



CHAPTER 13

Configuring iSCSI Multipath

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This chapter describes how to configure iSCSI multipath for multiple routes between a server and its storage devices and includes the following topics:

- [Information About iSCSI Multipath, page 13-1](#)
- [Guidelines and Limitations, page 13-4](#)
- [Prerequisites, page 13-5](#)
- [Default Settings, page 13-5](#)
- [Configuring iSCSI Multipath, page 13-5](#)
- [Verifying the iSCSI Multipath Configuration, page 13-18](#)
- [Additional References, page 13-19](#)
- [Feature History for iSCSI Multipath, page 13-19](#)

Information About iSCSI Multipath

This section includes the following topics:

- [Overview, page 13-1](#)
- [Supported iSCSI Adapters, page 13-2](#)
- [iSCSI Multipath Setup on the VMware Switch, page 13-3](#)

Overview

The iSCSI multipath feature sets up multiple routes between a server and its storage devices for maintaining a constant connection and balancing the traffic load. The multipathing software handles all input and output requests and passes them through on the best possible path. Traffic from host servers is transported to shared storage using the iSCSI protocol that packages SCSI commands into iSCSI packets and transmits them on the Ethernet network.

iSCSI multipath provides path failover. In the event a path or any of its components fails, the server selects another available path. In addition to path failover, multipathing reduces or removes potential bottlenecks by distributing storage loads across multiple physical paths.

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The Cisco Nexus 1000V DVS performs iSCSI multipathing regardless of the iSCSI target. The iSCSI daemon on an ESX server communicates with the iSCSI target in multiple sessions using two or more VMkernel NICs on the host and pinning them to physical NICs on the Cisco Nexus 1000V. Uplink pinning is the only function of multipathing provided by the Cisco Nexus 1000V. Other multipathing functions such as storage binding, path selection, and path failover are provided by VMware code running in the VMkernel.

Setting up iSCSI Multipath is accomplished in the following steps:

1. Uplink Pinning

Each VMkernel port created for iSCSI access is pinned to one physical NIC.

This overrides any NIC teaming policy or port bundling policy. All traffic from the VMkernel port uses only the pinned uplink to reach the upstream switch.

2. Storage Binding

Each VMkernel port is pinned to the VMware iSCSI host bus adapter (VMHBA) associated with the physical NIC to which the VMkernel port is pinned.

The ESX or ESXi host creates the following VMHBAs for the physical NICs.

- In Software iSCSI, only one VMHBA is created for all physical NICs.
- In Hardware iSCSI, one VMHBA is created for each physical NIC that supports iSCSI offload in hardware.

For detailed information about how to use VMware ESX and VMware ESXi systems with an iSCSI storage area network (SAN), see the [iSCSI SAN Configuration Guide](#).

Supported iSCSI Adapters

This section lists the available VMware iSCSI host bus adapters (VMHBAs) and indicates those supported by the Cisco Nexus 1000V.

| VMware iSCSI Host Bus Adapter (VMHBA) | Supported on VSM? | Description | Requires VMkernel networking? |
|---------------------------------------|-------------------|--|-------------------------------|
| Software | Yes | Allows standard NICs to connect the host to a remote iSCSI target on the IP network. | Yes |
| Dependent Hardware | Yes | Third-party adapter offloads the iSCSI and network processing from host, but not the iSCSI control processing. | Yes |
| Independent Hardware | No | Third-party adapter offloads iSCSI control and network processing from host. Configured directly from vSphere client and requires no configuration on VSM. | No |

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iSCSI Multipath Setup on the VMware Switch

Before enabling or configuring multipathing, networking must be configured for the software or hardware iSCSI adapter. This involves creating a VMkernel iSCSI port for the traffic between the iSCSI adapter and the physical NIC.

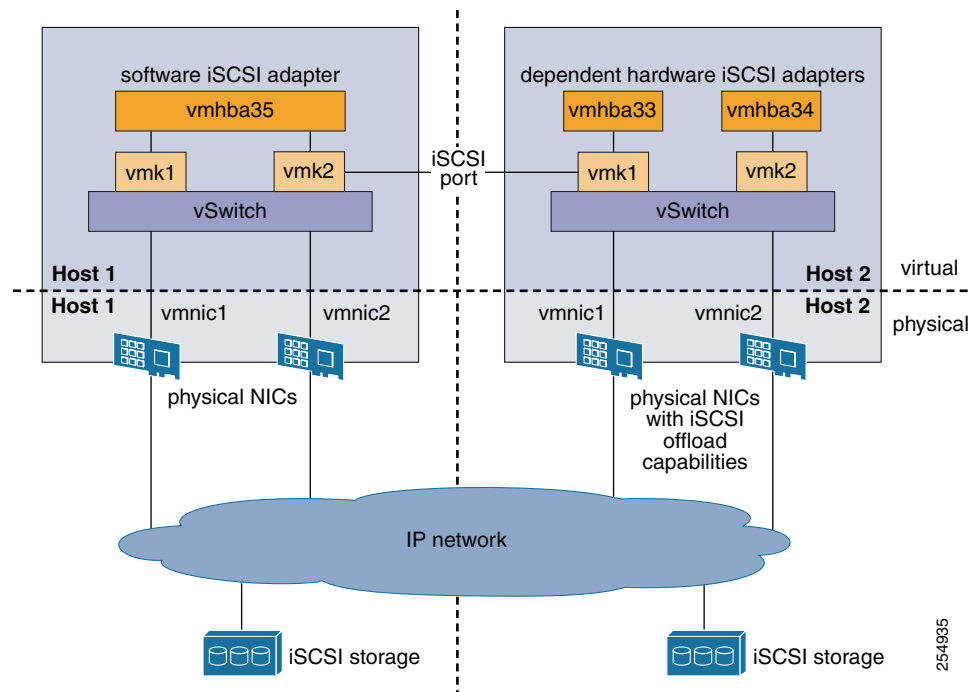
On the vSwitch, uplink pinning is done manually by the admin directly on the vSphere client.

Storage binding is also done manually by the admin directly on the ESX host or using RCLI.

For software iSCSI, only one VMHBA is required for the entire implementation. All VMkernel ports are bound to this adapter. For example, in [Figure 13-1 on page 13-3](#), both vmk1 and vmk2 are bound to VMHBA35.

For hardware iSCSI, a separate adapter is required for each NIC. Each VMkernel port is bound to the adapter of the physical VM NIC to which it is pinned. For example, in [Figure 13-1 on page 13-3](#), vmk1 is bound to VMHBA33, the iSCSI adapter associated with vmnic1 and to which vmk1 is pinned. Similarly vmk2 is bound to VMHBA34.

Figure 13-1 iSCSI Multipath on VMware Virtual Switch



The following are the adapters and NICs used in the hardware and software iSCSI multipathing configuration shown in [Figure 13-1](#).

| Software HBA | VMkernel NIC | VM NIC |
|---------------------|--------------|--------|
| VMHBA35 | 1 | 1 |
| | 2 | 2 |
| Hardware HBA | | |
| VMHBA33 | 1 | 1 |
| VMHBA34 | 2 | 2 |

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Guidelines and Limitations

The following are guidelines and limitations for the iSCSI multipath feature.

- Only port profiles of type vEthernet can be configured with **capability iscsi-multipath**.
- The port profile used for iSCSI multipath must be an access port profile, not a trunk port profile.
- The following are not allowed on a port profile configured with **capability iscsi-multipath**
 - The port profile cannot also be configured with **capability l3 control**.
 - A system VLAN change when the port profile is inherited by VMkernel NIC.
 - An access VLAN change when the port profile is inherited by VMkernel NIC.
 - A port mode change to trunk mode.
- Only VMkernel NIC ports can inherit a port profile configured with **capability iscsi-multipath**.
- The Cisco Nexus 1000V imposes the following limitations if you try to override its automatic uplink pinning.
 - A VMkernel port can only be pinned to one physical NIC.
 - Multiple VMkernel ports can be pinned to a software physical NIC.
 - Only one VMkernel port can be pinned to a hardware physical NIC.
- The iSCSI initiators and storage must already be operational.
- ESX 4.0 Update1 or later supports only software iSCSI multipathing.
- ESX 4.1 or later supports both software and hardware iSCSI multipathing.
- VMkernel ports must be created before enabling or configuring the software or hardware iSCSI for multipathing.
- VMkernel networking must be functioning for the iSCSI traffic.
- Before removing from the DVS an uplink to which an active VMkernel NIC is pinned, you must first remove the binding between the VMkernel NIC and its VMHBA. The following system message displays as a warning:


```
vsm# 2010 Nov 10 02:22:12 sekrishn-bl-vsm %VEM_MGR-SLOT8-1-VEM_SYSLOG_ALERT: sfport
: Removing Uplink Port Eth8/3 (l1 19), when vmknic lveth8/1 (l1 49) is pinned to
this port for iSCSI Multipathing
```
- Hardware iSCSI is new in Cisco Nexus 1000V Release 4.2(1)SV1(4b). If you configured software iSCSI multipathing in a previous release, the following are preserved after upgrade:
 - multipathing
 - software iSCSI uplink pinning
 - VMHBA adapter bindings
 - host access to iSCSI storage

To leverage the hardware offload capable NICs on ESX 4.1, use the [“Converting to a Hardware iSCSI Configuration” procedure on page 13-13](#).
- An iSCSI target and initiator should be in the same subnet.

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Prerequisites

The iSCSI Multipath feature has the following prerequisites.

- You must understand VMware iSCSI SAN storage virtualization. For detailed information about how to use VMware ESX and VMware ESXi systems with an iSCSI storage area network (SAN), see the *iSCSI SAN Configuration Guide*.
- You must know how to set up the iSCSI Initiator on your VMware ESX/ESXi host.
- The host is already functioning with one of the following:
 - VMware ESX 4.0.1 Update 01 for software iSCSI
 - VMware ESX 4.1 or later for software and hardware iSCSI
- You must understand iSCSI multipathing and path failover.
- VMware kernel NICs configured to access the SAN external storage are required.

Default Settings

Table 13-1 lists the default settings in the iSCSI Multipath configuration.

Table 13-1 *iSCSI Multipath Defaults*

| Parameter | Default |
|---------------------------------------|------------------------------|
| Type (port-profile) | vEthernet |
| Description (port-profile) | None |
| VMware port group name (port-profile) | The name of the port profile |
| Switchport mode (port-profile) | Access |
| State (port-profile) | Disabled |

Configuring iSCSI Multipath

Use the following procedures to configure iSCSI Multipath.

- [“Uplink Pinning and Storage Binding” procedure on page 13-5](#)
- [“Converting to a Hardware iSCSI Configuration” procedure on page 13-13](#)
- [“Changing the VMkernel NIC Access VLAN” procedure on page 13-15](#)

Uplink Pinning and Storage Binding

Use this section to configure iSCSI multipathing between hosts and targets over iSCSI protocol by assigning the vEthernet interface to an iSCSI multipath port profile configured with a system VLAN.

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Process for Uplink Pinning and Storage Binding

-
- Step 1** “Creating a Port Profile for a VMkernel NIC” procedure on page 13-6.
- Step 2** “Creating VMkernel NICs and Attaching the Port Profile” procedure on page 13-8.
- Step 3** Do one of the following:
- If you want to override the automatic pinning of NICS, go to “Manually Pinning the NICs” procedure on page 13-9.
 - If not continue with storage binding.
- You have completed uplink pinning. Continue with the next step for storage binding.
- Step 4** “Identifying the iSCSI Adapters for the Physical NICs” procedure on page 13-11
- Step 5** “Binding the VMkernel NICs to the iSCSI Adapter” procedure on page 13-13
- Step 6** “Verifying the iSCSI Multipath Configuration” procedure on page 13-18
-

Creating a Port Profile for a VMkernel NIC

You can use this procedure to create a port profile for a VMkernel NIC.

BEFORE YOU BEGIN

Before starting this procedure, you must know or do the following.

- You have already configured the host with one port channel that includes two or more physical NICs.
- Multipathing must be configured on the interface by using this procedure to create an iSCSI multipath port profile and then assigning the interface to it.
- You are logged in to the CLI in EXEC mode.
- You know the VLAN ID for the VLAN you are adding to this iSCSI multipath port profile.
 - The VLAN must already be created on the Cisco Nexus 1000V.
 - The VLAN that you assign to this iSCSI multipath port profile must be a system VLAN.
 - One of the uplink ports must already have this VLAN in its system VLAN range.
- The port profile must be an access port profile. It cannot be a trunk port profile. This procedure includes steps to configure the port profile as an access port profile.

SUMMARY STEPS

1. **config t**
2. **port-profile type vethernet *name***
3. **vmware port-group [*name*]**
4. **switchport mode access**
5. **switchport access vlan *vlanID***
6. **no shutdown**
7. **(Optional) system vlan *vlanID***

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8. **capability iscsi-multipath**
9. **state enabled**
10. (Optional) **show port-profile *name***
11. (Optional) **copy running-config startup-config**

DETAILED STEPS

| | Command | Purpose |
|--------|--|--|
| Step 1 | config t Example: n1000v# config t n1000v(config)# | Places you in the CLI Global Configuration mode. |
| Step 2 | port-profile type vethernet <i>name</i> Example: n1000v(config)# port-profile type vethernet VMK-port-profile n1000v(config-port-prof)# | Places you into the CLI Port Profile Configuration mode for the specified port profile. <ul style="list-style-type: none"> type: Defines the port-profile as Ethernet or vEthernet type. Once configured, this setting cannot be changed. The default is vEthernet type. Note If a port profile is configured as an Ethernet type, then it cannot be used to configure VMware virtual ports. <ul style="list-style-type: none"> <i>name:</i> The port profile name can be up to 80 characters and must be unique for each port profile on the Cisco Nexus 1000V. |
| Step 3 | description <i>profile description</i> Example: n1000v(config-port-prof)# description "Port Profile for iSCSI multipath" n1000v(config-port-prof)# | Adds a description to the port profile. This description is automatically pushed to the vCenter Server. <i>profile description:</i> up to 80 ASCII characters Note If the description includes spaces, it must be surrounded by quotations. |
| Step 4 | vmware port-group [<i>name</i>] Example: n1000v(config-port-prof)# vmware port-group VMK-port-profile n1000v(config-port-prof)# | Designates the port-profile as a VMware port group. The port profile is mapped to a VMware port group of the same name. When a vCenter Server connection is established, the port group created in Cisco Nexus 1000V is then distributed to the virtual switch on the vCenter Server. <i>name:</i> The VMware port group name. If you want to map the port profile to a different port group name, use the alternate name. |
| Step 5 | switchport mode access Example: n1000v(config-port-prof)# switchport mode access n1000v(config-port-prof)# | Designates that the interfaces are switch access ports (the default). |

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| | Command | Purpose |
|---------|--|--|
| Step 6 | switchport access vlan <i>vlanID</i> Example: n1000v(config-port-prof)# switchport access vlan 254 n1000v(config-port-prof)# | Assigns the system VLAN ID to the access port for this port profile. Note The VLAN assigned to this iSCSI port profile must be a system VLAN. |
| Step 7 | no shutdown Example: n1000v(config-port-prof)# no shutdown n1000v(config-port-prof)# | Administratively enables all ports in the profile. |
| Step 8 | system vlan <i>vlanID</i> Example: n1000v(config-port-prof)# system vlan 254 n1000v(config-port-prof)# | Adds the system VLAN to this port profile. This ensures that, when the host is added for the first time or rebooted later, the VEM will be able to reach the VSM. One of the uplink ports must have this VLAN in its system VLAN range. |
| Step 9 | capability iscsi-multipath Example: n1000v(config-port-prof)# capability iscsi-multipath n1000v(config-port-prof)# | Allows the port to be used for iSCSI multipathing. In vCenter Server, the iSCSI Multipath port profile must be selected and assigned to the VMkernel NIC port. |
| Step 10 | state enabled Example: n1000v(config-port-prof)# state enabled n1000v(config-port-prof)# | Enables the port profile. The configuration for this port profile is applied to the assigned ports, and the port group is created in the VMware vSwitch on the vCenter Server. |
| Step 11 | show port-profile name <i>name</i> Example: n1000v(config-port-prof)# show port-profile name multipath-profile n1000v(config-port-prof)# | (Optional) Displays the current configuration for the port profile. |
| Step 12 | copy running-config startup-config Example: n1000v(config-port-prof)# copy running-config startup-config | (Optional) Saves the running configuration persistently through reboots and restarts by copying it to the startup configuration. |
| Step 13 | “Process for Uplink Pinning and Storage Binding” section on page 13-6 | |

Creating VMkernel NICs and Attaching the Port Profile

You can use this procedure to create VMkernel NICs and attach a port profile to them which triggers the automatic pinning of the VMkernel NICs to physical NICs.

BEFORE YOU BEGIN

Before starting this procedure, you must know or do the following.

- You have already created a port profile using the procedure, “[Creating a Port Profile for a VMkernel NIC](#)” procedure on page 13-6, and you know the name of this port profile.
- The VMkernel ports are created directly on the vSphere client.

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- Create one VMkernel NIC for each physical NIC that carries the iSCSI VLAN. The number of paths to the storage device is the same as the number of VMkernel NIC created.
- Step 2 of this procedure triggers automatic pinning of VMkernel NICs to physical NICs, so you must understand the following rules for automatic pinning:
 - A VMkernel NIC is pinned to an uplink only if the VMkernel NIC and the uplink carry the same VLAN.
 - The hardware iSCSI NIC is picked first if there are many physical NICs carrying the iSCSI VLAN.
 - The software iSCSI NIC is picked only if there is no available hardware iSCSI NIC.
 - Two VMkernel NICs are never pinned to the same hardware iSCSI NIC.
 - Two VMkernel NICs can be pinned to the same software iSCSI NIC.

-
- Step 1** Create one VMkernel NIC for each physical NIC that carries the iSCSI VLAN.
- For example, if you want to configure two paths, create two physical NICs on the Cisco Nexus 1000V DVS to carry the iSCSI VLAN. The two physical NICs may carry other vlans. Create two VMkernel NICs for two paths.
- Step 2** Attach the port profile configured with **capability iscsi-multipath** to the VMkernel ports.
- The Cisco Nexus 1000V automatically pins the VMkernel NICs to the physical NICs.
- Step 3** From the ESX host, display the auto pinning configuration for verification.
- ~ # **vemcmd show iscsi pinning**
- Example:**
- ```
~ # vemcmd show iscsi pinning
Vmknict LTL Pinned_Uplink LTL
vmk6 49 vmnic2 19
vmk5 50 vmnic1 18
```
- Step 4** You have completed this procedure. Return to the [“Process for Uplink Pinning and Storage Binding” section on page 13-6](#).
- 

## Manually Pinning the NICs

You can use this procedure to override the automatic pinning of NICs done by the Cisco Nexus 1000V, and manually pin the VMkernel NICs to the physical NICs.



### Note

If the pinning done automatically by Cisco Nexus 1000V is not optimal or if you want to change the pinning, then this procedure describes how to use the vemcmd on the ESX host to override it.

### BEFORE YOU BEGIN

Before starting this procedure, you must know or do the following:

- You are logged in to the ESX host.
- You have already created VMkernel NICs and attached a port profile to them, using the [“Creating VMkernel NICs and Attaching the Port Profile” procedure on page 13-8](#).

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- Before changing the pinning, you must remove the binding between the iSCSI VMkernel NIC and the VMHBA. This procedure includes a step for doing this.
- Manual pinning persists across ESX host reboots. Manual pinning is lost if the VMkernel NIC is moved from the DVS to the vSwitch and back.

**Step 1** List the binding for each VMHBA to identify the binding to remove (iSCSI VMkernel NIC to VMHBA).

**esxcli swiscsi nic list -d vmhbann**

**Example:**

```
esxcli swiscsi nic list -d vmhba33
vmk6
 pNic name: vmnic2
 ipv4 address: 169.254.0.1
 ipv4 net mask: 255.255.0.0
 ipv6 addresses:
 mac address: 00:1a:64:d2:ac:94
 mtu: 1500
 toe: false
 tso: true
 tcp checksum: false
 vlan: true
 link connected: true
 ethernet speed: 1000
 packets received: 3548617
 packets sent: 102313
 NIC driver: bnx2
 driver version: 1.6.9
 firmware version: 3.4.4
vmk5
 pNic name: vmnic3
 ipv4 address: 169.254.0.2
 ipv4 net mask: 255.255.0.0
 ipv6 addresses:
 mac address: 00:1a:64:d2:ac:94
 mtu: 1500
 toe: false
 tso: true
 tcp checksum: false
 vlan: true
 link connected: true
 ethernet speed: 1000
 packets received: 3548617
 packets sent: 102313
 NIC driver: bnx2
 driver version: 1.6.9
 firmware version: 3.4.4
```

**Step 2** Remove the binding between the iSCSI VMkernel NIC and the VMHBA.

**Example:**

```
esxcli swiscsi nic remove --adapter vmhba33 --nic vmk6
esxcli swiscsi nic remove --adapter vmhba33 --nic vmk5
```



**Note** If active iSCSI sessions exist between the host and targets, the iSCSI port cannot be disconnected.

**Step 3** From the EXS host, display the auto pinning configuration.

**~ # vmecmd show iscsi pinning**

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**Example:**

```
~ # vemcmd show iscsi pinning
Vmknic LTL Pinned_Uplink LTL
vmk6 49 vmnic2 19
vmk5 50 vmnic1 18
```

**Step 4** Manually pin the VMkernel NIC to the physical NIC, overriding the auto pinning configuration.

```
~ # vemcmd set iscsi pinning vmk-ltl vmnic-ltl
```

**Example:**

```
~ # vemcmd set iscsi pinning 50 20
```

**Step 5** Verify the manual pinning.

```
~ # vemcmd show iscsi pinning
```

**Example:**

```
~ # vemcmd show iscsi pinning
Vmknic LTL Pinned_Uplink LTL
vmk6 49 vmnic2 19
vmk5 50 vmnic3 20
```

**Step 6** You have completed this procedure. Return to the [“Process for Uplink Pinning and Storage Binding” section on page 13-6](#).

## Identifying the iSCSI Adapters for the Physical NICs

You can use one of the following procedures in this section to identify the iSCSI adapters associated with the physical NICs.

- [“Identifying iSCSI Adapters on the vSphere Client” procedure on page 13-11](#)
- [“Identifying iSCSI Adapters on the Host Server” procedure on page 13-12](#)

## Identifying iSCSI Adapters on the vSphere Client

You can use this procedure on the vSphere client to identify the iSCSI adapters associated with the physical NICs.

### BEFORE YOU BEGIN

Before beginning this procedure, you must know or do the following:

- You are logged in to vSphere client.

**Step 1** From the Inventory panel, select a host.

**Step 2** Click the **Configuration** tab.

**Step 3** In the Hardware panel, click **Storage Adapters**.

The dependent hardware iSCSI adapter is displayed in the list of storage adapters.

**Step 4** Select the adapter and click **Properties**.

The iSCSI Initiator Properties dialog box displays information about the adapter, including the iSCSI name and iSCSI alias.

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- Step 5** Locate the name of the physical NIC associated with the iSCSI adapter.  
The default iSCSI alias has the following format: *driver\_name-vmnic#*, where *vmnic#* is the NIC associated with the iSCSI adapter.
- Step 6** You have completed this procedure. Return to the [“Process for Uplink Pinning and Storage Binding” section on page 13-6](#).
- 

## Identifying iSCSI Adapters on the Host Server

You can use this procedure on the ESX or ESXi host to identify the iSCSI adapters associated with the physical NICs.

### BEFORE YOU BEGIN

Before beginning this procedure, you must do the following:

- You are logged in to the server host.

- Step 1** List the storage adapters on the server.

**esxcfg-scsidevs -a**

**Example:**

```
esxcfg-scsidevs -a
vmhba33 bnx2i unbound iscsi.vmhba33 Broadcom iSCSI Adapter
vmhba34 bnx2i online iscsi.vmhba34 Broadcom iSCSI Adapter
```

- Step 2** For each adapter, list the physical NIC bound to it.

**esxcli swiscsi vmnic list -d adapter-name**

**Example:**

```
esxcli swiscsi vmnic list -d vmhba33 | grep name
vmnic name: vmnic2
esxcli swiscsi vmnic list -d vmhba34 | grep name
vmnic name: vmnic3
```

For the software iSCSI adapter, all physical NICs in the server are listed.

For each hardware iSCSI adaptor, one physical NIC is listed.

- Step 3** You have completed this procedure. Return to the section that pointed you here:
- [“Process for Uplink Pinning and Storage Binding” section on page 13-6](#).
  - [“Process for Converting to a Hardware iSCSI Configuration” section on page 13-14](#).
  - [“Process for Changing the Access VLAN” section on page 13-15](#).
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## Binding the VMkernel NICs to the iSCSI Adapter

You can use this procedure to manually bind the physical VMkernel NICs to the iSCSI adapter corresponding to the pinned physical NICs.

### BEFORE YOU BEGIN

Before starting this procedure, you must know or do the following:

- You are logged in to the ESX host.
- You know the iSCSI adapters associated with the physical NICs, found in the [“Identifying the iSCSI Adapters for the Physical NICs” procedure on page 13-11](#).

---

**Step 1** Find the physical NICs to which the VEM has pinned the VMkernel NICs.

**Example:**

```
Vmknic LTL Pinned_Uplink LTL
vmk2 48 vmnice2 18
vmk3 49 vmnice3 19
```

**Step 2** Bind the physical NIC to the iSCSI adapter found when [“Identifying the iSCSI Adapters for the Physical NICs” procedure on page 13-11](#).

**Example:**

```
esxcli swiscsi nic add --adapter vmhba33 --nic vmk2
```

**Example:**

```
esxcli swiscsi nic add --adapter vmhba34 --nic vmk3
```

**Step 3** You have completed this procedure. Return to the section that pointed you here:

- [“Process for Uplink Pinning and Storage Binding” section on page 13-6](#).
  - [“Process for Converting to a Hardware iSCSI Configuration” section on page 13-14](#).
  - [“Process for Changing the Access VLAN” section on page 13-15](#).
- 

## Converting to a Hardware iSCSI Configuration

You can use the procedures in this section on an ESX 4.1 host to convert from a software iSCSI to a hardware iSCSI.

### BEFORE YOU BEGIN

Before starting the procedures in this section, you must know or do the following:

- You have scheduled a maintenance window for this conversion. Converting the setup from software to hardware iSCSI involves a storage update.

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## Process for Converting to a Hardware iSCSI Configuration

You can use the following steps to convert to a hardware iSCSI configuration:

- 
- Step 1** In the vSphere client, disassociate the storage configuration made on the iSCSI NIC.
- Step 2** Remove the path to the iSCSI targets.
- Step 3** Remove the binding between the VMkernel NIC and the iSCSI adapter using the [“Removing the Binding to the Software iSCSI Adapter” procedure on page 13-14](#)
- Step 4** Move VMkernel NIC from the Cisco Nexus 1000V DVS to the vSwitch.
- Step 5** Install the hardware NICs on the ESX host, if not already installed.
- Step 6** Do one of the following:
- If the hardware NICs are already present on Cisco Nexus 1000V DVS, then continue with the next step.
  - If the hardware NICs are not already present on Cisco Nexus 1000V DVS, then go to the [“Adding the Hardware NICs to the DVS” procedure on page 13-15](#).
- Step 7** Move the VMkernel NIC back from the vSwitch to the Cisco Nexus 1000V DVS.
- Step 8** Find an iSCSI adapter, using the [“Identifying the iSCSI Adapters for the Physical NICs” procedure on page 13-11](#)
- Step 9** Bind the NIC to the adapter, using the [“Binding the VMkernel NICs to the iSCSI Adapter” procedure on page 13-13](#)
- Step 10** Verify the iSCSI multipathing configuration, using the [“Verifying the iSCSI Multipath Configuration” procedure on page 13-18](#)
- 

## Removing the Binding to the Software iSCSI Adapter

You can use this procedure to remove the binding between the iSCSI VMkernel NIC and the software iSCSI adapter.

- 
- Step 1** Remove the iSCSI VMkernel NIC binding to the VMHBA.
- Example:**
- ```
esxcli swiscsi nic remove --adapter vmhba33 --nic vmk6
esxcli swiscsi nic remove --adapter vmhba33 --nic vmk5
```
- Step 2** You have completed this procedure. Return to the [“Process for Converting to a Hardware iSCSI Configuration” section on page 13-14](#).
-

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Adding the Hardware NICs to the DVS

You can use this procedure, if the hardware NICs are not on Cisco Nexus 1000V DVS, to add the uplinks to the DVS using the vSphere client.

BEEFORE YOU BEGIN

Before starting this procedure, you must know or do the following:

- You are logged in to vSphere client.
- This procedure requires a server reboot.

-
- Step 1** Select a server from the inventory panel.
 - Step 2** Click the Configuration tab.
 - Step 3** In the Configuration panel, click **Networking**.
 - Step 4** Click the **vNetwork Distributed Switch**.
 - Step 5** Click **Manage Physical Adapters**.
 - Step 6** Select the port profile to use for the hardware NIC.
 - Step 7** Click **Click to Add NIC**.
 - Step 8** In Unclaimed Adapters, select the physical NIC and Click **OK**.
 - Step 9** In the Manage Physical Adapters window, click **OK**.
 - Step 10** Move the iSCSI VMkernel NICs from vSwitch to the Cisco Nexus 1000V DVS.
The VMkernel NICs are automatically pinned to the hardware NICs.
 - Step 11** You have completed this procedure. Return to the [“Process for Converting to a Hardware iSCSI Configuration” section on page 13-14](#).
-

Changing the VMkernel NIC Access VLAN

You can use the procedures in this section to change the access VLAN, or the networking configuration, of the iSCSI VMkernel.

Process for Changing the Access VLAN

You can use the following steps to change the VMkernel NIC access VLAN:

-
- Step 1** In the vSphere client, disassociate the storage configuration made on the iSCSI NIC.
 - Step 2** Remove the path to the iSCSI targets.
 - Step 3** Remove the binding between the VMkernel NIC and the iSCSI adapter using the [“Removing the Binding to the Software iSCSI Adapter” procedure on page 13-14](#)
 - Step 4** Move VMkernel NIC from the Cisco Nexus 1000V DVS to the vSwitch.
 - Step 5** Change the access VLAN, using the [“Changing the Access VLAN” procedure on page 13-16](#).

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- Step 6** Move the VMkernel NIC back from the vSwitch to the Cisco Nexus 1000V DVS.
 - Step 7** Find an iSCSI adapter, using the “Identifying the iSCSI Adapters for the Physical NICs” procedure on page 13-11
 - Step 8** Bind the NIC to the adapter, using the “Binding the VMkernel NICs to the iSCSI Adapter” procedure on page 13-13
 - Step 9** Verify the iSCSI multipathing configuration, using the “Verifying the iSCSI Multipath Configuration” procedure on page 13-18
-

Changing the Access VLAN

BEFORE YOU BEGIN

Before starting this procedure, you must know or do the following:

- You are logged in to the ESX host.
 - You are not allowed to change the access VLAN of an iSCSI multipath port profile if it is inherited by a VMkernel NIC. Use the **show port-profile name profile-name** command to verify inheritance.
-

- Step 1** Remove the path to the iSCSI targets from the vSphere client.
- Step 2** List the binding for each VMHBA to identify the binding to remove (iSCSI VMkernel NIC to VMHBA).

esxcli swiscsi nic list -d vmhbann

Example:

```
esxcli swiscsi nic list -d vmhbba33
vmk6
  pNic name: vmnic2
  ipv4 address: 169.254.0.1
  ipv4 net mask: 255.255.0.0
  ipv6 addresses:
  mac address: 00:1a:64:d2:ac:94
  mtu: 1500
  toe: false
  tso: true
  tcp checksum: false
  vlan: true
  link connected: true
  ethernet speed: 1000
  packets received: 3548617
  packets sent: 102313
  NIC driver: bnx2
  driver version: 1.6.9
  firmware version: 3.4.4
vmk5
  pNic name: vmnic3
  ipv4 address: 169.254.0.2
  ipv4 net mask: 255.255.0.0
  ipv6 addresses:
  mac address: 00:1a:64:d2:ac:94
  mtu: 1500
  toe: false
  tso: true
  tcp checksum: false
  vlan: true
```


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```
link connected: true
ethernet speed: 1000
packets received: 3548617
packets sent: 102313
NIC driver: bnx2
driver version: 1.6.9
firmware version: 3.4.4
```

Step 3 Remove the iSCSI VMkernel NIC binding to the VMHBA.

Example:

```
esxcli swiscsi nic remove --adapter vmhba33 --nic vmk6
esxcli swiscsi nic remove --adapter vmhba33 --nic vmk5
```

Step 4 Remove the **capability iscsi-multipath** configuration from the port profile.

no capability iscsi-multipath

Example:

```
n1000v# config t
n1000v(config)# port-profile type vethernet VMK-port-profile
n1000v(config-port-prof)# no capability iscsi-multipath
```

Step 5 Remove the system VLAN.

no system vlan *vlanID*

Example:

```
n1000v# config t
n1000v(config)# port-profile type vethernet VMK-port-profile
n1000v(config-port-prof)# no system vlan 300
```

Step 6 Change the access VLAN in the port profile.

switchport access vlan *vlanID*

Example:

```
n1000v# config t
n1000v(config)# port-profile type vethernet VMK-port-profile
n1000v(config-port-prof)# switchport access vlan 300
```

Step 7 Add the system VLAN.

system vlan *vlanID*

Example:

```
n1000v# config t
n1000v(config)# port-profile type vethernet VMK-port-profile
n1000v(config-port-prof)# system vlan 300
```

Step 8 Add the **capability iscsi-multipath** configuration back to the port profile.

capability iscsi-multipath

Example:

```
n1000v# config t
n1000v(config)# port-profile type vethernet VMK-port-profile
n1000v(config-port-prof)# capability iscsi-multipath
```

Step 9 You have completed this procedure. Return to the [“Process for Changing the Access VLAN”](#) section on page 13-15.

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Verifying the iSCSI Multipath Configuration

You can use the commands in this section to verify the iSCSI multipath configuration.

| Command | Purpose |
|---|--|
| <code>~ # vemcmd show iscsi pinning</code> | Displays the auto pinning of VMkernel NICs See Example 13-1 on page 13-18 . |
| <code>esxcli swiscsi nic list -d vmhba33</code> | Displays the iSCSI adapter binding of VMkernel NICs. See Example 13-2 on page 13-18 |
| <code>show port-profile [brief expand-interface usage] [name profile-name]</code> | Displays the port profile configuration. See Example 13-3 on page 13-18 |

Example 13-1 ~ # vemcmd show iscsi pinning

```
~ # vemcmd show iscsi pinning
Vmknict   LTL       Pinned_Uplink   LTL
vmk6      49        vmnic2          19
vmk5      50        vmnic1          18
```

Example 13-2 esxcli swiscsi nic list -d vmhba33

```
esxcli swiscsi nic list -d vmhba33
vmk6
  pNic name: vmnic2
  ipv4 address: 169.254.0.1
  ipv4 net mask: 255.255.0.0
  ipv6 addresses:
  mac address: 00:1a:64:d2:ac:94
  mtu: 1500
  toe: false
  tso: true
  tcp checksum: false
  vlan: true
  link connected: true
  ethernet speed: 1000
  packets received: 3548617
  packets sent: 102313
  NIC driver: bnx2
  driver version: 1.6.9
  firmware version: 3.4.4
```

Example 13-3 show port-profile name iscsi-profile

```
n1000v# show port-profile name iscsi-profile
port-profile iscsi-profile
  type: Vethernet
  description:
  status: enabled
  max-ports: 32
  inherit:
  config attributes:
  evaluated config attributes:
  assigned interfaces:
  port-group:
```

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```

system vlans: 254
capability l3control: no
capability iscsi-multipath: yes
port-profile role: none
port-binding: static
n1000v#

```

Additional References

For additional information related to implementing iSCSI Multipath, see the following sections:

- [Related Documents, page 13-19](#)
- [Standards, page 13-19](#)

Related Documents

| Related Topic | Document Title |
|---|--|
| VMware SAN Configuration | VMware SAN Configuration Guide |
| Port Profile Configuration | <i>Cisco Nexus 1000V Port Profile Configuration Guide, Release 4.2(1)SV1(4a)</i> |
| Interface Configuration | <i>Cisco Nexus 1000V Interface Configuration Guide, Release 4.2(1)SV1(4a)</i> |
| Complete command syntax, command modes, command history, defaults, usage guidelines, and examples for all Cisco Nexus 1000V commands. | <i>Cisco Nexus 1000V Command Reference, Release 4.2(1)SV1(4a)</i> |

Standards

| Standards | Title |
|---|-------|
| No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature. | — |

Feature History for iSCSI Multipath

Table 13-2 lists the release history for the iSCSI Multipath feature.

Table 13-2 Feature History for iSCSI Multipath

| Feature Name | Releases | Feature Information |
|--------------------------|--------------|---|
| Hardware iSCSI Multipath | 4.2(1)SV1(4) | Added support for hardware iSCSI Multipath. |
| iSCSI Multipath | 4.0(4)SV1(2) | The iSCSI Multipath feature was added. |

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