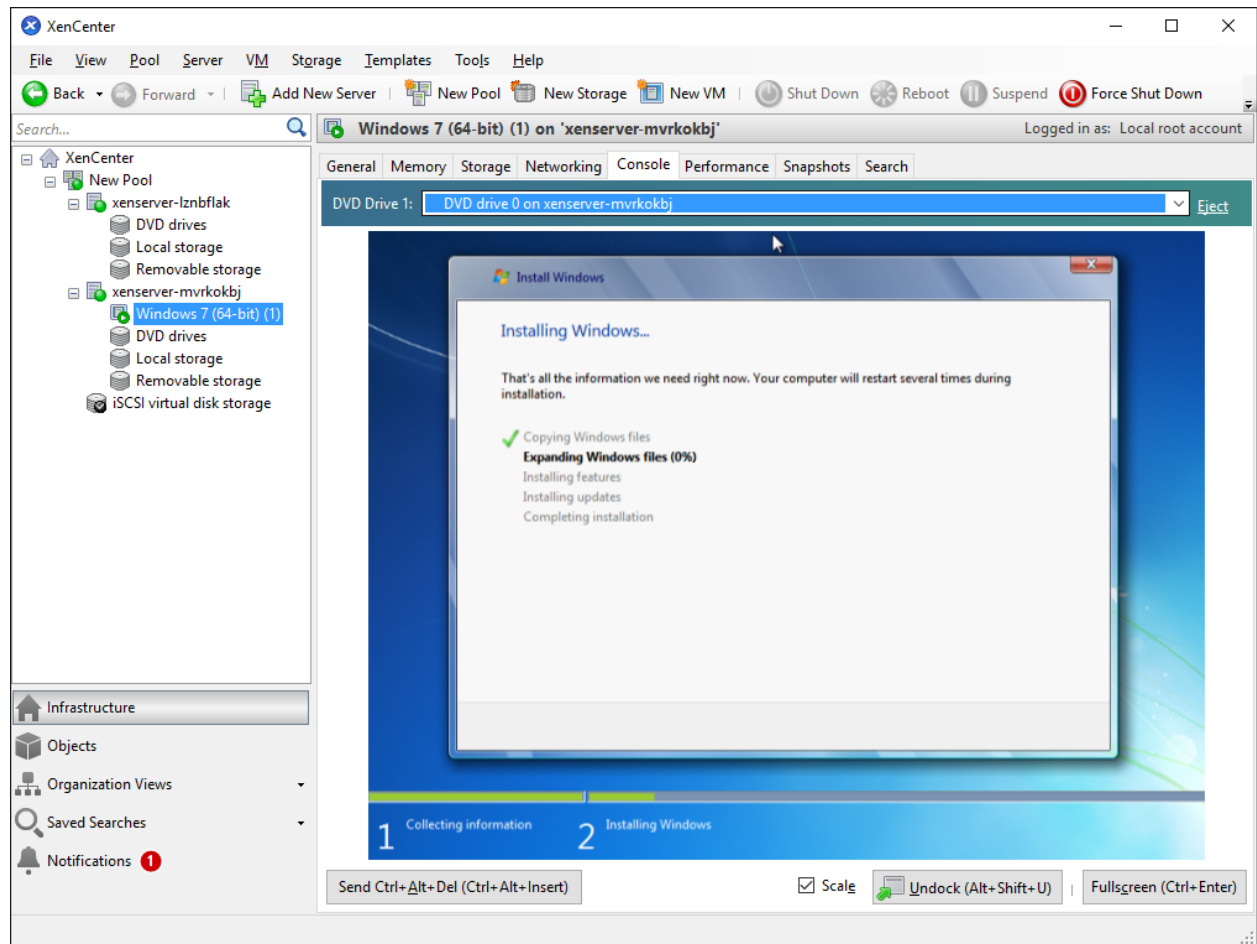


Press the **Install Now** button to install OS.

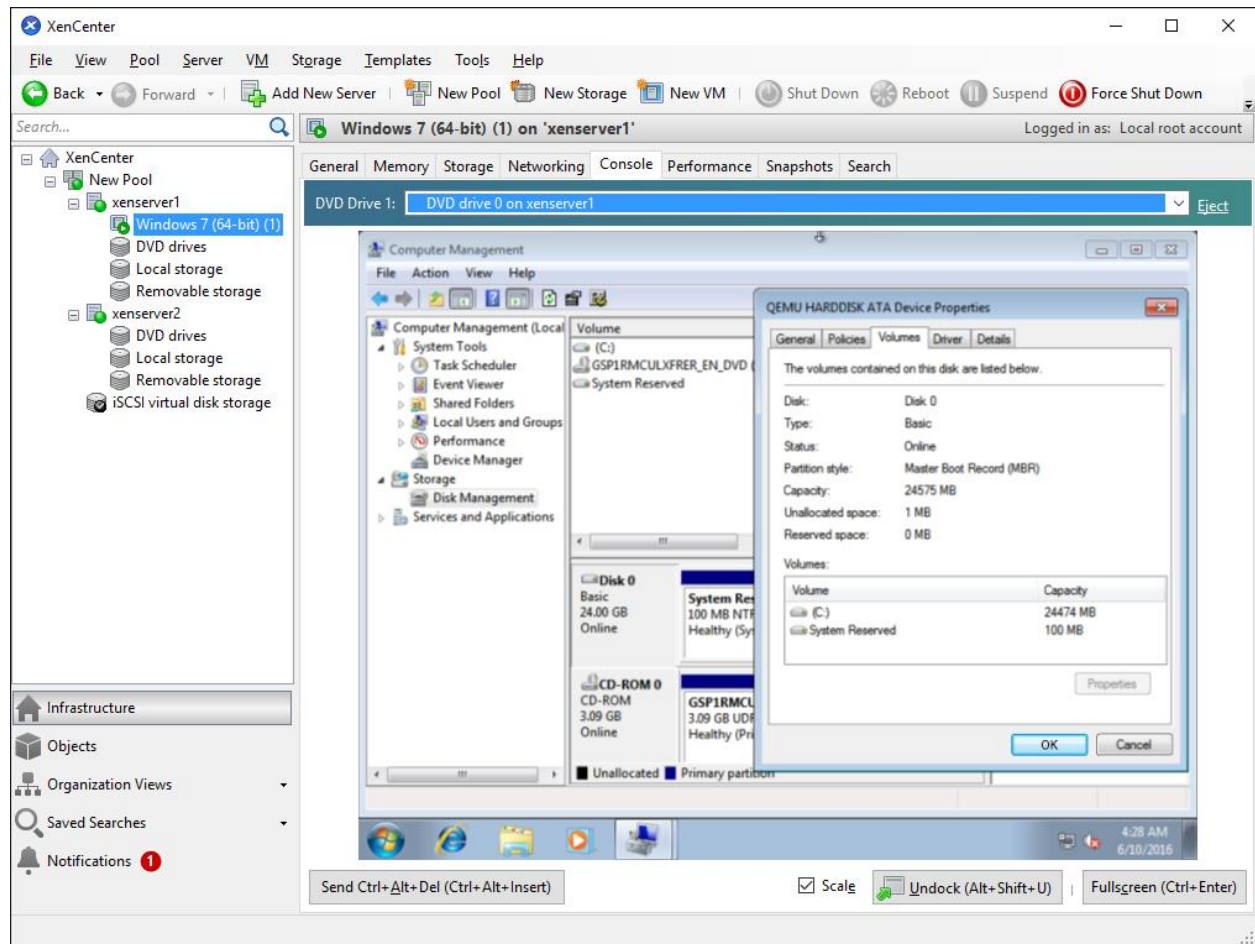


Select the 24G disk. Just like that on a real hard disk.

Setup starts copying files



Last, with all work done, we'll see iSCSI virtual storage device in the virtual operating system.



Likewise, you may install Windows Server 2008, Windows10 and Windows Server 2012, or even any version of Linux as you need.

By the same way, you can create more targets and create HA application to link them together so that you can create 3 or more nodes hyper- converged solutions.

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