CHAPTER 4

Configuring Internet Small Computer Systems Interface

Cisco MDS 9000 Family IP storage (IPS) services extend the reach of Fibre Channel SANs by using open-standard, IP-based technology. The switch allows IP hosts to access Fibre Channel storage using the Internet Small Computer Systems Interface (iSCSI) protocol.

Note The iSCSI feature is specific to the Fibre Channel module with IPS ports and is available in Cisco MDS 9200 Switches or Cisco MDS 9500 Directors. In Cisco MDS NX-OS Release 7.3(0)DY(1) and later, iSCSI is not supported on Cisco MDS 9700 Directors with 24/10 port SAN Extension modules.

The Cisco MDS 9216i switch and the 14/2 Multiprotocol Services (MPS-14/2) module also allow you to use Fibre Channel, FCIP, and iSCSI features. The MPS-14/2 module is available for use in any switch in the Cisco MDS 9200 Series or Cisco MDS 9500 Series.

Note For information on configuring Gigabit Ethernet interfaces, see "Basic Gigabit Ethernet Configuration for IPv4" section on page 7-cclviii.

This chapter includes the following sections:

- Overview of iSCSI, page 4-lxxvii
- Configuring iSCSI, page 4-lxxx
- Configuring iSLB, page 4-cxxix
- iSCSI High Availability, page 4-clv
- iSCSI Authentication Setup Guidelines and Scenarios, page 4-clxii
- iSNS Cloud Discovery, page 4-cxcviii
- Default Settings, page 4-ccii

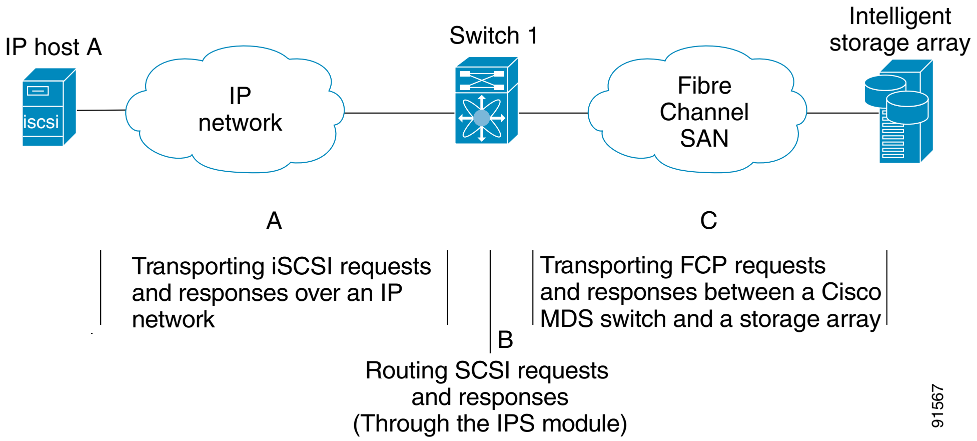
Overview of iSCSI

Cisco MDS 9000 Family IP Storage (IPS) services extend the reach of Fibre Channel SANs by using open-standard, IP-based technology. The iSCSI feature consists of routing iSCSI requests and responses between iSCSI hosts in an IP network and Fibre Channel storage devices in the Fibre Channel SAN that are accessible from any Fibre Channel interface of the Cisco MDS 9000 Family switch. Using the iSCSI protocol, the iSCSI driver allows an iSCSI host to transport SCSI requests and responses over an IP network. To use the iSCSI feature, you must explicitly enable iSCSI on the required switches in the fabric.

Note The iSCSI feature is not supported on the Cisco Fabric Switch for HP c-Class Bladesystem and Cisco Fabric Switch for IBM BladeCenter.

The iSCSI feature consists of routing iSCSI requests and responses between iSCSI hosts in an IP network and Fibre Channel storage devices in the Fibre Channel SAN that are accessible from any Fibre Channel interface of the Cisco MDS 9000 Family switch (see Figure 4-1).

Figure 4-1 *Transporting iSCSI Requests and Responses for Transparent iSCSI Routing*

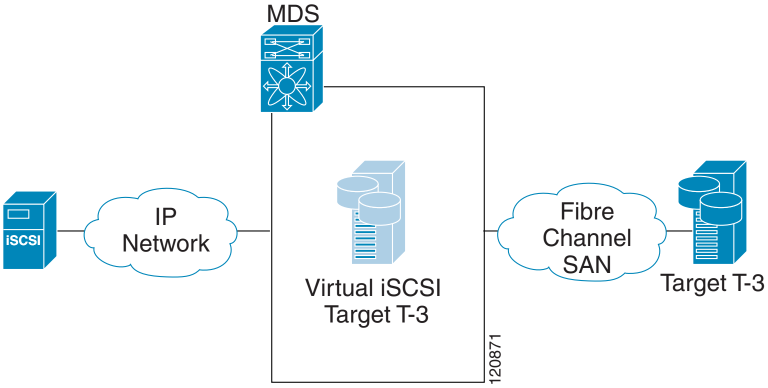

IP host A
iscsi
IP network
Switch 1
Fibre Channel SAN
Intelligent storage array
A
Transporting iSCSI requests and responses over an IP network
C
Transporting FCP requests and responses between a Cisco MDS switch and a storage array
B
Routing SCSI requests and responses (Through the IPS module)
91567

Each iSCSI host that requires access to storage through the Fibre Channel module with IPS ports or MPS-14/2 module needs to have a compatible iSCSI driver installed. Using the iSCSI protocol, the iSCSI driver allows an iSCSI host to transport SCSI requests and responses over an IP network. From the host operating system perspective, the iSCSI driver appears to be an SCSI transport driver similar to a Fibre Channel driver in the host.

The Fibre Channel module with IPS ports or MPS-14/2 module provides transparent SCSI routing. IP hosts using the iSCSI protocol can transparently access targets on the Fibre Channel network. It (see Figure 4-1) provides an example of a typical configuration of iSCSI hosts connected to an Fibre Channel module with IPS ports or MPS-14/2 module through the IP network access Fibre Channel storage on the Fibre Channel SAN.

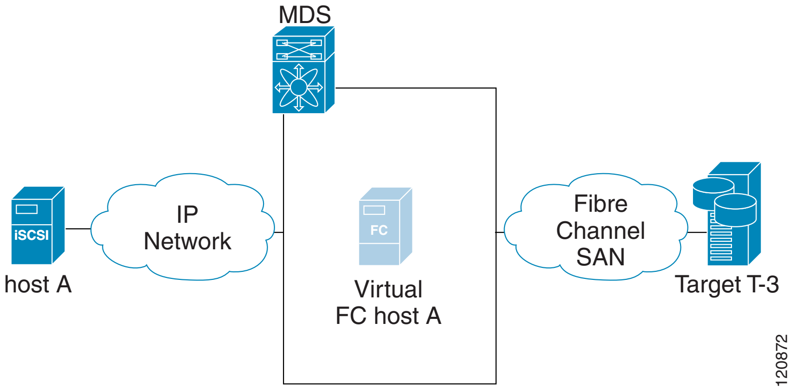
The Fibre Channel module with IPS ports or MPS-14/2 module create a separate iSCSI SAN view and Fibre Channel SAN view. For the iSCSI SAN view, the Fibre Channel module with IPS ports or MPS-14/2 module creates iSCSI virtual targets and then maps them to physical Fibre Channel targets available in the Fibre Channel SAN. They present the Fibre Channel targets to IP hosts as if the physical iSCSI targets were attached to the IP network (see Figure 4-2).

Figure 4-2 iSCSI SAN View—iSCSI Virtual Targets


MDS
iSCSI
IP Network
Virtual iSCSI Target T-3
Fibre Channel SAN
Target T-3
120871

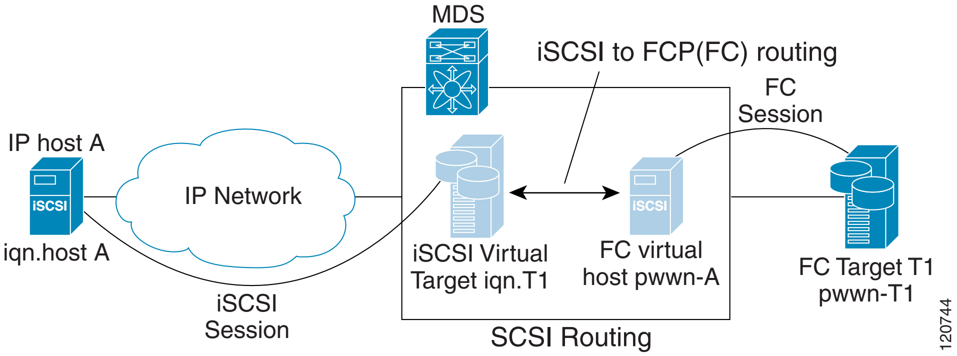
For the Fibre Channel SAN view, the Fibre Channel module with IPS ports or MPS-14/2 module presents iSCSI hosts as a virtual Fibre Channel host. The storage devices communicate with the virtual Fibre Channel host similar to communications performed with real Fibre Channel hosts (see Figure 4-3).

Figure 4-3 Fibre Channel SAN View—iSCSHI Host as an HBA


MDS
iSCSI
host A
IP Network
FC
Virtual FC host A
Fibre Channel SAN
Target T-3
120872

The Fibre Channel module with IPS ports or MPS-14/2 modules transparently map the command between the iSCSI virtual target and the virtual Fibre Channel host (see Figure 4-4).

Figure 4-4 iSCSI to FCP (Fibre Channel) Routing


MDS
iSCSI to FCP(FC) routing
FC Session
IP host A
iSCSI
iqn.host A
IP Network
iSCSI Session
iSCSI Virtual Target iqn.T1
iSCSI
FC virtual host pwwn-A
SCSI Routing
FC Target T1 pwwn-T1
120744

Routing SCSI from the IP host to the Fibre Channel storage device consists of the following main actions:

- The iSCSI requests and responses are transported over an IP network between the hosts and the Fibre Channel module with IPS ports or MPS-14/2 module.
- The SCSI requests and responses are routed between the hosts on an IP network and the Fibre Channel storage device (converting iSCSI to FCP and vice versa). The Fibre Channel module with IPS ports or MPS-14/2 module performs this conversion and routing.
- The FCP requests or responses are transported between the Fibre Channel module with IPS ports or MPS-14/2 module and the Fibre Channel storage devices.

Note FCP (the Fibre Channel equivalent of iSCSI) carries SCSI commands over a Fibre Channel SAN. Refer to the IETF standards for IP storage at http://www.ietf.org for information on the iSCSI protocol.

iSCSI Configuration Limits

iSCSI configuration has the following limits:

- The maximum number of iSCSI and iSLB initiators supported in a fabric is 2000.
- The maximum number of iSCSI and iSLB initiators supported is 200 per port.
- The maximum number of iSCSI and iSLB sessions supported by an IPS port in either transparent or proxy initiator mode is 500.
- The maximum number of iSCSI and iSLB session support by switch is 5000.
- The maximum number of iSCSI and iSLB targets supported in a fabric is 6000.

Configuring iSCSI

This section describes how to configure iSCSI on the Cisco MDS 9000 Family switches.

This section includes the following sections:

- Enabling iSCSI, page 4-lxxx
- Creating iSCSI Interfaces, page 4-lxxxii
- Using the iSCSI Wizard, page 4-lxxxiii
- Presenting Fibre Channel Targets as iSCSI Targets, page 4-lxxxv
- Presenting iSCSI Hosts as Virtual Fibre Channel Hosts, page 4-xcii
- iSCSI Access Control, page 4-cv
- iSCSI Session Authentication, page 4-cx
- iSCSI Immediate Data and Unsolicited Data Features, page 4-cxvi
- iSCSI Interface Advanced Features, page 4-cxvi

Enabling iSCSI

To use the iSCSI feature, you must explicitly enable iSCSI on the required switches in the fabric. Alternatively, you can enable or disable the iSCSI feature directly on the required modules using Fabric Manager or Device Manager. By default, this feature is disabled in all switches in the Cisco MDS 9000 Family.

To enable iSCSI on any participating switch, follow these steps:

	Command	Purpose
Step 1	`switch# config terminalerminal`	Enters the configuration commands, one per line. End with CNTL/Z.
Step 2	`switch(config)# feature iscsi`	Enables iSCSI on that switch.
	`switch(config)# no feature iscsi`	Disables (default) iSCSI on that switch.
	`switch(config)# iscsi enable module <x>`	Enables iSCSI modules on the switch. **Note** New command added so that SME and iSCSI are available on the same switch.
	`switch(config)# no iscsi enable module <x>`	Disables the iSCSI module on the switch.

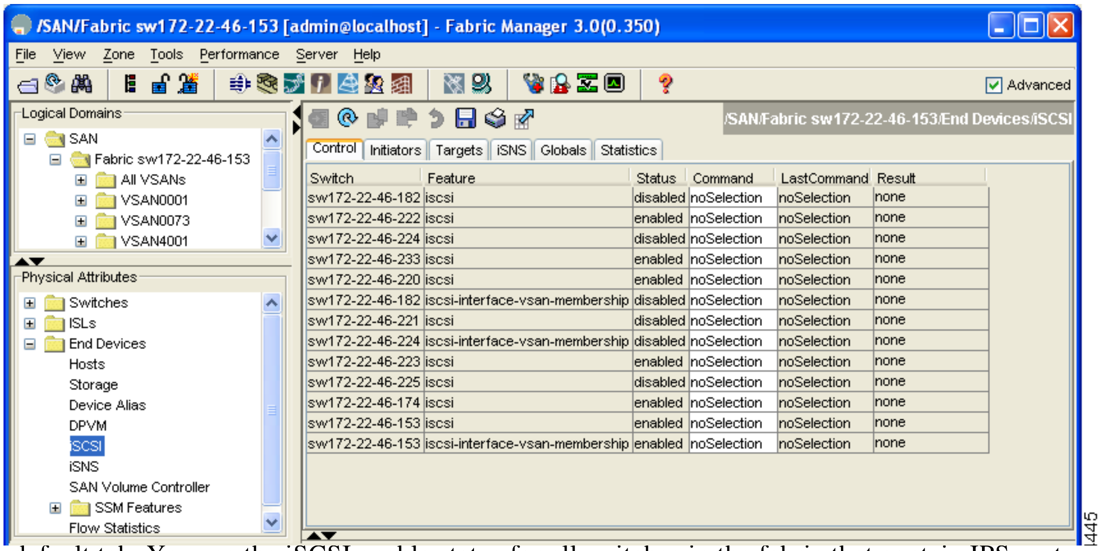
Caution When you disable this feature, all related configurations are automatically discarded.

To enable iSCSI on any switch using Fabric Manager, follow these steps:

Step 1 Choose **End Devices** > **iSCSI** in the Physical Attributes pane.

You see the iSCSI tables in the Information pane (see Figure 4-5).

Figure 4-5 iSCSI Tables in Fabric Manager


/SAN/Fabric sw172-22-46-153 [admin@localhost] - Fabric Manager 3.0(0.350)
File View Zone Tools Performance Server Help
☑ Advanced
Logical Domains
SAN
Fabric sw172-22-46-153
All VSANs
VSAN0001
VSAN0073
VSAN4001
Physical Attributes
Switches
ISLs
End Devices
Hosts
Storage
Device Alias
DPVM
iSCSI
iSNS
SAN Volume Controller
SSM Features
Flow Statistics
/SAN/Fabric sw172-22-46-153/End Devices/iSCSI
Control
Initiators
Targets
iSNS
Globals
Statistics
1445

Switch	Feature	Status	Command	LastCommand	Result
sw172-22-46-182	iscsi	disabled	noSelection	noSelection	none
sw172-22-46-222	iscsi	enabled	noSelection	noSelection	none
sw172-22-46-224	iscsi	disabled	noSelection	noSelection	none
sw172-22-46-233	iscsi	enabled	noSelection	noSelection	none
sw172-22-46-220	iscsi	enabled	noSelection	noSelection	none
sw172-22-46-182	iscsi-interface-vsan-membership	disabled	noSelection	noSelection	none
sw172-22-46-221	iscsi	disabled	noSelection	noSelection	none
sw172-22-46-224	iscsi-interface-vsan-membership	disabled	noSelection	noSelection	none
sw172-22-46-223	iscsi	enabled	noSelection	noSelection	none
sw172-22-46-225	iscsi	disabled	noSelection	noSelection	none
sw172-22-46-174	iscsi	enabled	noSelection	noSelection	none
sw172-22-46-153	iscsi	enabled	noSelection	noSelection	none
sw172-22-46-153	iscsi-interface-vsan-membership	enabled	noSelection	noSelection	none

The **Control** tab is the default tab. You see the iSCSI enable status for all switches in the fabric that contain IPS ports.

Step 2 Choose **enable** from the Command column for each switch that you want to enable iSCSI on.

Step 3 Click the **Apply Changes** icon to save these changes.

To enable iSCSI on a module using Fabric Manager, follow these steps:

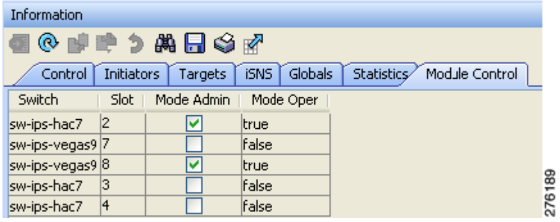
Step 1 Choose **End Devices** > **iSCSI** in the Physical Attributes pane.

You see the iSCSI tables in the Information pane.

Step 2 Click the **Module Control** tab.

You see the Module Control dialog box in the information pane (see Figure 4-6).

Figure 4-6 Module Control Dialog Box


Information
Control
Initiators
Targets
iSNS
Globals
Statistics
Module Control
276189

Switch	Slot	Mode Admin	Mode Oper
sw-ips-hac7	2	☑	true
sw-ips-vegas9	7	☐	false
sw-ips-vegas9	8	☑	true
sw-ips-hac7	3	☐	false
sw-ips-hac7	4	☐	false

Step 3 Check the **Mode Admin** check box to enable iSCSI for a specified port on the selected module.

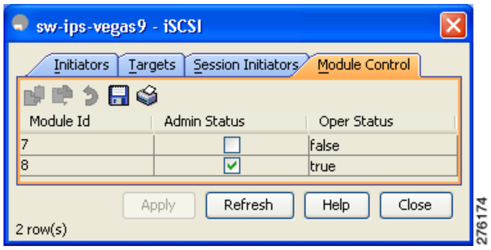
Step 4 Click the **Apply Changes** icon to save these changes.

To enable iSCSI on a module using Device Manager, follow these steps:

Step 1 Choose **IP** > **iSCSI**

You see the iSCSI table (see Figure 4-7).

Figure 4-7 iSCSI Table


sw-ips-vegas9 - iSCSI
Initiators
Targets
Session Initiators
Module Control
Apply
Refresh
Help
Close
276174

Module Id	Admin Status	Oper Status
7	☐	false
8	☑	true

2 row(s)

Step 2 Check the **Mode Admin** check box to enable iSCSI for the specified port on the selected module.

Step 3 Click **Apply** to save these changes.

Creating iSCSI Interfaces

Each physical Gigabit Ethernet interface on an Fibre Channel module with IPS ports, MPS-14/2 module or 1/10Gbps IPStorage port on a Cisco MDS 9250i Multiservice Fabric Switch can be used to translate and route iSCSI requests to Fibre Channel targets and responses in the opposite direction. To enable this capability, the corresponding iSCSI interface must be in an enabled state.

To enable iSCSI interfaces, follow these steps:

Step 1 Enable the required Gigabit Ethernet interface.

```
switch# config terminal
switch(config)# interface gigabitethernet 2/1
switch(config-if)# no shutdown
switch(config-if)# exit
switch(config)#
```

Step 2 Create the required iSCSI interface and enable the interface.

```
switch(config)# interface iscsi 2/1
switch(config-if)# no shutdown
```

Note Use the **tcp maximum-bandwidth-kbps** and **tcp maximum-bandwidth-mbps** commands to configure the iSCSI speed and the **switchport speed** command to set the Physical IPStorage ports to 1Gbps or 10Gbps speed. The Cisco MDS switches do not limit the configuration of the iSCSI tcp maximum-bandwidth-kbps and maximum-bandwidth-mbps based on the speed of the underlying physical Gigabit Ethernet or IPStorage ports. Consequently, it is possible to configure iSCSI **tcp maximum-bandwidth-kbps** and **tcp maximum-bandwidth-mbps** commands to the equivalent of 10Gbps on a physical IPStorage port that is running at a 1Gbps speed. When configuring the tcp maximum bandwidth, ensure that it does not exceed the maximum speed of the physical IPStorage port.

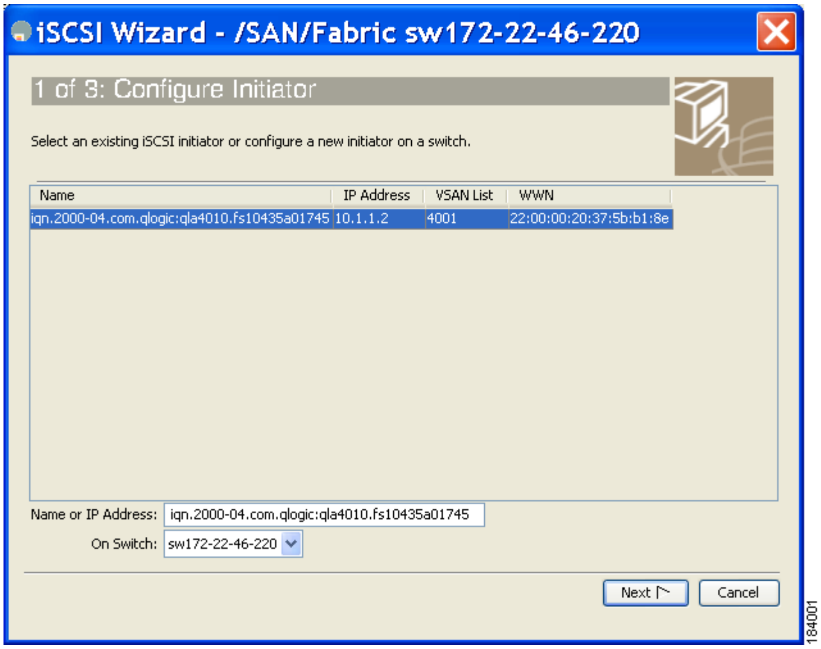
Using the iSCSI Wizard

To use the iSCSI wizard in Fabric Manager, follow these steps:

Step 1 Click the **iSCSI Setup Wizard** icon.

You see the iSCSI Wizard Configure Initiator dialog box (see Figure 4-8).

Figure 4-8 iSCSI Wizard Configure Initiator Dialog Box



iSCSI Wizard - /SAN/Fabric sw172-22-46-220

1 of 3: Configure Initiator

Select an existing iSCSI initiator or configure a new initiator on a switch.

Name	IP Address	VSAN List	WWN
iqn.2000-04.com.qlogic:qla4010.fs10435a01745	10.1.1.2	4001	22:00:00:20:37:5b:b1:8e

Name or IP Address: iqn.2000-04.com.qlogic:qla4010.fs10435a01745

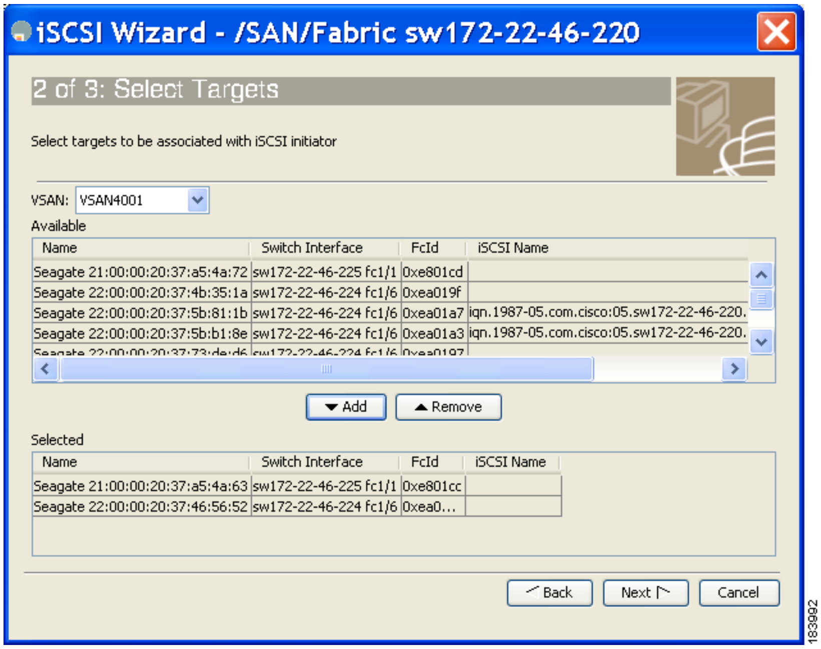
On Switch: sw172-22-46-220

Step 2 Select an existing iSCSI initiator or add the iSCSI node name or IP address for a new iSCSI initiator.

Step 3 Select the switch for this iSCSI initiator if you are adding a new iSCSI initiator and click **Next**.

You see the iSCSI Wizard Select Targets dialog box (see Figure 4-9).

Figure 4-9 iSCSI Wizard Select Targets Dialog Box



iSCSI Wizard - /SAN/Fabric sw172-22-46-220

2 of 3: Select Targets

Select targets to be associated with iSCSI initiator

VSAN: VSAN4001

Available

Name	Switch Interface	FcId	iSCSI Name
Seagate 21:00:00:20:37:a5:4a:72	sw172-22-46-225 fc1/1	0xe801cd	
Seagate 22:00:00:20:37:4b:35:1a	sw172-22-46-224 fc1/6	0xea019f	
Seagate 22:00:00:20:37:5b:81:1b	sw172-22-46-224 fc1/6	0xea01a7	iqn.1987-05.com.cisco:05.sw172-22-46-220.
Seagate 22:00:00:20:37:5b:b1:8e	sw172-22-46-224 fc1/6	0xea01a3	iqn.1987-05.com.cisco:05.sw172-22-46-220.
Seagate 22:00:00:20:37:73:de:d6	sw172-22-46-224 fc1/6	0xea0197	

Selected

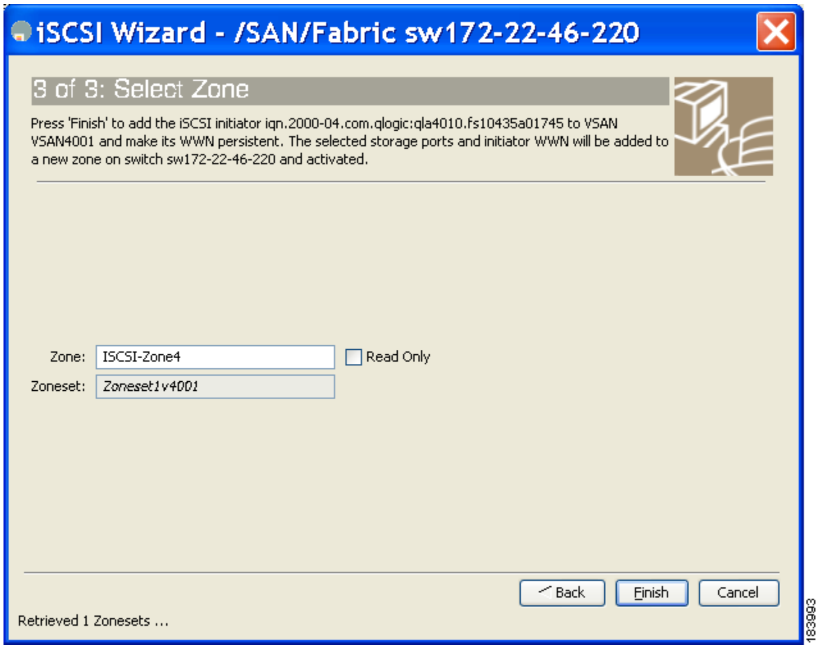
Name	Switch Interface	FcId	iSCSI Name
Seagate 21:00:00:20:37:a5:4a:63	sw172-22-46-225 fc1/1	0xe801cc	
Seagate 22:00:00:20:37:46:56:52	sw172-22-46-224 fc1/6	0xea0...	

Step 4 Select the VSAN and targets to associate with this iSCSI initiator and click **Next**.

Note The iSCSI wizard turns on the Dynamic Import FC Targets feature.

You see the iSCSI Wizard Select Zone dialog box (see Figure 4-10).

Figure 4-10 iSCSI Wizard Select Zone Dialog Box



Press 'Finish' to add the iSCSI initiator iqn.2000-04.com.qlogic:qla4010.fs10435a01745 to VSAN VSAN4001 and make its WWN persistent. The selected storage ports and initiator WWN will be added to a new zone on switch sw172-22-46-220 and activated.

Zone: ISCSI-Zone4 ☐ Read Only

Zoneset: Zoneset1v4001

Retrieved 1 Zonesets ...

Step 5 Set the zone name for this new iSCSI zone and check the **ReadOnly** check box if needed.

Step 6 Click **Finish** to create this iSCSI initiator.

If created, the target VSAN is added to the iSCSI host VSAN list.

Note iSCSI wizard automatically turns on the Dynamic FC target import.

Presenting Fibre Channel Targets as iSCSI Targets

The Fibre Channel module with IPS ports or MPS-14/2 module presents physical Fibre Channel targets as iSCSI virtual targets, allowing them to be accessed by iSCSI hosts. The module presents these targets in one of the two ways:

- Dynamic mapping—Automatically maps all the Fibre Channel target devices/ports as iSCSI devices. Use this mapping to create automatic iSCSI target names.
- Static mapping—Manually creates iSCSI target devices and maps them to the whole Fibre Channel target port or a subset of Fibre Channel LUNs. With this mapping, you must specify unique iSCSI target names.

  Static mapping should be used when iSCSI hosts should be restricted to subsets of LUs in the Fibre Channel targets and/or iSCSI access control is needed (see the "iSCSI Access Control" section on page 4-cv). Also, static mapping allows the configuration of transparent failover if the LUs of the Fibre Channel targets are reachable by redundant Fibre Channel ports (see the "Transparent Target Failover" section on page 4-clv).

Note The Fibre Channel module with IPS ports or MPS-14/2 module does not import Fibre Channel targets to iSCSI by default. Either dynamic or static mapping must be configured before the Fibre Channel module with IPS ports or MPS-14/2 module makes Fibre Channel targets available to iSCSI initiators.

Dynamic Mapping

When you configure dynamic mapping the Fibre Channel module with IPS ports or MPS-14/2 module imports all Fibre Channel targets to the iSCSI domain and maps each physical Fibre Channel target port as one iSCSI target. That is, all LUs accessible through the physical storage target port are available as iSCSI LUs with the same LU number (LUN) as in the physical Fibre Channel target port.

The iSCSI target node name is created automatically using the iSCSI qualified name (IQN) format. The iSCSI qualified name is restricted to a maximum name length of 223 alphanumeric characters and a minimum length of 16 characters.

The Fibre Channel module with IPS ports or MPS-14/2 module creates an IQN formatted iSCSI target node name using the following conventions because the name must be unique in the SAN:

- IPS Gigabit Ethernet ports that are not part of a Virtual Router Redundancy Protocol (VRRP) group or port channel use this format:

  `iqn.1987-05.com.cisco:05.<mgmt-ip-address>.<slot#>-<port#>-<sub-intf#>.<Target-pWWN>`

- IPS ports that are part of a VRRP group use this format:

  `iqn.1987-05.com.cisco:05.vrrp-<vrrp-ID#>-<vrrp-IP-addr>.<Target-pWWN>`

- Ports that are part of a port channel use this format:

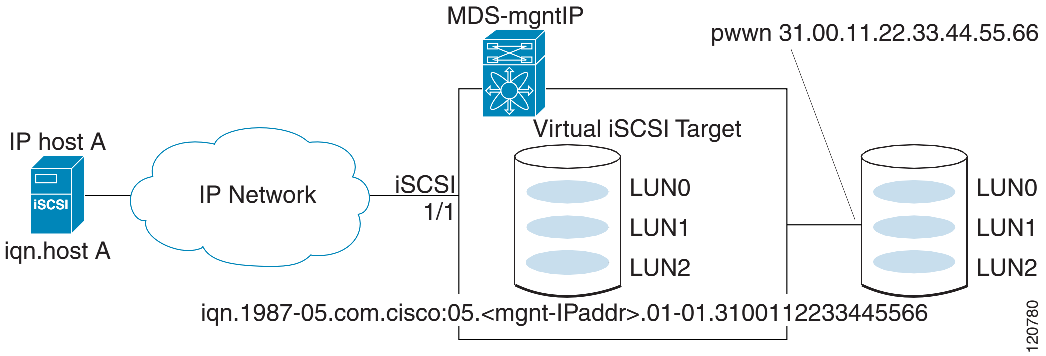
  `iqn.1987-02.com.cisco:02.<mgmt-ip-address>.pc-<port-ch-sub-intf#>.<Target-pWWN>`

Note If you have configured a switch name, then the switch name is used instead of the management IP address. If you have not configured a switch name, the management IP address is used.

With this convention, each IPS port in a Cisco MDS 9000 Family switch creates a unique iSCSI target node name for the same Fibre Channel target port in the SAN.

For example, if an iSCSI target was created for a Fibre Channel target port with pWWN 31:00:11:22:33:44:55:66 and that pWWN contains LUN 0, LUN 1, and LUN 2, those LUNs would become available to an IP host through the iSCSI target node name iqn.1987-05.com.cisco:05. *MDS_switch_management_IP_address*.01-01.3100112233445566 (see Figure 4-11).

Figure 4-11 Dynamic Target Mapping



Note Each iSCSI initiator may not have access to all targets depending on the configured access control mechanisms (see the "iSCSI Access Control" section on page 4-cv).

To enable dynamic mapping of Fibre Channel targets into iSCSI, follow these steps:

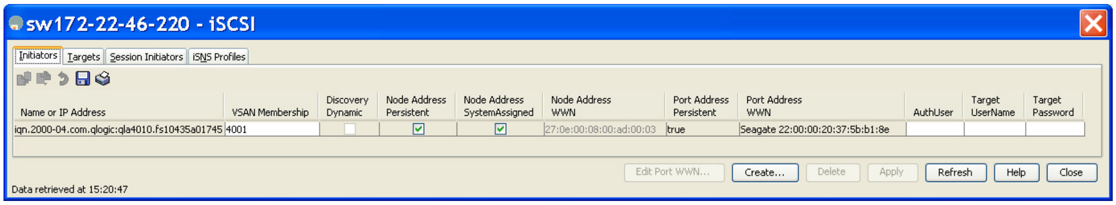
	Command	Purpose
Step 1	`switch#` **`config terminal`** `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)#` **`iscsi import target fc`**	Fibre Channel module with IPS ports and MPS-14/2 modules dynamically import all Fibre Channel targets in the Fibre Channel SAN into the IP network.

To enable dynamic mapping of Fibre Channel targets into iSCSI using Device Manager, follow these steps:

Step 1 Choose **IP > iSCSI**.

You see the iSCSI configuration (see Figure 4-12).

Figure 4-12 iSCSI Configuration in Device Manager

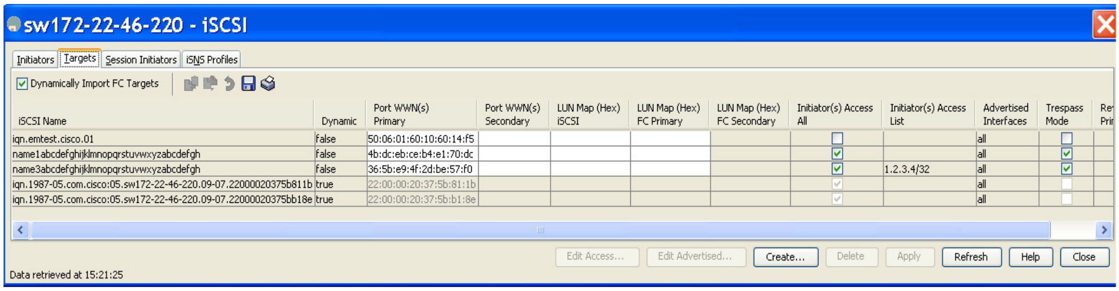

sw172-22-46-220 - iSCSI
Initiators
Targets
Session Initiators
iSNS Profiles
Edit Port WWN...
Create...
Delete
Apply
Refresh
Help
Close
183994

Name or IP Address	VSAN Membership	Discovery Dynamic	Node Address Persistent	Node Address SystemAssigned	Node Address WWN	Port Address Persistent	Port Address WWN	AuthUser	Target UserName	Target Password
iqn.2000-04.com.qlogic:qla4010.fs10435a01745	4001	☐	☑	☑	27:0e:00:08:00:ad:00:03	true	Seagate 22:00:00:20:37:5b:b1:8e			

Data retrieved at 15:20:47

Step 2 Click the Target tab to display a list of existing iSCSI targets (see Figure 4-13).

Figure 4-13 iSCSI Targets Tab


sw172-22-46-220 - iSCSI
Initiators
Targets
Session Initiators
iSNS Profiles
Edit Access...
Edit Advertised...
Create...
Delete
Apply
Refresh
Help
Close
183995

☑ Dynamically Import FC Targets

iSCSI Name	Dynamic	Port WWN(s) Primary	Port WWN(s) Secondary	LUN Map (Hex) iSCSI	LUN Map (Hex) FC Primary	LUN Map (Hex) FC Secondary	Initiator(s) Access All	Initiator(s) Access List	Advertised Interfaces	Trespass Mode
iqn.emtest.cisco.01	false	50:06:01:60:10:60:14:f5					☐		all	☐
name1abcdefghijklmnopqrstuvwxyzabcdefgh	false	4b:dc:eb:ce:b4:e1:70:dc					☑		all	☑
name3abcdefghijklmnopqrstuvwxyzabcdefgh	false	36:5b:e9:4f:2d:be:57:f0					☑	1.2.3.4/32	all	☑
iqn.1987-05.com.cisco:05.sw172-22-46-220.09-07.22000020375b811b	true	22:00:00:20:37:5b:81:1b					☑		all	☐
iqn.1987-05.com.cisco:05.sw172-22-46-220.09-07.22000020375bb18e	true	22:00:00:20:37:5b:b1:8e					☑		all	☐

Data retrieved at 15:21:25

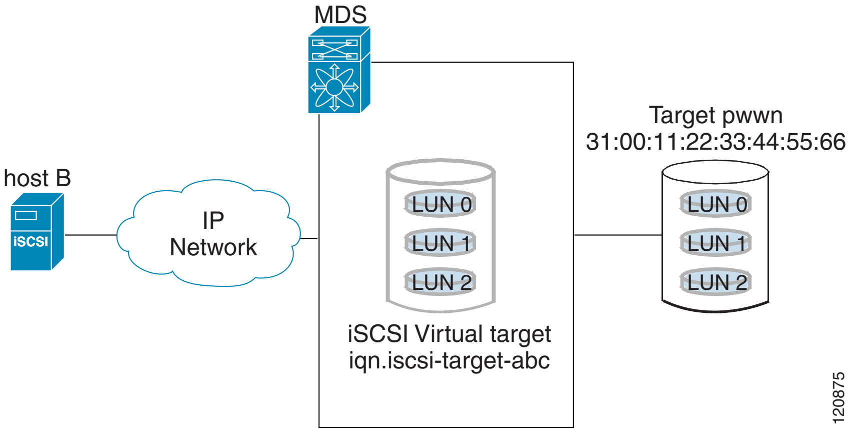
Step 3 Check the **Dynamically Import FC Targets** check box.

Step 4 Click **Apply** to save this change.

Static Mapping

You can manually (statically) create an iSCSI target by assigning a user-defined unique iSCSI node name to it. The iSCSI qualified name is restricted to a minimum length of 16 characters and a maximum of 223 characters. A statically mapped iSCSI target can either map the whole Fibre Channel target port (all LUNs in the target port mapped to the iSCSI target), or it can contain one or more LUs from a Fibre Channel target port (see Figure 4-14).

Figure 4-14 Statically Mapped iSCSI Targets


MDS
Target pwwn
31:00:11:22:33:44:55:66
host B
iSCSI
IP
Network
LUN 0
LUN 1
LUN 2
LUN 0
LUN 1
LUN 2
iSCSI Virtual target
iqn.iscsi-target-abc
120875

To create a static iSCSI virtual target for the entire Fibre Channel target port using Device Manager, follow these steps:

Step 1 Click **IP > iSCSI**.

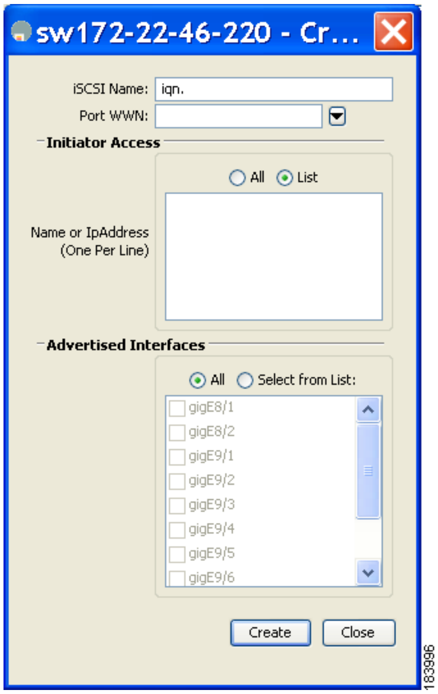
You see the iSCSI configuration (see Figure 4-12).

Step 2 Click the **Targets** tab to display a list of existing iSCSI targets (see Figure 4-13).

Step 3 Click **Create** to create an iSCSI target.

You see the Create iSCSI Targets dialog box (See Figure 4-15).

Figure 4-15 Create iSCSI Targets Dialog Box



sw172-22-46-220 - Cr...

iSCSI Name: iqn.

Port WWN:

Initiator Access

○ All ● List

Name or IpAddress (One Per Line)

Advertised Interfaces

● All ○ Select from List:

Step 4 Set the iSCSI target node name in the iSCSI Name field, in IQN format.

Step 5 Set the Port WWN field for the Fibre Channel target port you are mapping.

Step 6 Click the **Select from List** radio button and set the iSCSI initiator node names or IP addresses that you want this virtual iSCSI target to access, or click the **All** radio button to let the iSCSI target access all iSCSI initiators. Also see the "iSCSI Access Control" section on page 4-cv.

Step 7 Click the **Select from List** radio button and check each interface you want to advertise the iSCSI targets on or click the **All** radio button to advertise all interfaces.

Step 8 Click **Apply** to save this change.

Tip An iSCSI target cannot contain more than one Fibre Channel target port. If you have already mapped the whole Fibre Channel target port, you cannot use the LUN mapping option.

Note See the "iSCSI-Based Access Control" section on page 4-cviii for more information on controlling access to statically mapped targets.

Advertising Static iSCSI Targets

You can limit the Gigabit Ethernet interfaces through which static iSCSI targets are advertised. By default iSCSI targets are advertised on all Gigabit Ethernet interfaces, subinterfaces, port channel interfaces, and port channel subinterfaces.

To configure a specific interface that should advertise the iSCSI virtual target using Device Manager, follow these steps:

Step 1 Select **IP > iSCSI**.

You see the iSCSI configuration (see Figure 4-12).

Step 2 Click the **Targets** tab to display a list of existing iSCSI targets (see Figure 4-13).

Step 3 Right-click the iSCSI target that you want to modify and click **Edit Advertised**.

You see the Advertised Interfaces dialog box.

Step 4 (Optional) Right-click an interface that you want to delete and click **Delete**.

Step 5 (Optional) Click **Create** to advertise on more interfaces.

You see the Create Advertised Interfaces dialog box.

To configure a specific interface that should advertise the iSCSI virtual target, follow these steps:

	Command	Purpose
Step 1	`switch(config-iscsi-tgt)# advertise interface GigabitEthernet 2/5`	Advertises the virtual target only on the specified interface. By default, it is advertised on all interfaces in all Fibre Channel module with IPS ports or MPS-14/2 modules. **Note** To advertise the virtual target on multiple interfaces, issue the command for each interface.
	`switch(config-iscsi-tgt)# no advertise interface GigabitEthernet 2/5`	Removes this interface from the list of interfaces from which this target is advertised.

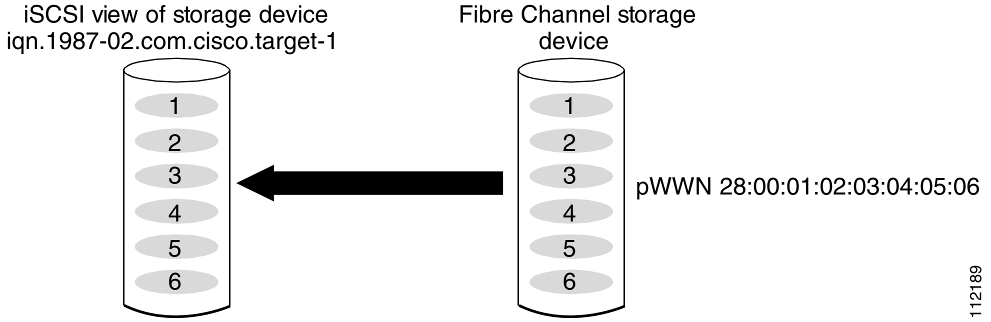
iSCSI Virtual Target Configuration Examples

This section provides three examples of iSCSI virtual target configurations.

Example 1

This example assigns the whole Fibre Channel target as an iSCSI virtual target. All LUNs that are part of the Fibre Channel target are available as part of the iSCSI target (see Figure 4-16).

Figure 4-16 Assigning iSCSI Node Names


iSCSI view of storage device
iqn.1987-02.com.cisco.target-1
1
2
3
4
5
6
Fibre Channel storage device
1
2
3
4
5
6
pWWN 28:00:01:02:03:04:05:06
112189

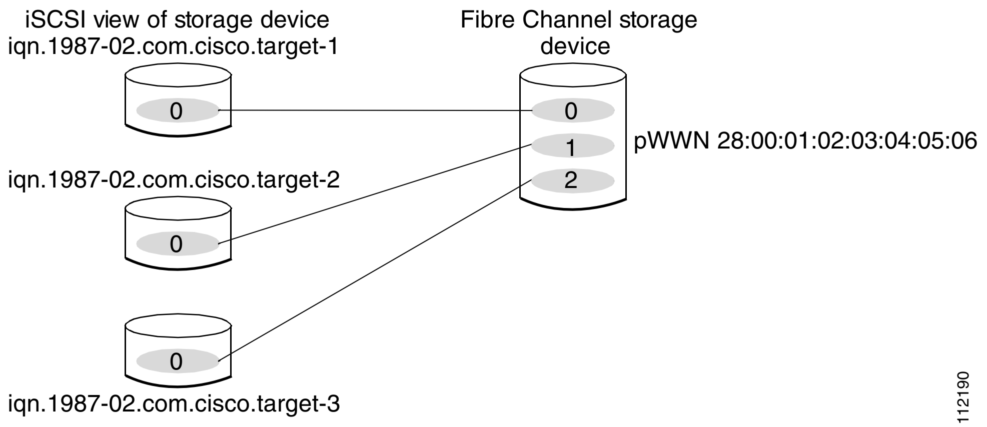
```
iscsi virtual-target name iqn.1987-02.com.cisco.target-1
```

```
    pWWN 28:00:01:02:03:04:05:06
```

Example 2

This example maps a subset of LUNs of a Fibre Channel target to three iSCSI virtual targets. Each iSCSI target only has one LUN (see Figure 4-17).

Figure 4-17 Mapping LUNs to an iSCSI Node Name

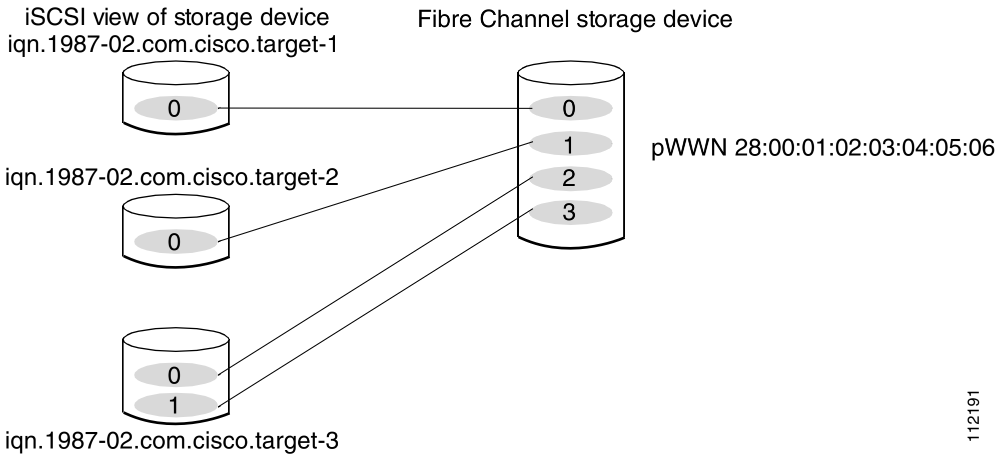

iSCSI view of storage device
iqn.1987-02.com.cisco.target-1
0
Fibre Channel storage device
0
1
2
pWWN 28:00:01:02:03:04:05:06
iqn.1987-02.com.cisco.target-2
0
0
iqn.1987-02.com.cisco.target-3
112190

```
iscsi virtual-target name iqn.1987-02.com.cisco.target-1
    pWWN 28:00:01:02:03:04:05:06 fc-lun 0 iscsi-lun 0
iscsi virtual-target name iqn.1987-02.com.cisco.target-2
    pWWN 28:00:01:02:03:04:05:06 fc-lun 1 iscsi-lun 0
iscsi virtual-target name iqn.1987-02.com.cisco.target-3
    pWWN 28:00:01:02:03:04:05:06 fc-lun 2 iscsi-lun 0
```

Example 3

This example maps three subsets of Fibre Channel LUN targets to three iSCSI virtual targets. Two iSCSI targets have one LUN and the third iSCSI target has two LUNs (see Figure 4-18).

Figure 4-18 Mapping LUNs to Multiple iSCSI Node Names


iSCSI view of storage device
iqn.1987-02.com.cisco.target-1
0
Fibre Channel storage device
0
1
2
3
pWWN 28:00:01:02:03:04:05:06
iqn.1987-02.com.cisco.target-2
0
0
1
iqn.1987-02.com.cisco.target-3
112191

```
iscsi virtual-target name iqn.1987-02.com.cisco.target-1
```

```
    pWWN 28:00:01:02:03:04:05:06 fc-lun 0 iscsi-lun 0
iscsi virtual-target name iqn.1987-02.com.cisco.target-2
    pWWN 28:00:01:02:03:04:05:06 fc-lun 1 iscsi-lun 0
iscsi virtual-target name iqn.1987-02.com.cisco.target-3
    pWWN 28:00:01:02:03:04:05:06 fc-lun 2 iscsi-lun 0
    pWWN 28:00:01:02:03:04:05:06 fc-lun 3 iscsi-lun 1
```

Presenting iSCSI Hosts as Virtual Fibre Channel Hosts

The Fibre Channel module with IPS ports or MPS-14/2 module connects to the Fibre Channel storage devices on behalf of the iSCSI host to send commands and transfer data to and from the storage devices. These modules use a virtual Fibre Channel N port to access the Fibre Channel storage devices on behalf of the iSCSI host. iSCSI hosts are identified by either iSCSI qualified name (IQN) or IP address.

Initiator Identification

iSCSI hosts can be identified by the Fibre Channel module with IPS ports or MPS-14/2 module using the following:

- iSCSI qualified name (IQN)

  An iSCSI initiator is identified based on the iSCSI node name it provides in the iSCSI login. This mode can be useful if an iSCSI host has multiple IP addresses and you want to provide the same service independent of the IP address used by the host. An initiator with multiple IP addresses (multiple network interface cards—NICs) has one virtual N port on each IPS port to which it logs in.

- IP address

  An iSCSI initiator is identified based on the IP address of the iSCSI host. This mode is useful if an iSCSI host has multiple IP addresses and you want to provide different service-based on the IP address used by the host. It is also easier to get the IP address of a host compared to getting the iSCSI node name. A virtual N port is created for each IP address it uses to log in to iSCSI targets. If the host using one IP address logs in to multiple IPS ports, each IPS port will create one virtual N port for that IP address.

You can configure the iSCSI initiator identification mode on each IPS port and all the iSCSI hosts terminating on the IPS port will be identified according to that configuration. The default mode is to identify the initiator by name.

To specify the initiator identification mode, follow these steps:

	Command	Purpose
Step 1	`switch# `**`config terminal`** `switch(config)#`	Enters the configuration mode.
Step 2	`switch(config)# `**`interface iscsi 4/1`** `switch(config-if)#`	Selects the iSCSI interface on the switch that identifies all the initiators.
Step 3	`switch(config-if)# `**`switchport initiator id ip-address`**	Identifies the iSCSI initiator based on the IP address.
	`switch(config-if)# `**`switchport initiator id name`**	Identifies the iSCSI initiator based on the initiator node name. This is the default behavior.

To specify the initiator identification mode using Fabric Manager, follow these steps:

Step 1 Choose **Interfaces > FC Logical** from the Physical Attributes pane.

You see the interfaces configuration in the Information pane.

Step 2 Click the **iSCSI** tab.

You see the iSCSI interfaces configuration.

Step 3 Right-click the Initiator ID Mode field for the iSCSI interface that you want to modify and select **name** or **ipaddress** from the drop-down menu.

Step 4 Click **Apply Changes** to save this change.

Initiator Presentation Modes

Two modes are available to present iSCSI hosts in the Fibre Channel fabric: transparent initiator mode and proxy initiator mode.

- In transparent initiator mode, each iSCSI host is presented as one virtual Fibre Channel host. The benefit of transparent mode is it allows a finer level of Fibre Channel access control configuration (similar to managing a “real” Fibre Channel host). Because of the one-to-one mapping from iSCSI to Fibre Channel, each host can have different zoning or LUN access control on the Fibre Channel storage device.
- In proxy initiator mode, there is only one virtual Fibre Channel host per one IPS port and all iSCSI hosts use that to access Fibre Channel targets. In a scenario where the Fibre Channel storage device requires explicit LUN access control for every host, the static configuration for each iSCSI initiator can be overwhelming. In this case, using the proxy initiator mode simplifies the configuration.

Caution Enabling proxy initiator mode of an iSCSI interface that is part of an iSLB VRRP group impacts load balancing on the interface. See the “Changing iSCSI Interface Parameters and the Impact on Load Balancing” section on page 4-cxlv.

The Cisco MDS switches support the following iSCSI session limits:

- The maximum number of iSCSI sessions on a switch is 5000.
- The maximum number of iSCSI sessions per IPS port in transparent initiator mode is 500.
- The maximum number of iSCSI sessions per IPS port in proxy initiator mode is 500.
- The maximum number of concurrent sessions an IPS port can create is five (but the total number of sessions that can be supported is 500).

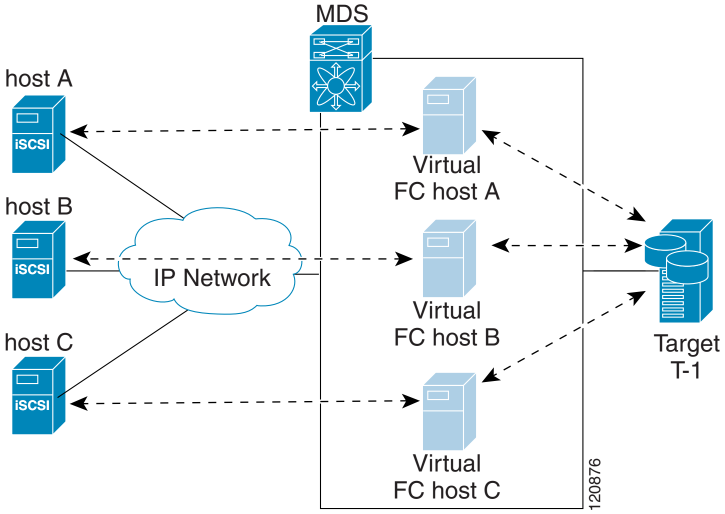
Note If more than five iSCSI sessions try to come up simultaneously on a port, the initiator receives a temporary error and later retries to create a session.

Transparent Initiator Mode

Each iSCSI host is presented as one virtual Fibre Channel host (that is, one Fibre Channel N port). The benefit of transparent mode is it allows a finer-level of Fibre Channel access control configuration. Because of the one-to-one mapping from iSCSI to Fibre Channel, each host can have different zoning or LUN access control on the Fibre Channel storage device.

When an iSCSI host connects to the Fibre Channel module with IPS ports or MPS-14/2 module, a virtual host N port (HBA port) is created for the host (see Figure 4-19). Every Fibre Channel N port requires a unique Node WWN and Port WWN.

Figure 4-19 Virtual Host HBA Port



After the virtual N port is created with the WWNs, a fabric login (FLOGI) is done through the virtual iSCSI interface of the IPS port. After the FLOGI is completed, the virtual N port is online in the Fibre Channel SAN and virtual N port is registered in the Fibre Channel name server. The Fibre Channel module with IPS ports or MPS-14/2 module registers the following entries in the Fibre Channel name server:

- IP address of the iSCSI host in the IP-address field on the name server
- IQN of the iSCSI host in the symbolic-node-name field of the name server
- SCSI_FCP in the FC-4 type field of the name server
- Initiator flag in the FC-4 feature of the name server
- Vendor-specific iSCSI GW flag in the FC-4 type field to identify the N-port device as an iSCSI gateway device in the name server.

When all the iSCSI sessions from the iSCSI host are terminated, the Fibre Channel module with IPS ports or MPS-14/2 modules perform an explicit Fabric logout (FLOGO) to remove the virtual N-port device from the Fibre Channel SAN (this indirectly de-registers the device from the Fibre Channel name server).

For every iSCSI session from the host to the iSCSI virtual target there is a corresponding Fibre Channel session to the real Fibre Channel target. There are three iSCSI hosts (see Figure 4-19), and all three of them connect to the same Fibre Channel target. There is one Fibre Channel session from each of the three virtual Fibre Channel hosts to the target.

iSCSI Initiator Idle Timeout

iSCSI initiator idle timeout specifies the time for which the virtual Fibre Channel N port is kept idle after the initiator logs out from its last iSCSI session. The default value for this timer is 300 seconds. This is useful to avoid N ports logging in to and logging off of the Fibre Channel SAN as transient failure occurs in the IP network. This helps reduce unnecessary RSCNs being generated in the Fibre Channel SAN.

To configure the initiator idle timeout, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters the configuration mode.
Step 2	`switch(config)# iscsi initiator idle-timeout 10`	Configures the iSCSI initiators to have an idle timeout value of 10 seconds.

To configure the initiator idle timeout using Fabric Manager, follow these steps:

Step 1 Choose **End Devices** > **iSCSI** in the Physical Attributes pane.

You see the iSCSI tables in the Information pane (see Figure 4-5).

Step 2 Click the **Globals** tab.

You see the iSCSI global configuration.

Step 3 Right-click on the InitiatorIdle Timeout field that you want to modify and enter the new timeout value.

Step 4 Click the **Apply Changes** icon to save these changes.

WWN Assignment for iSCSI Initiators

An iSCSI host is mapped to an N port's WWNs by one of the following mechanisms:

- Dynamic mapping (default)
- Static mapping

Dynamic Mapping

With dynamic mapping, an iSCSI host is mapped to a dynamically generated port WWN (pWWN) and node WWN (nWWN). Each time the iSCSI host connects it might be mapped to a different WWN. Use this option if no access control is required on the Fibre Channel target device (because the target device access control is usually configured using the host WWN).

The WWNs are allocated from the MDS switch's WWN pool. The WWN mapping to the iSCSI host is maintained as long as the iSCSI host has at least one iSCSI session to the IPS port. When all iSCSI sessions from the host are terminated and the Fibre Channel module with IPS ports or MPS-14/2 module performs an FLOGO for the virtual N port of the host, the WWNs are released back to the switch's Fibre Channel WWN pool. These addresses are then available for assignment to other iSCSI hosts requiring access to the Fibre Channel Fabric.

The following are three dynamic initiator modes are supported:

- iSCSI—Dynamic initiators are treated as iSCSI initiators and can access dynamic virtual targets and configured iSCSI virtual targets.
- iSLB—Dynamic initiators are treated as iSLB initiators.
- Deny—Dynamic initiators are not allowed to log in to the MDS switch.

iSCSI dynamic mapping is the default mode of operation. This configuration is distributed using CFS.

Note Configuring dynamic initiator modes is supported only through the CLI, not through Device Manager or Fabric Manager.

To configure dynamic mapping (using the **name** option) for an iSCSI initiator, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi dynamic initiator islb`	Specifies iSLB dynamic initiator mode.
	`switch(config)# iscsi dynamic initiator deny`	Disallows dynamic initiators from logging on to the MDS switch.
	`switch(config)# no iscsi dynamic initiator islb`	Reverts to iSCSI mode (default).

Static Mapping

With static mapping, an iSCSI host is mapped to a specific pWWN and nWWN. This mapping is maintained in persistent storage and each time the iSCSI host connects, the same WWN mapping is used. This mode is required if you use access control on the target device.

You can implement static mapping in one of two ways:

- User assignment—You can specify your own unique WWN by providing them during the configuration process.
- System assignment—You can request that the switch provide a WWN from the switch's Fibre Channel WWN pool and keep the mapping in its configuration.

Tip We recommend using the **system-assign** option. If you manually assign a WWN, you must ensure its uniqueness (see the *Cisco Fabric Manager Fabric Configuration Guide* and *Cisco MDS 9000 Family NX-OS Fabric Configuration Guide* for more information). You should not use any previously assigned WWNs.

To configure static mapping (using the **name** option) for an iSCSI initiator, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi initiator name iqn.1987-02.com.cisco.initiator` `switch(config-iscsi-init)#`	Configures an iSCSI initiator using the iSCSI name of the initiator node. The maximum name length is restricted to 223 alphanumeric characters. The minimum length is 16.
	`switch(config)# no iscsi initiator name iqn.1987-02.com.cisco.initiator`	Deletes the configured iSCSI initiator.

To configure static mapping for an iSCSI initiator using Device Manager, follow these steps:

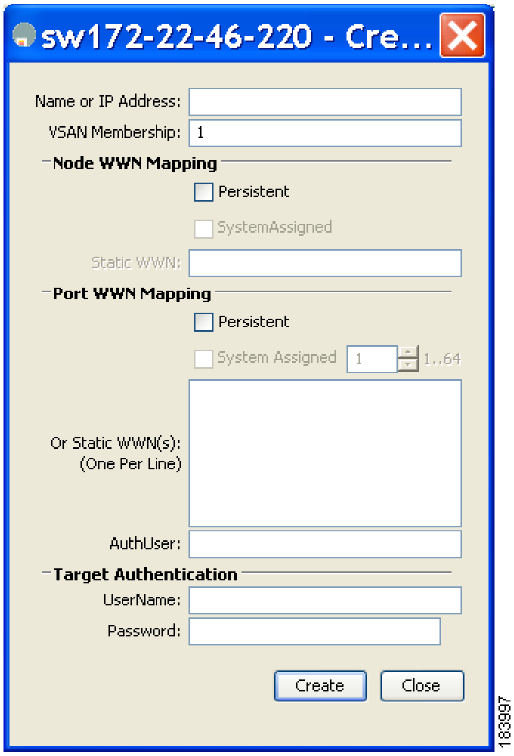
Step 1 Select **IP > iSCSI.**

You see the iSCSI configuration (see Figure 4-12). The Initiators tab is the default.

Step 2 Click **Create** to create an iSCSI initiator.

You see the Create iSCSI Initiators dialog box (see Figure 4-20).

Figure 4-20 Create iSCSI Initiators Dialog Box



sw172-22-46-220 - Cre...
Name or IP Address:
Node WWN Mapping
☐ Persistent
☐ SystemAssigned
Static WWN:
Port WWN Mapping
☐ Persistent
☐ System Assigned 1 1..64
Or Static WWN(s): (One Per Line)
AuthUser:
Target Authentication
UserName:
Password:
Create
Close
183997

VSAN Membership: 1

Step 3 Set the iSCSI node name or IP address and VSAN membership.

Step 4 In the Node WWN section, check the **Persistent** check box.

Step 5 Check the **System Assigned** check box if you want the switch to assign the nWWN or leave this unchecked and set the Static WWN field.

Step 6 In the Port WWN section, check the **Persistent** check box if you want to statically map pWWNs to the iSCSI initiator.

Step 7 If persistent, check the **System Assigned** check box and set the number of pWWNs to reserve for this iSCSI initiator if you want the switch to assign pWWNs. Alternately, you can leave this unchecked and set one or more pWWNs for this iSCSI initiator.

Step 8 (Optional) Set the AuthUser field if authentication is enabled. Also see the "iSCSI Session Authentication" section on page 4-cx.

Step 9 Click **Create** to create this iSCSI initiator.

To configure static mapping (using the **ip-address** option) for an iSCSI initiator, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi initiator ip-address 10.50.0.0` `switch(config-iscsi-init)#`	Configures an iSCSI initiator using the IPv4 address of the initiator node.
	`switch(config)# iscsi initiator ip-address 2001:0DB8:800:200C::417A` `switch(config-iscsi-init)#`	Configures an iSCSI initiator using the IPv6 unicast address of the initiator node.
	`switch(config)# no iscsi initiator ip-address 2001:0DB8:800:200C::417A`	(Optional) Deletes the configured iSCSI initiator.

To assign the WWN for an iSCSI initiator, follow these steps:

	Command	Purpose
Step 1	`switch(config-iscsi-init)# static nWWN system-assign`	Uses the switch's WWN pool to allocate the nWWN for this iSCSI initiator and keeps it persistent.
	`switch(config-iscsi-init)# static nWWN 20:00:00:05:30:00:59:11`	Assigns the user provided WWN as the nWWN for the iSCSI initiator. You can only specify one nWWN for each iSCSI node.
Step 2	`switch(config-iscsi-init)# static pWWN system-assign 2`	Uses the switch's WWN pool to allocate two pWWNs for this iSCSI initiator and keeps them persistent. The range is from 1 to 64.
	`switch(config-iscsi-init)# static pWWN 21:00:00:20:37:73:3b:20`	Assigns the user provided WWN as the pWWN for the iSCSI initiator.

Note If the system-assign option is used to configure WWNs for an iSCSI initiator, when the configuration is saved to an ASCII file the system-assigned WWNs are also saved. Subsequently if you perform a write erase, you must manually delete the WWN configuration from the ASCII file. Failing to do so can cause duplicate WWN assignments if the ASCII configuration file is reapplied on the switch.

Making the Dynamic iSCSI Initiator WWN Mapping Static

After a dynamic iSCSI initiator has already logged in, you may decide to permanently keep the automatically assigned nWWN/pWWN mapping so this initiator uses the same mapping the next time it logs in.

You can convert a dynamic iSCSI initiator to static iSCSI initiator and make its WWNs persistent (see the "Dynamic Mapping" section on page 4-xcv).

Note You cannot convert a dynamic iSCSI initiator to a static iSLB initiator or a dynamic iSLB initiator to a static iSCSI initiator.

Note Making the dynamic pWWNs static after the initiator is created is supported only through the CLI, not through Device Manager or Fabric Manager. In Fabric Manager or Device Manager, you must delete and then recreate this initiator to have the pWWNs static.

To permanently keep the automatically assigned nWWN/pWWN mapping, follow these steps:

	Command	Purpose
Step 1	`switch#` **`config terminal`** `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)#` **`iscsi save-initiator name iqn.1987-02.com.cisco.initiator`**	Saves the nWWN and pWWNs that have automatically been assigned to the iSCSI initiator whose name is specified.
	`switch(config)#` **`iscsi save-initiator ip-address 10.10.100.11`**	Saves the nWWN and pWWNs that have automatically been assigned to the iSCSI initiator whose IPv4 address is specified.
	`switch(config)#` **`iscsi save-initiator ip-address 2001:0DB8:800:200C::417A`**	Saves the nWWN and pWWNs that have automatically been assigned to the iSCSI initiator whose IPv6 unicast address is specified.
	`switch(config)#` **`iscsi save-initiator`**	Saves the nWWN and pWWNs that have automatically been assigned to all the initiators.
Step 3	`switch(config)#` **`exit`** `switch#`	Returns to EXEC mode.
Step 4	`switch#` **`copy running-config startup-config`**	Saves the nWWN/pWWN mapping configuration across system reboots.

Checking for WWN Conflicts

WWNs assigned to static iSCSI initiators by the system can be inadvertently returned to the system when an upgrade fails or you downgrade the system software (manually booting up an older Cisco MDS SAN-OS release without using the **install all** command). In these instances, the system can later assign those WWNs to other iSCSI initiators (dynamic or static) and cause conflicts.

You can address this problem by checking for and removing any configured WWNs that belong to the system whenever such scenarios occur.

To check for and remove WWN conflicts, follow these steps:

	Command	Purpose
Step 1	`switch#` **`config terminal`** `switch(config)#`	Enters configuration mode.

Step 2	`switch(config)#` **`iscsi duplicate-wwn-check`**
	`List of Potential WWN Conflicts:`
	`-------------------------------`
	`Node : iqn.test-local-nwwn:1-local-pwwn:1`
	`nWWN : 22:03:00:0d:ec:02:cb:02`
	`pWWN : 22:04:00:0d:ec:02:cb:02`
		Checks for WWN conflicts.

Step 3	`switch(config)#` **`iscsi initiator name iqn.test-local-nwwn:1-local-pwwn:1`**	Enters iSCSI initiator configuration mode for the initiator named iqn.test-local-nwwn:1-local-pwwn:1.
Step 4	`switch(config-iscsi-init)#` **`no static nWWN 22:03:00:0d:ec:02:cb:02`**	Removes a conflicting nWWN.
Step 5	`switch(config-iscsi-init)#` **`no static pWWN 22:04:00:0d:ec:02:cb:02`**	Removes a conflicting pWWN.

To permanently keep the automatically assigned nWWN mapping using Fabric Manager, follow these steps:

Step 1 Choose **End Devices** > **iSCSI** in the Physical Attributes pane.

You see the iSCSI tables in the Information pane (see Figure 4-5).

Step 2 Click the **Initiators** tab.

You see the iSCSI initiators configured.

Step 3 Check the **Persistent Node WWN** check box for the iSCSI initiators that you want to make static.

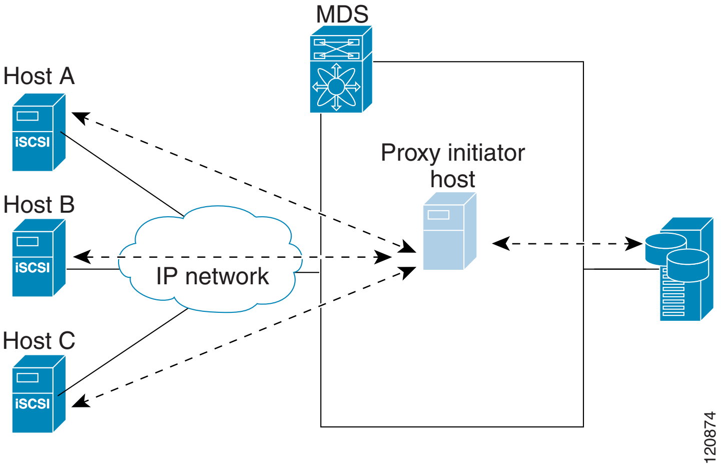
Step 4 Click the **Apply Changes** icon to save these changes.

Proxy Initiator Mode

In the event that the Fibre Channel storage device requires explicit LUN access control for every host use the transparent initiator mode (presenting one iSCSI host as one Fibre Channel host). Every iSCSI host has to be configured statically. This can mean several configuration tasks for each iSCSI host. If you do not need explicit LUN access control, using the proxy initiator mode simplifies the configuration.

In this mode, only one virtual host N port (HBA port) is created per IPS port. All the iSCSI hosts connecting to that IPS port will be multiplexed using the same virtual host N port (see Figure 4-21). This mode simplifies the task of statically binding WWNs. LUN mapping and assignment on the Fibre Channel storage array must be configured to allow access from the proxy virtual N port's pWWN for all LUNs used by each iSCSI initiator that connects through this IPS port. The LUN is then assigned to each iSCSI initiator by configuring iSCSI virtual targets (see the "Static Mapping" section on page 4-lxxxviii) with LUN mapping and iSCSI access control (see the "iSCSI Access Control" section on page 4-cv).

Figure 4-21 Multiplexing IPS Ports



Proxy initiator mode can be configured on a per IPS port basis, in which case only iSCSI initiators terminating on that IPS port will be in this mode.

When an IPS port is configured in proxy-initiator mode, fabric login (FLOGI) is done through the virtual iSCSI interface of the IPS port. After the FLOGI is completed, the proxy-initiator virtual N port is online in the Fibre Channel fabric and virtual N port is registered in the Fibre Channel name server. The Fibre Channel module with IPS ports or MPS-14/2 module registers the following entries in the Fibre Channel name server:

- iSCSI interface name iSCSI slot /port is registered in the symbolic-node-name field of the name server
- SCSI_FCP in the FC-4 type field of the name server

- Initiator flag in the FC-4 feature of the name server
- Vendor specific flag (iscsi-gw) in the FC-4 type field to identify the N-port device as an iSCSI gateway device in the name server

Similar to transparent initiator mode, the user can provide a pWWN and nWWN or request a system assigned WWN for the proxy initiator N port.

Caution Enabling the proxy initiator mode of an iSCSI interface that is part of an iSLB VRRP group impacts load balancing on the interface. See the "Changing iSCSI Interface Parameters and the Impact on Load Balancing" section on page 4-cxlv.

To configure the proxy initiator, follow these steps:

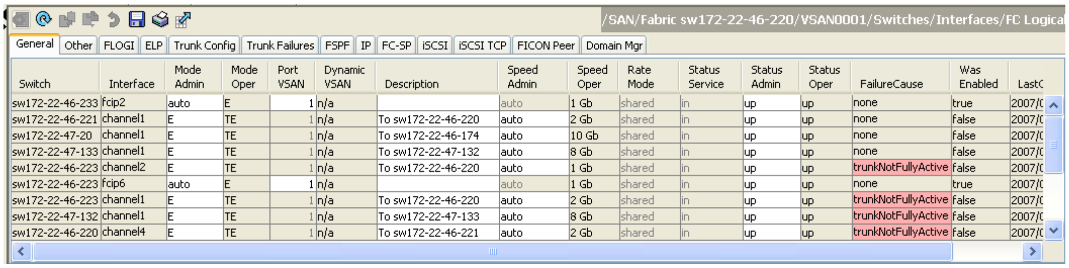
	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# interface iscsi 4/1` `switch(config-if)#`	Selects the iSCSI interface on the switch that initiators will connect to.
Step 3	`switch(config-if)# switchport proxy-initiator`	Configures the proxy initiator mode with system-assignment nWWN and pWWN.
	`switch(config-if)# no switchport proxy-initiator`	(Optional) Disables the proxy initiator mode.
Step 4	`switch(config-if)# switchport proxy-initiator nWWN 11:11:11:11:11:11:11:11 pwwn 22:22:22:22:22:22:22:22`	(Optional) Configures the proxy initiator mode using the specified WWNs.
	`switch(config-if)# no switchport proxy-initiator nWWN 11:11:11:11:11:11:11:11 pwwn 22:22:22:22:22:22:22:22`	(Optional) Disables the proxy initiator mode.

To configure the proxy initiator using Fabric Manager, follow these steps:

Step 1 Expand **Switches**, expand **Interfaces,** and then select **FC Logical** in the Physical Attributes pane.

You see the Interface tables in the Information pane (see Figure 4-22).

Figure 4-22 FC Logical Interface Tables

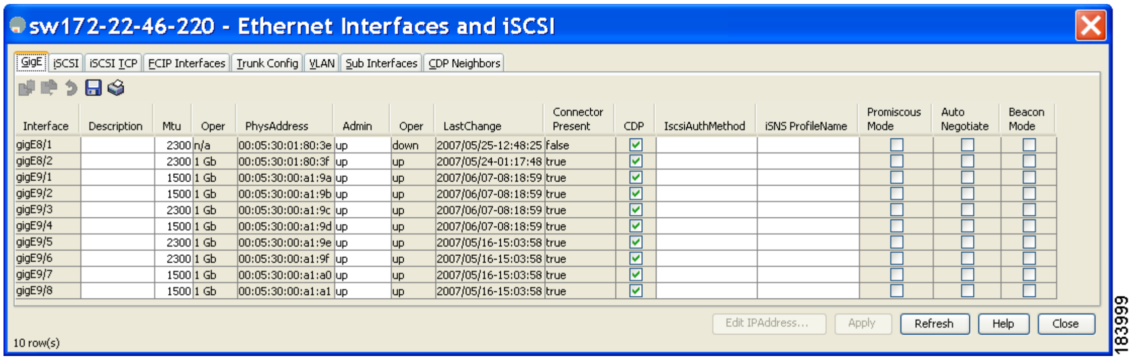


Switch	Interface	Mode Admin	Mode Oper	Port VSAN	Dynamic VSAN	Description	Speed Admin	Speed Oper	Rate Mode	Status Service	Status Admin	Status Oper	FailureCause	Was Enabled	Last
sw172-22-46-233	fcip2	auto	E	1	n/a		auto	1 Gb	shared	in	up	up	none	true	2007/
sw172-22-46-221	channel1	E	TE	1	n/a	To sw172-22-46-220	auto	2 Gb	shared	in	up	up	none	false	2007/
sw172-22-47-20	channel1	E	TE	1	n/a	To sw172-22-46-174	auto	10 Gb	shared	in	up	up	none	false	2007/
sw172-22-47-133	channel1	E	TE	1	n/a	To sw172-22-47-132	auto	8 Gb	shared	in	up	up	none	false	2007/
sw172-22-46-223	channel2	E	TE	1	n/a	To sw172-22-46-220	auto	1 Gb	shared	in	up	up	trunkNotFullyActive	false	2007/
sw172-22-46-223	fcip6	auto	E	1	n/a		auto	1 Gb	shared	in	up	up	none	true	2007/
sw172-22-46-223	channel1	E	TE	1	n/a	To sw172-22-46-220	auto	2 Gb	shared	in	up	up	trunkNotFullyActive	false	2007/
sw172-22-47-132	channel1	E	TE	1	n/a	To sw172-22-47-133	auto	8 Gb	shared	in	up	up	trunkNotFullyActive	false	2007/
sw172-22-46-220	channel4	E	TE	1	n/a	To sw172-22-46-221	auto	2 Gb	shared	in	up	up	trunkNotFullyActive	false	2007/

Step 2 In Device Manager, select **Interface > Ethernet and iSCSI**.

You see the Ethernet Interfaces and iSCSI dialog box (See in Figure 4-23).

Figure 4-23 ***Ethernet Interfaces and iSCSI Dialog Box***



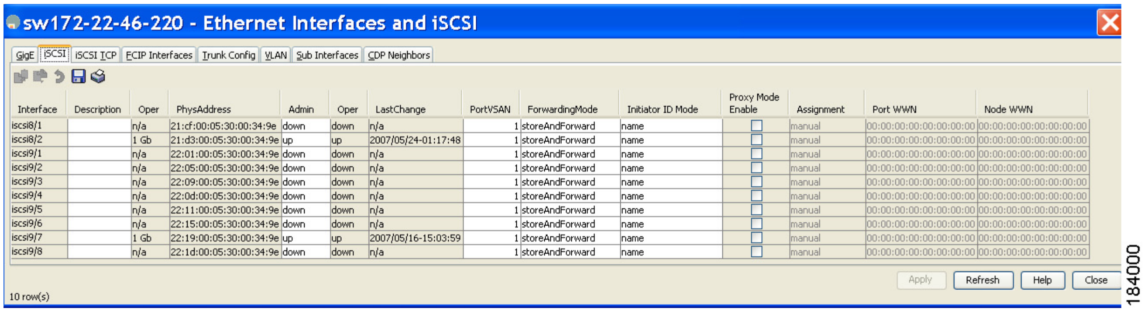
Interface	Description	Mtu	Oper	PhysAddress	Admin	Oper	LastChange	Connector Present	CDP	IscsiAuthMethod	iSNS ProfileName	Promiscous Mode	Auto Negotiate	Beacon Mode
gigE8/1		2300	n/a	00:05:30:01:80:3e	up	down	2007/05/25-12:48:25	false	☑			☐	☐	☐
gigE8/2		2300	1 Gb	00:05:30:01:80:3f	up	up	2007/05/24-01:17:48	true	☑			☐	☐	☐
gigE9/1		1500	1 Gb	00:05:30:00:a1:9a	up	up	2007/06/07-08:18:59	true	☑			☐	☐	☐
gigE9/2		1500	1 Gb	00:05:30:00:a1:9b	up	up	2007/06/07-08:18:59	true	☑			☐	☐	☐
gigE9/3		2300	1 Gb	00:05:30:00:a1:9c	up	up	2007/06/07-08:18:59	true	☑			☐	☐	☐
gigE9/4		1500	1 Gb	00:05:30:00:a1:9d	up	up	2007/06/07-08:18:59	true	☑			☐	☐	☐
gigE9/5		2300	1 Gb	00:05:30:00:a1:9e	up	up	2007/05/16-15:03:58	true	☑			☐	☐	☐
gigE9/6		2300	1 Gb	00:05:30:00:a1:9f	up	up	2007/05/16-15:03:58	true	☑			☐	☐	☐
gigE9/7		1500	1 Gb	00:05:30:00:a1:a0	up	up	2007/05/16-15:03:58	true	☑			☐	☐	☐
gigE9/8		1500	1 Gb	00:05:30:00:a1:a1	up	up	2007/05/16-15:03:58	true	☑			☐	☐	☐

10 row(s)

Step 3 Click the **iSCSI** tab in either FM or DM.

You see the iSCSI interface configuration table (see Figure 4-24).

Figure 4-24 ***iSCSI Tab in Device Manager***



Interface	Description	Oper	PhysAddress	Admin	Oper	LastChange	PortVSAN	ForwardingMode	Initiator ID Mode	Proxy Mode Enable	Assignment	Port WWN	Node WWN
iscsi8/1		n/a	21:cf:00:05:30:00:34:9e	down	down	n/a	1	storeAndForward	name	☐	manual	00:00:00:00:00:00:00:00	00:00:00:00:00:00:00:00
iscsi8/2		1 Gb	21:d3:00:05:30:00:34:9e	up	up	2007/05/24-01:17:48	1	storeAndForward	name	☐	manual	00:00:00:00:00:00:00:00	00:00:00:00:00:00:00:00
iscsi9/1		n/a	22:01:00:05:30:00:34:9e	down	down	n/a	1	storeAndForward	name	☐	manual	00:00:00:00:00:00:00:00	00:00:00:00:00:00:00:00
iscsi9/2		n/a	22:05:00:05:30:00:34:9e	down	down	n/a	1	storeAndForward	name	☐	manual	00:00:00:00:00:00:00:00	00:00:00:00:00:00:00:00
iscsi9/3		n/a	22:09:00:05:30:00:34:9e	down	down	n/a	1	storeAndForward	name	☐	manual	00:00:00:00:00:00:00:00	00:00:00:00:00:00:00:00
iscsi9/4		n/a	22:0d:00:05:30:00:34:9e	down	down	n/a	1	storeAndForward	name	☐	manual	00:00:00:00:00:00:00:00	00:00:00:00:00:00:00:00
iscsi9/5		n/a	22:11:00:05:30:00:34:9e	down	down	n/a	1	storeAndForward	name	☐	manual	00:00:00:00:00:00:00:00	00:00:00:00:00:00:00:00
iscsi9/6		n/a	22:15:00:05:30:00:34:9e	down	down	n/a	1	storeAndForward	name	☐	manual	00:00:00:00:00:00:00:00	00:00:00:00:00:00:00:00
iscsi9/7		1 Gb	22:19:00:05:30:00:34:9e	up	up	2007/05/16-15:03:59	1	storeAndForward	name	☐	manual	00:00:00:00:00:00:00:00	00:00:00:00:00:00:00:00
iscsi9/8		n/a	22:1d:00:05:30:00:34:9e	down	down	n/a	1	storeAndForward	name	☐	manual	00:00:00:00:00:00:00:00	00:00:00:00:00:00:00:00

10 row(s)

Step 4 Check the **Proxy Mode Enable** check box.

Step 5 Click the **Apply Changes** icon in Fabric Manager or click **Apply** in Device Manager to save these changes.

Note When an interface is in proxy initiator mode, you can only configure Fibre Channel access control (zoning) based on the iSCSI interface's proxy N port attributes—the WWN pairs or the FC ID. You cannot configure zoning using iSCSI attributes such as IP address or IQN of the iSCSI initiator. To enforce initiator-based access control, use iSCSI based access control (see the "iSCSI Access Control" section on page 4-cv).

VSAN Membership for iSCSI

VSAN membership can be configured for an iSCSI interface, called the port VSAN. All the iSCSI devices that connect to this interface automatically become members of this VSAN, if it is not explicitly configured in a VSAN. The default port VSAN of an iSCSI interface is VSAN 1. Similar to Fibre Channel devices, iSCSI devices have two mechanisms by which VSAN membership can be defined.

- iSCSI host—VSAN membership to iSCSI host. (This method takes precedent over the iSCSI interface).

- iSCSI interface—VSAN membership to iSCSI interface. (All iSCSI hosts connecting to this iSCSI interface inherit the interface VSAN membership if the host is not configured in any VSAN by the iSCSI host method).

Configuring VSAN Membership for iSCSI Hosts

Individual iSCSI hosts can be configured to be in a specific VSAN. The specified VSAN overrides the iSCSI interface VSAN membership.

To assign VSAN membership for iSCSI hosts, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi initiator name iqn.1987-02.com.cisco.initiator` `switch(config-iscsi-init)#`	Configures an iSCSI initiator.
Step 3	`switch(config-iscsi-init)# vsan 3`	Assigns the iSCSI initiator node to a specified VSAN. **Note** You can assign this host to one or more VSANs.
	`switch(config-iscsi-init)# no vsan 5`	Removes the iSCSI node from the specified VSAN.

To assign VSAN membership for iSCSI hosts using Fabric Manager, follow these steps:

Step 1 Choose **End Devices** > **iSCSI** in the Physical Attributes pane.

You see the iSCSI tables in the Information pane (see Figure 4-5).

Step 2 Click the **Initiators** tab.

You see the iSCSI initiators configured.

Step 3 Fill in the VSAN Membership field to assign a VSAN to the iSCSI hosts.

Step 4 Click the **Apply Changes** icon to save these changes.

Note When an initiator is configured in any other VSAN (other than VSAN 1), for example VSAN 2, the initiator is automatically removed from VSAN 1. If you also want it to be present in VSAN 1, you must explicitly configure the initiator in VSAN 1.

Configuring Default Port VSAN for iSCSI Interfaces

VSAN membership can be configured for an iSCSI interface, called the *port VSAN*. All the iSCSI devices that connect to this interface automatically become members of this VSAN, if it is not explicitly configured in a VSAN. In other words, the port VSAN of an iSCSI interface is the default VSAN for all dynamic iSCSI initiators. The default port VSAN of an iSCSI interface is VSAN 1.

Caution Changing the VSAN membership of an iSCSI interface that is part of an iSLB VRRP group impacts load balancing on the interface. See the "Changing iSCSI Interface Parameters and the Impact on Load Balancing" section on page 4-cxlv.

To change the default port VSAN for an iSCSI interface, follow these steps:

	Command	Purpose
Step 1	`switch#` **`config terminal`** `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)#` **`iscsi interface vsan-membership`**	Enables you to configure VSAN membership for iSCSI interfaces.
Step 3	`switch(config)#` **`vsan database`** `switch(config-vsan-db)#`	Configures the database for a VSAN. Application specific VSAN parameters cannot be configured from this prompt.
Step 4	`switch(config-vsan-db)#` **`vsan 2 interface iscsi 2/1`**	Assigns the membership of the iscsi 2/1 interface to the specified VSAN (VSAN 2).
	`switch(config-vsan-db)#` **`no vsan 2 interface iscsi 2/1`**	Reverts to using the default VSAN as the port VSAN of the iSCSI interface.

To change the default port VSAN for an iSCSI interface using Device Manager, follow these steps:

Step 1 Choose **Interface > Ethernet and iSCSI**.

You see the Ethernet Interfaces and iSCSI dialog box (see Figure 4-23).

Step 2 Click the **iSCSI** tab.

You see the iSCSI interface configuration table (see Figure 4-24).

Step 3 Double-click the PortVSAN column and modify the default port VSAN.

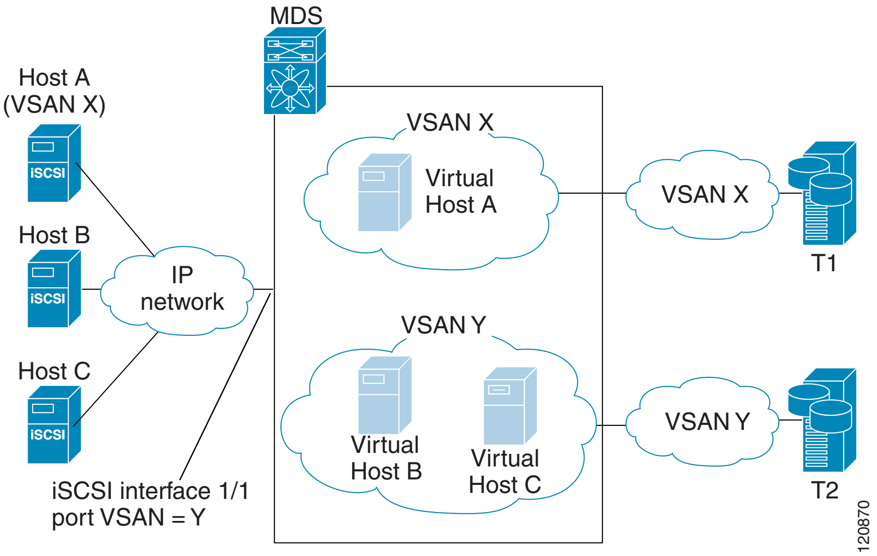
Step 4 Click **Apply** to save these changes.

Example of VSAN Membership for iSCSI Devices

Figure 4-25 provides an example of VSAN membership for iSCSI devices:

- iSCSI interface 1/1 is a member of VSAN Y.
- iSCSI initiator host A has explicit VSAN membership to VSAN X.
- Three iSCSI initiators (host A, host B, and host C) C connect to iSCSI interface 1/1.

Figure 4-25 VSAN Membership for iSCSI Interfaces



Host A's virtual Fibre Channel N port will be added to VSAN X because of explicit membership for the initiator. The virtual host-B and host-C N ports do not have any explicit membership configuration so they will inherit the iSCSI interface VSAN membership and be part of VSAN Y.

Advanced VSAN Membership for iSCSI Hosts

An iSCSI host can be a member of multiple VSANs. In this case, multiple virtual Fibre Channel hosts are created, one in each VSAN in which the iSCSI host is a member. This configuration is useful when certain resources such as Fibre Channel tape devices need to be shared among different VSANs.

iSCSI Access Control

Two methods of access control are available for iSCSI devices. Depending on the initiator mode used to present the iSCSI hosts in the Fibre Channel fabric, either or both of the access control methods can be used.

- Fiber Channel zoning-based access control—Fibre Channel zoning has been extended to support iSCSI devices, and this extension has the advantage of having a uniform, flexible access control mechanism across the whole SAN. In the case of iSCSI, multiple iSCSI devices may be connected behind an iSCSI interface. Interface-based zoning may not be useful because all iSCSI devices behind the interface will automatically be within the same zone.
- iSCSI ACL-based access control—iSCSI-based access control is applicable only if static iSCSI virtual targets are created. For a static iSCSI target, you can configure a list of iSCSI initiators that are allowed to access the targets. By default, static iSCSI virtual targets are not accessible to any iSCSI host.

Depending on the initiator mode used to present the iSCSI hosts in the Fibre Channel fabric, either or both the access control mechanisms can be used.

The following topics are included in this section:

- Fibre Channel Zoning-Based Access Control, page 4-cvi
- iSCSI-Based Access Control, page 4-cviii
- Enforcing Access Control, page 4-cx

Fibre Channel Zoning-Based Access Control

Cisco SAN-OS Release 3.x and NX-OS Release 4.1(1b) VSAN and zoning concepts have been extended to cover both Fibre Channel devices and iSCSI devices. Zoning is the standard access control mechanism for Fibre Channel devices, which is applied within the context of a VSAN. Fibre Channel zoning has been extended to support iSCSI devices, and this extension has the advantage of having a uniform, flexible access control mechanism across the whole SAN.

Common mechanisms for identifying members of a Fibre Channel zone are the following:

- Fibre Channel device pWWN.
- Interface and switch WWN. Device connecting via that interface is within the zone.

See the *Cisco Fabric Manager Fabric Configuration Guide* and *Cisco MDS 9000 Family NX-OS Fabric Configuration Guide* for details on Fibre Channel zoning.

In the case of iSCSI, multiple iSCSI devices may be connected behind an iSCSI interface. Interface-based zoning may not be useful because all the iSCSI devices behind the interface will automatically be within the same zone.

In transparent initiator mode (where one Fibre Channel virtual N port is created for each iSCSI host as described in the "Transparent Initiator Mode" section on page 4-xciii), if an iSCSI host has static WWN mapping then the standard Fibre Channel device pWWN-based zoning membership mechanism can be used.

Zoning membership mechanism has been enhanced to add iSCSI devices to zones based on the following:

- IPv4 address/subnet mask
- IPv6 address/prefix length
- iSCSI qualified name (IQN)
- Symbolic-node-name (IQN)

For iSCSI hosts that do not have a static WWN mapping, the feature allows the IP address or iSCSI node name to be specified as zone members. Note that iSCSI hosts that have static WWN mapping can also use these features. IP address based zone membership allows multiple devices to be specified in one command by providing the subnet mask.

Note In proxy initiator mode, all iSCSI devices connecting to an IPS port gain access to the Fibre Channel fabric through a single virtual Fibre Channel N port. Zoning based on the iSCSI node name or IP address will not have any effect. If zoning based on pWWN is used, then all iSCSI devices connecting to that IPS port will be put in the same zone. To implement individual initiator access control in proxy initiator mode, configure an iSCSI ACL on the virtual target (see the "iSCSI-Based Access Control" section on page 4-cviii).

To add an iSCSI initiator to the zone database, follow these steps:

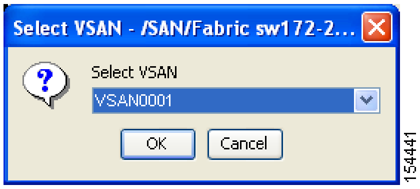
	Command	Purpose
Step 1	`switch#` **`config terminal`** `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)#` **`zone name iSCSIzone vsan 1`** `switch(config-zone)`	Creates a zone name for the iSCSI devices in the Fibre Channel module with IPS ports or MPS-14/2 module to be included.
Step 3	`switch(config-zone)#` **`member symbolic-nodename iqn.1987-02.com.cisco.initiator1`**	Assigns an iSCSI node name-based membership into a zone.
	`switch(config-zone)#` **`no member symbolic-nodename iqn.1987-02.com.cisco.init1`**	(Optional) Deletes the specified device from a zone.
	`switch(config-zone)#` **`member ip-address 10.50.1.1`**	Assigns an iSCSI IPv4 address-based membership into a zone.
	`switch(config-zone)#` **`no member ip-address 10.50.1.1`**	(Optional) Deletes the specified device from a zone.
	`switch(config-zone)#` **`member ipv6-address 2001:0DB8:800:200C::417A`**	Assigns an iSCSI IPv6 address-based membership into a zone.
	`switch(config-zone)#` **`no member ipv6-address 2001:0DB8:800:200C::417A`**	Deletes the specified device from a zone.
	`switch(config-zone)#` **`member pwwn 20:00:00:05:30:00:59:11`**	Assigns an iSCSI port WWN-based membership into a zone.
	`switch(config-zone)#` **`no member pwwn 20:00:00:05:30:00:59:11`**	Deletes the device identified by the port WWN from a zone.

To add an iSCSI initiator to the zone database using Fabric Manager, follow these steps:

Step 1 Choose **Zone > Edit Local Full Zone Database**.

You see the Edit Local Zone Database dialog box (see Figure 4-26).

Figure 4-26 Edit Local Zone Database Dialog Box in Fabric Manager

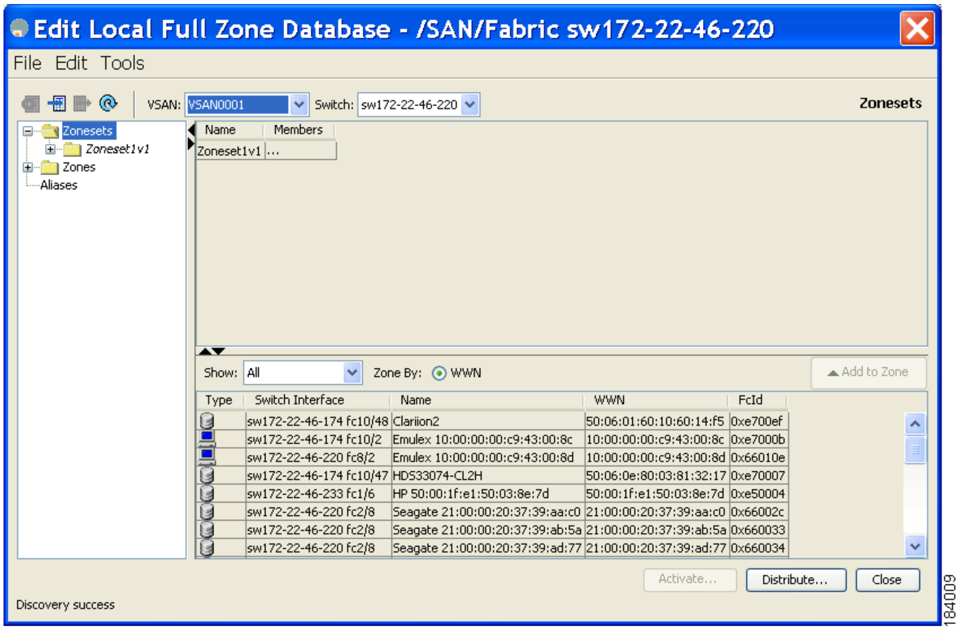


Select VSAN: VSAN0001

Step 2 Select the VSAN you want to add the iSCSI host initiator to and click **OK**.

You see the available zones and zone sets for that VSAN (see Figure 4-27).

Figure 4-27 Available Zones and Zone Sets


Edit Local Full Zone Database - /SAN/Fabric sw172-22-46-220
File Edit Tools
VSAN: VSAN0001
Switch: sw172-22-46-220
Zonesets
Zonesets
Zoneset1v1
Zones
Aliases
Name
Members
Zoneset1v1 ...
Show: All
Zone By: ● WWN
Add to Zone
Activate...
Distribute...
Close
Discovery success
184009

Type	Switch Interface	Name	WWN	FcId
	sw172-22-46-174 fc10/48	Clariion2	50:06:01:60:10:60:14:f5	0xe700ef
	sw172-22-46-174 fc10/2	Emulex 10:00:00:00:c9:43:00:8c	10:00:00:00:c9:43:00:8c	0xe7000b
	sw172-22-46-220 fc8/2	Emulex 10:00:00:00:c9:43:00:8d	10:00:00:00:c9:43:00:8d	0x66010e
	sw172-22-46-174 fc10/47	HDS33074-CL2H	50:06:0e:80:03:81:32:17	0xe70007
	sw172-22-46-233 fc1/6	HP 50:00:1f:e1:50:03:8e:7d	50:00:1f:e1:50:03:8e:7d	0xe50004
	sw172-22-46-220 fc2/8	Seagate 21:00:00:20:37:39:aa:c0	21:00:00:20:37:39:aa:c0	0x66002c
	sw172-22-46-220 fc2/8	Seagate 21:00:00:20:37:39:ab:5a	21:00:00:20:37:39:ab:5a	0x660033
	sw172-22-46-220 fc2/8	Seagate 21:00:00:20:37:39:ad:77	21:00:00:20:37:39:ad:77	0x660034

Step 3 From the list of available devices with iSCSI host initiators, drag the initiators to add into the zone.

Step 4 Click **Distribute** to distribute the change.

iSCSI-Based Access Control

iSCSI-based access control is applicable only if static iSCSI virtual targets are created (see the "Static Mapping" section on page 4-lxxxviii). For a static iSCSI target, you can configure a list of iSCSI initiators that are allowed to access the targets.

By default, static iSCSI virtual targets are not accessible to any iSCSI host. You must explicitly configure accessibility to allow an iSCSI virtual target to be accessed by all hosts. The initiator access list can contain one or more initiators. The iSCSI initiator can be identified by one of the following mechanisms:

- iSCSI node name
- IPv4 address and subnet
- IPv6 address

Note For a transparent mode iSCSI initiator, if both Fibre Channel zoning and iSCSI ACLs are used, then for every static iSCSI target that is accessible to the iSCSI host, the initiator's virtual N port should be in the same Fibre Channel zone as the Fibre Channel target.

To configure access control in iSCSI follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi virtual-target name iqn.1987-02.com.cisco.initiator` `switch(config-iscsi-tgt)#`	Creates the iSCSI target name iqn.1987-02.com.cisco.initiator.
Step 3	`switch(config-iscsi-tgt)# pWWN 26:00:01:02:03:04:05:06` `switch(config-iscsi-tgt)#`	Maps a virtual target node to a Fibre Channel target.
Step 4	`switch(config-iscsi-tgt)# initiator iqn.1987-02.com.cisco.initiator1 permit`	Allows the specified iSCSI initiator node to access this virtual target. You can issue this command multiple times to allow multiple initiators.
	`switch(config-iscsi-tgt)# no initiator iqn.1987-02.com.cisco.initiator1 permit`	(Optional) Prevents the specified initiator node from accessing virtual targets.
	`switch(config-iscsi-tgt)# no initiator ip address 10.50.1.1 permit`	Prevents the specified IPv4 address from accessing virtual targets.
	`switch(config-iscsi-tgt)# initiator ip address 10.50.1.0 255.255.255.0 permit`	Allows all initiators in this IPv4 subnetwork (10.50.1/24) to access this virtual target.
	`switch(config-iscsi-tgt)# no initiator ip address 10.50.1.0 255.255.255.0 permit`	Prevents all initiators in this IPv4 subnetwork from accessing virtual targets.
	`switch(config-iscsi-tgt)# initiator ip address 2001:0DB8:800:200C::/64 permit`	Allows all initiators in this IPv6 subnetwork (2001:0DB8:800:200C::/64) to access this virtual target.
	`switch(config-iscsi-tgt)# no initiator ip address 2001:0DB8:800:200C::/64 permit`	Prevents all initiators in this IPv6 subnetwork from accessing virtual targets.
	`switch(config-iscsi-tgt)# all-initiator-permit`	Allows all initiator nodes to access this virtual target.
	`switch(config-iscsi-tgt)# no all-initiator-permit`	Prevents any initiator from accessing virtual targets (default).

To configure access control in iSCSI using Device Manager, follow these steps:

Step 1 Select **IP > iSCSI.**

You see the iSCSI configuration (see Figure 4-12).

Step 2 Click the **Targets** tab.

You see the iSCSI virtual targets.

Step 3 Uncheck the **Initiators Access All** check box if checked.

Step 4 Click **Edit Access**.

You see the Initiators Access dialog box.

Step 5 Click **Create** to add more initiators to the Initiator Access list.

You see the Create Initiators Access dialog box.

Step 6 Add the name or IP address for the initiator that you want to permit for this virtual target.

Step 7 Click **Create** to add this initiator to the Initiator Access List.

Enforcing Access Control

Fibre Channel module with IPS ports and MPS-14/2 modules use both iSCSI and Fibre Channel zoning-based access control lists to enforce access control. Access control is enforced both during the iSCSI discovery phase and the iSCSI session creation phase. Access control enforcement is not required during the I/O phase because the Fibre Channel module with IPS ports or MPS-14/2 module is responsible for the routing of iSCSI traffic to Fibre Channel.

- iSCSI discovery phase—When an iSCSI host creates an iSCSI discovery session and queries for all iSCSI targets, the Fibre Channel module with IPS ports or MPS-14/2 module returns only the list of iSCSI targets this iSCSI host is allowed to access based on the access control policies discussed in the previous section. The Fibre Channel module with IPS ports or MPS-14/2 module does this by querying the Fibre Channel name server for all the devices in the same zone as the initiator in all VSANs. It then filters out the devices that are initiators by looking at the FC4-feature field of the FCNS entry. (If a device does not register as either initiator or target in the FC4-feature field, the Fibre Channel module with IPS ports or MPS-14/2 module will advertise it). It then responds to the iSCSI host with the list of targets. Each will have either a static iSCSI target name that you configure or a dynamic iSCSI target name that the Fibre Channel module with IPS ports or MPS-14/2 module creates for it (see the "Dynamic Mapping" section on page 4-lxxxvi).
- iSCSI session creation—When an IP host initiates an iSCSI session, the Fibre Channel module with IPS ports or MPS-14/2 module verifies if the specified iSCSI target (in the session login request) is allowed by both the access control mechanisms described in the "iSCSI-Based Access Control" section on page 4-cviii.

  If the iSCSI target is a static mapped target, the Fibre Channel module with IPS ports or MPS-14/2 module verifies if the iSCSI host is allowed within the access list of the iSCSI target. If the IP host does not have access, its login is rejected. If the iSCSI host is allowed, it validates if the virtual Fibre Channel N port used by the iSCSI host and the Fibre Channel target mapped to the static iSCSI virtual target are in the same Fibre Channel zone.

  If the iSCSI target is an autogenerated iSCSI target, then the Fibre Channel module with IPS ports or MPS-14/2 module extracts the WWN of the Fibre Channel target from the iSCSI target name and verifies if the initiator and the Fibre Channel target is in the same Fibre Channel zone or not. If they are, then access is allowed.

The Fibre Channel module with IPS ports or MPS-14/2 module uses the Fibre Channel virtual N port of the iSCSI host and does a zone-enforced name server query for the Fibre Channel target WWN. If the FC ID is returned by the name server, then the iSCSI session is accepted. Otherwise, the login request is rejected.

iSCSI Session Authentication

The Fibre Channel module with IPS ports or MPS-14/2 module supports the iSCSI authentication mechanism to authenticate the iSCSI hosts that request access to the storage devices. By default, the Fibre Channel module with IPS ports or MPS-14/2 modules allow CHAP or None authentication of iSCSI initiators. If authentication is always used, you must configure the switch to allow only CHAP authentication.

For CHAP user name or secret validation, you can use any method supported and allowed by the Cisco MDS AAA infrastructure. AAA authentication supports a RADIUS, TACACS+, or local authentication device. See the *Cisco Fabric Manager Security Configuration Guide.*

The **aaa authentication iscsi** command enables AAA authentication for the iSCSI host and specifies the method to use. *See Cisco MDS 9000 Family NX-OS Security Configuration Guide*

To configure AAA authentication for an iSCSI user, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# aaa authentication iscsi default group RadServerGrp`	Uses RADIUS servers that are added in the group called RadServerGrp for the iSCSI CHAP authentication.
	`switch(config)# aaa authentication iscsi default group TacServerGrp`	Uses TACACS+ servers that are added in the group called TacServerGrp for the iSCSI CHAP authentication.
	`switch(config)# aaa authentication iscsi default local`	Uses the local password database for iSCSI CHAP authentication.

To configure AAA authentication for an iSCSI user using Fabric Manager, follow these steps:

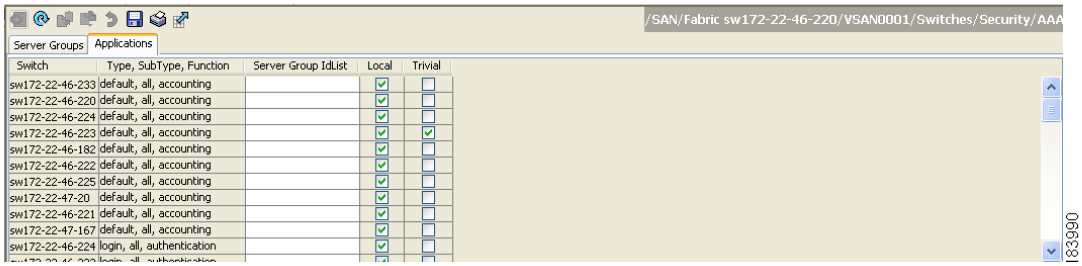
Step 1 Choose **Switches > Security > AAA** in the Physical Attributes pane.

You see the AAA configuration in the Information pane.

Step 2 Click the **Applications** tab.

You see the AAA configuration per application (see Figure 4-28).

Figure 4-28 AAA per Application Configuration



Switch	Type, SubType, Function	Server Group IdList	Local	Trivial
sw172-22-46-233	default, all, accounting		☑	☐
sw172-22-46-220	default, all, accounting		☑	☐
sw172-22-46-224	default, all, accounting		☑	☐
sw172-22-46-223	default, all, accounting		☑	☑
sw172-22-46-182	default, all, accounting		☑	☐
sw172-22-46-222	default, all, accounting		☑	☐
sw172-22-46-225	default, all, accounting		☑	☐
sw172-22-47-20	default, all, accounting		☑	☐
sw172-22-46-221	default, all, accounting		☑	☐
sw172-22-47-167	default, all, accounting		☑	☐
sw172-22-46-224	login, all, authentication		☑	☐

Step 3 Right-click the ServerGroup Id List field for the iSCSI application and enter the server group that you want iSCSI to use.

Note You should use an existing server group or create a new server group before configuring it for iSCSI session authentication.

Step 4 Click the **Apply Changes** icon to save these changes.

The following topics are included in this section:

- Configuring Authentication Mechanism, page 4-cxii
- Configuring Local Authentication, page 4-cxiii
- Restricting iSCSI Initiator Authentication, page 4-cxiv
- Configuring Mutual CHAP Authentication, page 4-cxiv
- Configuring an iSCSI RADIUS Server, page 4-cxvi

Configuring Authentication Mechanism

You can configure iSCSI CHAP or None authentication at both the global level and at each interface level.

The authentication for a Gigabit Ethernet interface or subinterface overrides the authentication method configured at the global level.

If CHAP authentication is used, issue the **iscsi authentication chap** command at either the global level or at a per-interface level. If authentication should not be used at all, issue the **iscsi authentication none** command.

To configure the authentication mechanism for iSCSI, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi authentication chap`	Configures CHAP as the default authentication mechanism globally for the Cisco MDS switch. CHAP authentication is required for all iSCSI sessions.

To configure AAA authentication for an iSCSI user using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSCSI** in the Physical Attributes pane.

You see the iSCSI tables in the Information pane (see Figure 4-5).

Step 2 Click the **Globals** tab.

You see the iSCSI authentication configuration table.

Step 3 Select **chap** or **none** from the authMethod column.

Step 4 Click the **Apply Changes** icon in Fabric Manager to save these changes.

To configure the authentication mechanism for iSCSI sessions to a particular interface, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# interface GigabitEthernet 2/1.100` `switch(config-if)#`	Selects the Gigabit Ethernet interface.
Step 3	`switch(config-if)# iscsi authentication none`	Specifies that no authentication is required for iSCSI sessions to the selected interface.

To configure the authentication mechanism for iSCSI sessions to a particular interface using Fabric Manager, follow these steps:

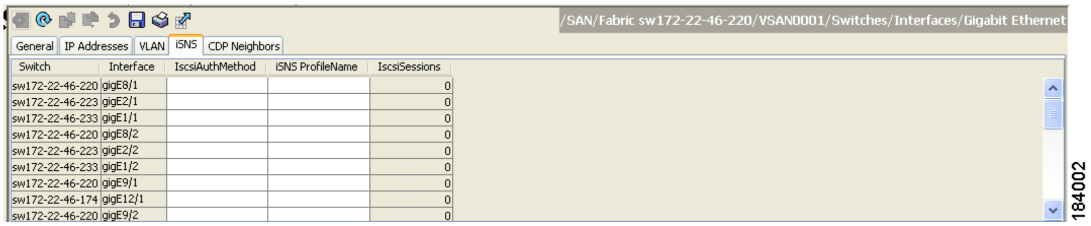
Step 1 Choose **Switches > Interfaces > Gigabit Ethernet** in the Physical Attributes pane.

You see the Gigabit Ethernet configuration in the Information pane.

Step 2 Click the **iSNS** tab.

You see the iSCSI and iSNS configuration (see Figure 4-29).

Figure 4-29   Configuring iSCSI Authentication on an Interface


/SAN/Fabric sw172-22-46-220/VSAN0001/Switches/Interfaces/Gigabit Ethernet
General
IP Addresses
VLAN
iSNS
CDP Neighbors
184002

Switch	Interface	IscsiAuthMethod	iSNS ProfileName	IscsiSessions
sw172-22-46-220	gigE8/1			0
sw172-22-46-223	gigE2/1			0
sw172-22-46-233	gigE1/1			0
sw172-22-46-220	gigE8/2			0
sw172-22-46-223	gigE2/2			0
sw172-22-46-233	gigE1/2			0
sw172-22-46-220	gigE9/1			0
sw172-22-46-174	gigE12/1			0
sw172-22-46-220	gigE9/2			0

Step 3 Right-click on the **IscsiAuthMethod** field and select none or chap.

Step 4 Click the **Apply Changes** icon to save these changes.

Configuring Local Authentication

See the *Cisco Fabric Manager Security Configuration Guide* and *Cisco MDS 9000 Family NX-OS Security Guide* to create the local password database. To create users in the local password database for the iSCSI initiator, the iSCSI keyword is mandatory.

To configure iSCSI users for local authentication, follow these steps:

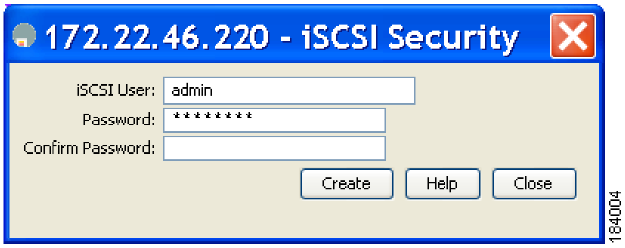
	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# username iscsiuser password ffsffsfsffs345353554535 iscsi`	Configures a user name (iscsiuser) and password (ffsffsfsffs345353554535) in the local database for iSCSI login authentication.

To configure iSCSI users for local authentication using Device Manager, follow these steps:

Step 1 Choose **Security > iSCSI**.

You see the iSCSI Security dialog box (see Figure 4-30).

Figure 4-30   iSCSI Security Dialog Box


172.22.46.220 - iSCSI Security
Create
Help
Close
184004

iSCSI User: admin
Password: ********
Confirm Password:

Step 2 Complete the iSCSI User, Password, and Password Confirmation fields.

Step 3 Click **Create** to save this new user.

Restricting iSCSI Initiator Authentication

By default, the iSCSI initiator can use any user name in the RADIUS server or in the local database in authenticating itself to the Fibre Channel module with IPS ports or MPS-14/2 module (the CHAP user name is independent of the iSCSI initiator name). The Fibre Channel module with IPS ports or MPS-14/2 module allows the initiator to log in as long as it provides a correct response to the CHAP challenge sent by the switch. This can be a problem if one CHAP user name and password has been compromised.

To restrict an initiator to use a specific user name for CHAP authentication, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi initiator name iqn.1987-02.com.cisco.init` `switch(config-iscsi-init)#`	Enters the configuration submode for the initiator iqn.1987-02.com.cisco.init.
Step 3	`switch(config-iscsi-init)# username user1`	Restricts the initiator iqn.1987-02.com.cisco.init to only authenticate using user1 as its CHAP user name. **Note** Be sure to define user1 as an iSCSI user in the local AAA database or the RADIUS server.

To restrict an initiator to use a specific user name for CHAP authentication using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSCSI** in the Physical Attributes pane.

You see the iSCSI tables in the Information pane (see Figure 4-5).

Step 2 Right-click the AuthUser field and enter the user name to which you want to restrict the iSCSI initiator.

Step 3 Click the **Apply Changes** icon to save these changes.

Configuring Mutual CHAP Authentication

The Fibre Channel module with IPS ports or MPS-14/2 module supports a mechanism by which the iSCSI initiator can authenticate the Cisco MDS switch’s iSCSI target during the iSCSI login phase. This authentication is available in addition to the Fibre Channel module with IPS ports or MPS-14/2 module authentication of the iSCSI initiator.

In addition to the Fibre Channel module with IPS ports or MPS-14/2 module authentication of the iSCSI initiator, the Fibre Channel module with IPS ports or MPS-14/2 module also supports a mechanism for the iSCSI initiator to authenticate the Cisco MDS switch’s iSCSI target during the iSCSI login phase. This authentication requires the user to configure a user name and password for the switch to present to the iSCSI initiator. The provided password is used to calculate a CHAP response to a CHAP challenge sent to the IPS port by the initiator.

To configure a global iSCSI target user name and password to be used by the switch to authenticate itself to an initiator, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.

	Command	Purpose
Step 2	`switch(config)# iscsi authentication username testuser password abc123`	Configures the switch user account (testuser) along with a password (abc123) specified in clear text (default) for all initiators. The password is limited to 128 characters.
	`switch(config)# iscsi authentication username user1 password 7!@*asdsfsdfjh!@df`	Configures the switch user account (user1) along with the encrypted password specified by 7 (!@*asdsfsdfjh!@df) for all initiators.
	`switch(config)# iscsi authentication username user1 password 0 abcd12AAA`	Configures the switch user account (user1) along with a password (abcd12AAA) specified in clear text (indicated by 0—default) for all initiators. The password is limited to 128 characters.
	`switch(config)# no iscsi authentication username testuser`	Removes the global configuration for all initiators.

To configure a global iSCSI target user name and password to be used by the switch to authenticate itself to an initiator using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSCSI** in the Physical Attributes pane.

You see the iSCSI tables in the Information pane (see Figure 4-5).

Step 2 Select the **Globals** tab.

You see the global iSCSI configuration.

Step 3 Fill in the Target UserName and Target Password fields.

Step 4 Click the **Apply Changes** icon to save these changes.

To configure a per-initiator iSCSI target's user name and password used by the switch to authenticate itself to an initiator, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi initiator name iqn.1987-02.com.cisco.initiator` `switch(config-iscsi-init)#`	Configures an iSCSI initiator using the iSCSI name of the initiator node.
Step 3	`switch(config-iscsi-init)# mutual-chap username testuser password abcd12AAA`	Configures the switch user account (testuser) along with a password (abcd12AAA) specified in clear text (default). The password is limited to 128 characters.
	`switch(config-iscsi-init)# mutual-chap username user1 password 7!@*asdsfsdfjh!@df`	Configures the switch user account (user1) along with the encrypted password specified by 7 (!@*asdsfsdfjh!@df).
	`switch(config-iscsi-init)# no mutual-chap username testuser`	Removes the switch authentication configuration.

Use the **show running-config** and the **show iscsi global** commands to display the global configuration. Use the **show running-config** and the **show iscsi initiator configured** commands to display the initiator specific configuration.(See the "Displaying iSCSI Information" section on page 4-cxx for command output examples).

To configure a per-initiator iSCSI target's user name and password used by the switch to authenticate itself to an initiator using Device Manager, follow these steps:

Step 1 Choose **IP > iSCSI**.

You see the iSCSI configuration (see Figure 4-12).

Step 2 Complete the Target UserName and Target Password fields for the initiator that you want to configure.

Step 3 Click **Create** to add this initiator to the Initiator Access List.

Configuring an iSCSI RADIUS Server

To configure an iSCSI RADIUS server, follow these steps:

Step 1 Configure the RADIUS server to allow access from the Cisco MDS switch's management Ethernet IP address.

Step 2 Configure the shared secret for the RADIUS server to authenticate the Cisco MDS switch.

Step 3 Configure the iSCSI users and passwords on the RADIUS server.

iSCSI Immediate Data and Unsolicited Data Features

Cisco MDS switches support the iSCSI immediate data and unsolicited data features if requested by the initiator during the login negotiation phase. Immediate data is iSCSI write data contained in the data segment of an iSCSI command protocol data unit (PDU), such as combining the write command and write data together in one PDU. Unsolicited data is iSCSI write data that an initiator sends to the iSCSI target, such as an MDS switch, in an iSCSI data-out PDU without having to receive an explicit ready to transfer (R2T) PDU from the target.

These two features help reduce I/O time for small write commands because it removes one round-trip between the initiator and the target for the R2T PDU. As an iSCSI target, the MDS switch allows up to 64 KB of unsolicited data per command. This is controlled by the FirstBurstLength parameter during iSCSI login negotiation phase.

If an iSCSI initiator supports immediate data and unsolicited data features, these features are automatically enabled on the MDS switch with no configuration required.

iSCSI Interface Advanced Features

Advanced configuration options are available for iSCSI interfaces on a per-IPS port basis. These configurations are similar to the advanced FCIP configurations and are already explained in that section (see Advanced FCIP Profile Configuration, page 2-xxvi for more information).

To access these commands from the iSCSI interface, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# interface iscsi 4/1` `switch(config-if)#`	Selects the iSCSI interface on the switch.

Cisco MDS switches support the following advanced features for iSCSI interfaces:

- iSCSI Listener Port, page 4-cxvii
- TCP Tuning Parameters, page 4-cxvii
- Setting QoS Values, page 4-cxvii
- iSCSI Routing Modes, page 4-cxviii

iSCSI Listener Port

You can configure the TCP port number for the iSCSI interface that listens for new TCP connections. The default port number is 3260. Once you change the TCP port number, the iSCSI port only accepts TCP connections on the newly configured port.

TCP Tuning Parameters

You can configure the following TCP parameters:

- Minimum retransmit timeout (See the "Minimum Retransmit Timeout" section on page 2-xxvii for more information).
- Keepalive timeout (See the"Keepalive Timeout" section on page 2-xxvii for more information).
- Maximum retransmissions (See the"Maximum Retransmissions" section on page 2-xxvii for more information).
- Path MTU (See the "Path MTUs" section on page 2-xxviii for more information).
- SACK (SACK is enabled by default for iSCSI TCP configurations).
- Window management (The iSCSI defaults are max-bandwidth is 1 Gbps, min-available-bandwidth is 70 Mbps, and round-trip-time is 1 msec). (See the "Window Management" section on page 2-xxix for more information).
- Buffer size (The iSCSI default send buffer size is 4096 KB) (See the "Displaying FCIP Profile Information" section on page 2-xxxi for more information).
- Window congestion monitoring (enabled by default and the default burst size is 50 KB) (See the "Monitoring Congestion" section on page 2-xxx for more information).
- Maximum delay jitter (enabled by default and the default time is 500 microseconds).

Setting QoS Values

To set the QoS values, follow these steps:

	Command	Purpose
Step 1	`switch(config-if)# qos 3`	Configures the differentiated services code point (DSCP) value of 3 to be applied to all outgoing IP packets in this iSCSI interface. The valid range for the iSCSI DSCP value is from 0 to 63.
Step 2	`switch(config-if)# no qos 5`	Reverts the switch to its factory default (marks all packets with DSCP value 0).

To set the QoS values using Fabric Manager, follow these steps:

Step 1 Expand **Switches**, expand **Interfaces** and then select **FC Logical** in the Physical Attributes pane.

You see the Interface tables in the Information pane (see Figure 4-22).

Step 2 In Device Manager, choose **Interface > Ethernet and iSCSI**.

You see the Ethernet Interfaces and iSCSI dialog box (see Figure 4-23).

Step 3 Click the **iSCSI TCP** tab in either Fabric Manager or Device Manager.

You see the iSCSI TCP configuration table.

Step 4 Set the QoS field from 1 to 6.

Step 5 Click the **Apply Changes** icon in Fabric Manager or click **Apply** in Device Manager to save these changes.

iSCSI Routing Modes

Cisco MDS 9000 Family switches support multiple iSCSI routing modes. Each mode negotiates different operational parameters, has different advantages and disadvantages, and is suitable for different usages.

- Pass-thru mode

  In pass-thru mode, the port on the Fibre Channel module with IPS ports or MPS 14/2 module converts and forwards read data frames from the Fibre Channel target to the iSCSI host frame-by-frame without buffering. This means that one data-in frame received is immediately sent out as one iSCSI data-in PDU.

  In the opposite direction, the port on the Fibre Channel module with IPS ports or MPS 14/2 module limits the maximum size of iSCSI write data-out PDU that the iSCSI host can send to the maximum data size that the Fibre Channel target specifies that it can receive. The result is one iSCSI data-out PDU received sent out as one Fibre Channel data frame to the Fibre Channel target.

  The absence of buffering in both directions leads to an advantage of lower forwarding latency. However, a small maximum data segment length usually results in lower data transfer performance from the host because of a higher processing overhead by the host system. Another benefit of this mode is iSCSI data digest can be enabled. This helps protect the integrity of iSCSI data carried in the PDU over what TCP checksum offers.

- Store-and-forward mode (default)

  In store-and-forward mode, the port on the Fibre Channel module with IPS ports or MPS 14/2 module assembles all the Fibre Channel data frames of an exchange to build one large iSCSI data-in PDU before forwarding it to the iSCSI client.

  In the opposite direction, the port on the Fibre Channel module with IPS ports or MPS 14/2 module does not impose a small data segment size on the host so the iSCSI host can send an iSCSI data-out PDU of any size (up to 256 KB). The port then waits until the whole iSCSI data-out PDU is received before it converts, or splits, the PDU, and forwards Fibre Channel frames to the Fibre Channel target.

  The advantage of this mode is higher data transfer performance from the host. The disadvantages are higher transfer latency and that the iSCSI data digest (CRC) cannot be used.

Note The store-and-forward mode is the default forwarding mode.

- Cut-through mode

  Cut-through mode improves the read operation performance over store-and-forward mode. The port on the Fibre Channel module with IPS ports or MPS 14/2 module achieves this by forwarding each Fibre Channel data-in frame to the iSCSI host as it is received without waiting for the whole exchange complete. There is no difference for write data-out operations from store-and-forward mode.

Figure 4-31 compares the messages exchanged by the iSCSI routing modes.

Figure 4-31 iSCSI Routing Modes

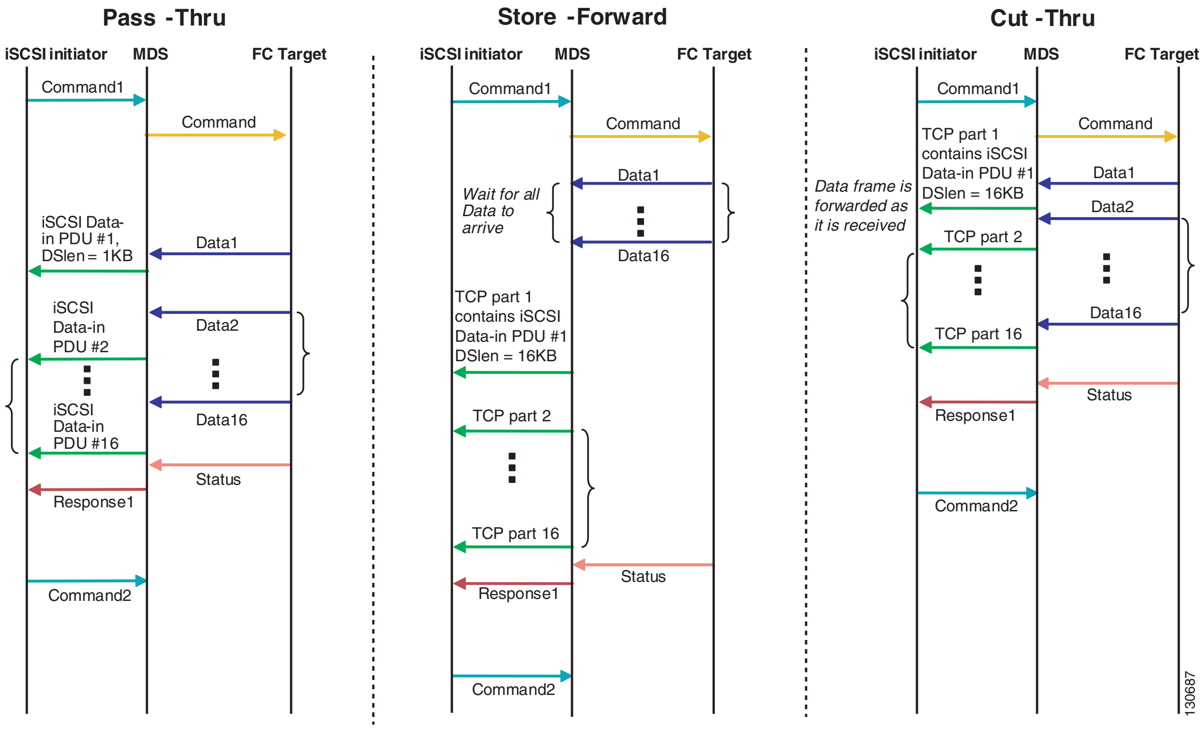

Pass -Thru
iSCSI initiator
MDS
FC Target
Command1
Command
iSCSI Data-in PDU #1, DSlen = 1KB
Data1
iSCSI Data-in PDU #2
Data2
iSCSI Data-in PDU #16
Data16
Status
Response1
Command2
Store -Forward
iSCSI initiator
MDS
FC Target
Command1
Command
Data1
Wait for all Data to arrive
Data16
TCP part 1 contains iSCSI Data-in PDU #1 DSlen = 16KB
TCP part 2
TCP part 16
Status
Response1
Command2
Cut -Thru
iSCSI initiator
MDS
FC Target
Command1
Command
TCP part 1 contains iSCSI Data-in PDU #1 DSlen = 16KB
Data1
Data frame is forwarded as it is received
Data2
TCP part 2
Data16
TCP part 16
Status
Response1
Command2
130687

Table 4-1 compares the advantages and disadvantages of the different iSCSI routing modes.

Table 4-1 Comparison of iSCSI Routing Modes

Mode	**Advantages**	**Disadvantages**
Pass-thru	Low-latency Data digest can be used	Lower data transfer performance.
Store-and-forward	Higher data transfer performance	Data digest cannot be used.
Cut-thru	Improved read performance over store-and-forward	If the Fibre Channel target sent read data for different commands interchangeably, data of the first command is forwarded in cut-thru mode but the data of subsequent commands is buffered and the behavior is the same as store-and-forward mode. Data digest cannot be used.

Caution Changing the forwarding mode of an iSCSI interface that is part of an iSLB VRRP group impacts load balancing on the interface. See the "Changing iSCSI Interface Parameters and the Impact on Load Balancing" section on page 4-cxlv.

Displaying iSCSI Information

Use the **show iscsi** command to obtain detailed information about iSCSI configurations.

This section includes the following topics:

- Displaying iSCSI Interfaces, page 4-cxx
- Displaying iSCSI Statistics, page 4-cxxi
- Displaying Proxy Initiator Information, page 4-cxxii
- Displaying Global iSCSI Information, page 4-cxxiv
- Displaying iSCSI Sessions, page 4-cxxiv
- Displaying iSCSI Initiators, page 4-cxxv
- Displaying iSCSI Virtual Targets, page 4-cxxviii
- Displaying iSCSI User Information, page 4-cxxix

Displaying iSCSI Interfaces

Use the **show iscsi interface** command to view the summary, counter, description, and status of the iSCSI interface. Use the output to verify the administrative mode, the interface status, TCP parameters currently used, and brief statistics.

Example 4-1 Displaying the iSCSI Interface Information

```
switch# show interface iscsi 4/1
iscsi4/1 is up
    Hardware is GigabitEthernet
    Port WWN is 20:cf:00:0c:85:90:3e:80
    Admin port mode is ISCSI
    Port mode is ISCSI
    Speed is 1 Gbps
    iSCSI initiator is identified by name
    Number of iSCSI session: 0 (discovery session: 0)
    Number of TCP connection: 0
    Configured TCP parameters
        Local Port is 3260
        PMTU discover is enabled, reset timeout is 3600 sec
        Keepalive-timeout is 60 sec
        Minimum-retransmit-time is 300 ms
        Max-retransmissions 4
        Sack is enabled
        QOS code point is 0
        Maximum allowed bandwidth is 1000000 kbps
        Minimum available bandwidth is 70000 kbps
        Estimated round trip time is 1000 usec
        Send buffer size is 4096 KB
        Congestion window monitoring is enabled, burst size is 50 KB
        Configured maximum jitter is 500 us
    Forwarding mode: store-and-forward
    TMF Queueing Mode : disabled
    Proxy Initiator Mode : disabled
    5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    iSCSI statistics
      Input 0 packets, 0 bytes
        Command 0 pdus, Data-out 0 pdus, 0 bytes
      Output 0 packets, 0 bytes
        Response 0 pdus (with sense 0), R2T 0 pdus
        Data-in 0 pdus, 0 bytes
```

Displaying iSCSI Statistics

Use the **show iscsi stats** command to view brief or detailed iSCSI statistics per iSCSI interface. See Example 4-2 and Example 4-3.

Example 4-2 displays iSCSI throughput on an IPS port in both inbound and outbound directions. It also displays the number of different types of iSCSI PDU received and transmitted by this IPS port.

Example 4-2 Displaying Brief iSCSI Statistics for an iSCSI Interface

```
switch# show iscsi stats iscsi 2/1
iscsi2/1
    5 minutes input rate 704 bits/sec, 88 bytes/sec, 1 frames/sec
    5 minutes output rate 704 bits/sec, 88 bytes/sec, 1 frames/sec
    iSCSI statistics
      974756 packets input, 142671620 bytes
        Command 2352 pdus, Data-out 44198 pdus, 92364800 bytes, 0 fragments, unsolicited 0 bytes
      output 1022920 packets, 143446248 bytes
        Response 2352 pdus (with sense 266), R2T 1804 pdus
        Data-in 90453 pdus, 92458248 bytes
```

Example 4-3displays detailed iSCSI statistics for an IPS port. Along with the traffic rate and the number of each iSCSI PDU type, it shows the number of FCP frames received and forwarded, the number of iSCSI login attempts, successes, and failures. It also shows the number of different types of iSCSI PDUs sent and received that are noncritical or occur less frequently, such as NOP in and out (NOP-In and NOP-Out), text request and response (Text-REQ and Text-RESP), and task management request and response (TMF-REQ and TMF-RESP).

Various types of errors and PDU or frame drop occurrences are also counted and displayed. For example, Bad header digest shows the number of iSCSI PDUs received that have a header digest that fails CRC verification. The iSCSI Drop section shows the number of PDUs that were dropped because of reasons such as target down, LUN mapping fail, Data CRC error, or unexpected Immediate or Unsolicited data. These statistics are helpful for debugging purposes when the feature is not working as expected.

The last section, Buffer Stats, gives statistics on the internal IPS packet buffer operation. This section is for debugging purposes only.

Example 4-3 Displaying Detailed iSCSI Statistics for the iSCSI Interface

```
switch# show iscsi stats iscsi 2/1 detail
iscsi2/1
    5 minutes input rate 704 bits/sec, 88 bytes/sec, 1 frames/sec
    5 minutes output rate 704 bits/sec, 88 bytes/sec, 1 frames/sec
    iSCSI statistics
      974454 packets input, 142656516 bytes
        Command 2352 pdus, Data-out 44198 pdus, 92364800 bytes, 0 fragments, unsolicited 0 bytes
      output 1022618 packets, 143431144 bytes
        Response 2352 pdus (with sense 266), R2T 1804 pdus
        Data-in 90453 pdus, 92458248 bytes
```

```
iSCSI Forward:
  Command:2352 PDUs (Rcvd:2352)
  Data-Out (Write):16236 PDUs (Rcvd 44198), 0 fragments, 92364800 bytes, unsolicited 0 bytes
FCP Forward:
  Xfer_rdy:1804 (Rcvd:1804)
  Data-In:90453 (Rcvd:90463), 92458248 bytes
  Response:2352 (Rcvd:2362), with sense 266
  TMF Resp:0

iSCSI Stats:
  Login:attempt:13039, succeed:110, fail:12918, authen fail:0
  Rcvd:NOP-Out:914582, Sent:NOP-In:914582
        NOP-In:0, Sent:NOP-Out:0
        TMF-REQ:0, Sent:TMF-RESP:0
        Text-REQ:18, Sent:Text-RESP:27
        SNACK:0
        Unrecognized Opcode:0, Bad header digest:0
        Command in window but not next:0, exceed wait queue limit:0
        Received PDU in wrong phase:0
        SCSI Busy responses:0
  Immediate data failure::Separation:0
  Unsolicited data failure::Separation:0, Segment:0
                         Add header:0
  Sequence ID allocation failure:0
FCP Stats:
  Total:Sent:47654
         Received:96625 (Error:0, Unknown:0)
  Sent:PLOGI:10, Rcvd:PLOGI_ACC:10, PLOGI_RJT:0
        PRLI:10, Rcvd:PRLI_ACC:10, PRLI_RJT:0, Error:0, From initiator:0
        LOGO:4, Rcvd:LOGO_ACC:0, LOGO_RJT:0
        PRLO:4, Rcvd:PRLO_ACC:0, PRLO_RJT:0
        ABTS:0, Rcvd:ABTS_ACC:0
        TMF REQ:0
        Self orig command:10, Rcvd:data:10, resp:10
  Rcvd:PLOGI:156, Sent:PLOGI_ACC:0, PLOGI_RJT:156
        LOGO:0, Sent:LOGO_ACC:0, LOGO_RJT:0
        PRLI:8, Sent:PRLI_ACC:8, PRLI_RJT:0
        PRLO:0, Sent:PRLO_ACC:0, PRLO_RJT:0
        ADISC:0, Sent:ADISC_ACC:0, ADISC_RJT:0
        ABTS:0

iSCSI Drop:
  Command:Target down 0, Task in progress 0, LUN map fail 0
           CmdSeqNo not in window 0, No Exchange ID 0, Reject 0
           No task:0
  Data-Out:0, Data CRC Error:0
  TMF-Req:0, No task:0
  Unsolicited data:0, Immediate command PDU:0
FCP Drop:
  Xfer_rdy:0, Data-In:0, Response:0

Buffer Stats:
  Buffer less than header size:0, Partial:45231, Split:322
  Pullup give new buf:0, Out of contiguous buf:0, Unaligned m_data:0
```

Displaying Proxy Initiator Information

If the proxy initiator feature is enabled in the iSCSI interface, use the **show interface iscsi** command to display configured proxy initiator information (see Example 4-4 and Example 4-5).

Example 4-4 Displaying Proxy Initiator Information for the iSCSI Interface with System-Assigned WWNs

```
switch# show interface iscsi 4/1
iscsi4/1 is up
    Hardware is GigabitEthernet
    Port WWN is 20:c1:00:05:30:00:a7:9e
    Admin port mode is ISCSI
    Port mode is ISCSI
    Speed is 1 Gbps
    iSCSI initiator is identified by name
    Number of iSCSI session: 0, Number of TCP connection: 0
    Configured TCP parameters
        Local Port is 3260
        PMTU discover is enabled, reset timeout is 3600 sec
        Keepalive-timeout is 60 sec
        Minimum-retransmit-time is 300 ms
        Max-retransmissions 4
        Sack is disabled
        QOS code point is 0
    Forwarding mode: pass-thru
    TMF Queueing Mode : disabled
    Proxy Initiator Mode : enabled<----------------------------Proxy initiator is enabled
        nWWN is 28:00:00:05:30:00:a7:a1  (system-assigned)<----System-assigned nWWN
        pWWN is 28:01:00:05:30:00:a7:a1  (system-assigned)<---- System-assigned pWWN
    5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    iSCSI statistics
      Input 7 packets, 2912 bytes
        Command 0 pdus, Data-out 0 pdus, 0 bytes
      Output 7 packets, 336 bytes
        Response 0 pdus (with sense 0), R2T 0 pdus
        Data-in 0 pdus, 0 bytes
```

Example 4-5 Displaying Proxy Initiator Information for the iSCSI Interface with User-Assigned WWNs

```
switch# show interface iscsi 4/2
iscsi4/2 is up
    Hardware is GigabitEthernet
    Port WWN is 20:c1:00:05:30:00:a7:9e
    Admin port mode is ISCSI
    Port mode is ISCSI
    Speed is 1 Gbps
    iSCSI initiator is identified by name
    Number of iSCSI session: 0, Number of TCP connection: 0
    Configured TCP parameters
        Local Port is 3260
        PMTU discover is enabled, reset timeout is 3600 sec
        Keepalive-timeout is 60 sec
        Minimum-retransmit-time is 300 ms
        Max-retransmissions 4
        Sack is disabled
        QOS code point is 0
    Forwarding mode: pass-thru
    TMF Queueing Mode : disabled
    Proxy Initiator Mode : enabled
        nWWN is 11:11:11:11:11:11:11:11 (manually-configured)<----User-assigned nWWN
        pWWN is 22:22:22:22:22:22:22:22 (manually-configured)<----User-assigned pWWN
    5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
    iSCSI statistics
      Input 7 packets, 2912 bytes
        Command 0 pdus, Data-out 0 pdus, 0 bytes
      Output 7 packets, 336 bytes
        Response 0 pdus (with sense 0), R2T 0 pdus
        Data-in 0 pdus, 0 bytes
```

Displaying Global iSCSI Information

Use the **show iscsi global** command to view the overall configuration and the iSCSI status. See Example 4-6.

Example 4-6 Displaying the Current Global iSCSI Configuration and State

```
switch# show iscsi global
iSCSI Global information
  Authentication: CHAP, NONE
  Import FC Target: Enabled
  Initiator idle timeout: 300 seconds
  Number of target node: 0
  Number of portals: 11
  Number of session: 0
  Failed session: 0, Last failed initiator name:
```

Displaying iSCSI Sessions

Use the **show iscsi session** command to view details about the current iSCSI sessions in the switch. Without parameters, this command displays all sessions. The output can be filtered by specifying an initiator, a target, or both.

Example 4-7 displays one iSCSI initiator configured based on the IQN (iqn.1987-05.com.cisco:02.3021b0f2fda0.avanti12-w2k) and another based on its IPv4 address (10.10.100.199).

Example 4-7 Displaying Brief Information of All iSCSI Sessions

```
switch# show iscsi session
Initiator iqn.1987-05.com.cisco:02.3021b0f2fda0.avanti12-w2k
  Initiator ip addr (s): 10.10.100.116
  Session #1
    Discovery session, ISID 00023d000043, Status active

  Session #2
    Target VT1
    VSAN 1, ISID 00023d000046, Status active, no reservation

  Session #3
    Target VT2
    VSAN 1, ISID 00023d000048, Status active, no reservation

Initiator 10.10.100.199
  Initiator name iqn.1987-05.com.cisco.01.7e3183ae458a94b1cd6bc168cba09d2e
  Session #1
    Target VT2
    VSAN 1, ISID 246700000000, Status active, no reservation

  Session #2
    Target VT1
    VSAN 1, ISID 246b00000000, Status active, no reservation

  Session #3
    Target iqn.1987-05.com.cisco:05.switch.04-01.2100002037a6be32
    VSAN 1, ISID 246e00000000, Status active, no reservation
```

Example 4-8 and Example 4-9 display the iSCSI initiator configured based on its IPv4 address (10.10.100.199).

Example 4-8 Displaying Brief Information About the Specified iSCSI Session

```
switch# show iscsi session initiator 10.10.100.199 target VT1
Initiator 10.10.100.199
  Initiator name iqn.1987-05.com.cisco.01.7e3183ae458a94b1cd6bc168cba09d2e
  Session #1
    Target VT1
    VSAN 1, ISID 246b00000000, Status active, no reservation
```

Example 4-9 Displaying Detailed Information About the Specified iSCSI Session

```
switch# show iscsi session initiator 10.10.100.199 target VT1 detail
Initiator 10.10.100.199 (oasis-qa)
  Initiator name iqn.1987-05.com.cisco.01.7e3183ae458a94b1cd6bc168cba09d2e
  Session #1 (index 3)
    Target VT1
    VSAN 1, ISID 246b00000000, TSIH 384, Status active, no reservation
    Type Normal, ExpCmdSN 39, MaxCmdSN 54, Barrier 0
    MaxBurstSize 0, MaxConn 0, DataPDUInOrder No
    DataSeqInOrder No, InitialR2T Yes, ImmediateData No
    Registered LUN 0, Mapped LUN 0
    Stats:
      PDU: Command: 38, Response: 38
      Bytes: TX: 8712, RX: 0
    Number of connection: 1
    Connection #1
      Local IP address: 10.10.100.200, Peer IP address: 10.10.100.199
      CID 0, State: LOGGED_IN
      StatSN 62, ExpStatSN 0
      MaxRecvDSLength 1024, our_MaxRecvDSLength 1392
      CSG 3, NSG 3, min_pdu_size 48 (w/ data 48)
      AuthMethod none, HeaderDigest None (len 0), DataDigest None (len 0)
      Version Min: 2, Max: 2
      FC target: Up, Reorder PDU: No, Marker send: No (int 0)
      Received MaxRecvDSLen key: No
```

Displaying iSCSI Initiators

Use the **show iscsi initiator** command to display information about all initiators connected to an iSCSI interface in the switch. The information can be filtered to display only the desired iSCSI initiator by specifying the initiator name. Detailed output of the iSCSI initiator can be obtained by specifying the **detail** option. The **iscsi-session** (and optionally **detail**) parameter displays only iSCSI session information. The **fcp-session** (and optionally **detail**) parameter displays only FCP session information. The output includes static and dynamic initiators. See Example 4-10 and Example 4-11.

Example 4-10 Displaying Information About Connected iSCSI Initiators

```
switch# show iscsi initiator
iSCSI Node name is iqn.1987-05.com.cisco:02.3021b0f2fda0.avanti12-w2k
    Initiator ip addr (s): 10.10.100.116
    iSCSI alias name: AVANTI12-W2K
    Node WWN is 22:01:00:05:30:00:10:e1 (configured)
    Member of vsans: 1, 2, 10
    Number of Virtual n_ports: 1
    Virtual Port WWN is 22:04:00:05:30:00:10:e1 (configured)
```

```
      Interface iSCSI 4/1, Portal group tag: 0x180
      VSAN ID 1, FCID 0x6c0202
      VSAN ID 2, FCID 0x6e0000
      VSAN ID 10, FCID 0x790000

iSCSI Node name is 10.10.100.199
    iSCSI Initiator name: iqn.1987-05.com.cisco.01.7e3183ae458a94b1cd6bc168cba09d2e
    iSCSI alias name: oasis-qa
    Node WWN is 22:03:00:05:30:00:10:e1 (configured)
    Member of vsans: 1, 5
    Number of Virtual n_ports: 1
    Virtual Port WWN is 22:00:00:05:30:00:10:e1 (configured)
      Interface iSCSI 4/1, Portal group tag: 0x180
      VSAN ID 5, FCID 0x640000
      VSAN ID 1, FCID 0x6c0203
```

Example 4-11 Displaying Detailed Information About the iSCSI Initiator

```
switch# show iscsi initiator iqn.1987-05.com.cisco:02.3021b0f2fda0.avanti12-w2k detail
iSCSI Node name is iqn.1987-05.com.cisco:02.3021b0f2fda0.avanti12-w2k
    Initiator ip addr (s): 10.10.100.116
    iSCSI alias name: AVANTI12-W2K
    Node WWN is 22:01:00:05:30:00:10:e1 (configured)
    Member of vsans: 1, 2, 10
    Number of Virtual n_ports: 1

    Virtual Port WWN is 22:04:00:05:30:00:10:e1 (configured)
      Interface iSCSI 4/1, Portal group tag is 0x180
      VSAN ID 1, FCID 0x6c0202
      1 FC sessions, 1 iSCSI sessions
      iSCSI session details    <--------------------iSCSI session details
        Target: VT1
          Statistics:
            PDU: Command: 0, Response: 0
            Bytes: TX: 0, RX: 0
            Number of connection: 1
          TCP parameters
            Local 10.10.100.200:3260, Remote 10.10.100.116:4190
            Path MTU: 1500 bytes
            Retransmission timeout: 310 ms
            Round trip time: Smoothed 160 ms, Variance: 38
            Advertized window: Current: 61 KB, Maximum: 62 KB, Scale: 0
            Peer receive window: Current: 63 KB, Maximum: 63 KB, Scale: 0
            Congestion window: Current: 1 KB

      FCP Session details      <--------------------FCP session details
        Target FCID: 0x6c01e8 (S_ID of this session: 0x6c0202)
          pWWN: 21:00:00:20:37:62:c0:0c, nWWN: 20:00:00:20:37:62:c0:0c
          Session state: CLEANUP
          1 iSCSI sessions share this FC session
            Target: VT1
          Negotiated parameters
            RcvDataFieldSize 1392 our_RcvDataFieldSize 1392
            MaxBurstSize 0, EMPD: FALSE
            Random Relative Offset: FALSE, Sequence-in-order: Yes
          Statistics:
            PDU: Command: 0, Response: 0
```

Use the **show fcns database** (and optionally **detail**) to display the Fibre Channel name server entry for the Fibre Channel N port created for iSCSI initiators in the SAN. See Example 4-12 and Example 4-13.

Example 4-12 Displaying the FCNS Database Contents

```
switch# show fcns database
VSAN 1:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x020101    N     22:04:00:05:30:00:35:e1 (Cisco)         scsi-fcp:init isc..w <--iSCSI
0x020102    N     22:02:00:05:30:00:35:e1 (Cisco)         scsi-fcp:init isc..w initiator
0x0205d4    NL    21:00:00:04:cf:da:fe:c6 (Seagate)       scsi-fcp:target
0x0205d5    NL    21:00:00:04:cf:e6:e4:4b (Seagate)       scsi-fcp:target
...
Total number of entries = 10

VSAN 2:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0xef0001    N     22:02:00:05:30:00:35:e1 (Cisco)         scsi-fcp:init isc..w
Total number of entries = 1

VSAN 3:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0xed0001    N     22:02:00:05:30:00:35:e1 (Cisco)         scsi-fcp:init isc..w
Total number of entries = 1
```

Example 4-13 Displaying the FCNS Database in Detail

```
switch# show fcns database detail
------------------------
VSAN:1     FCID:0x020101
------------------------
port-wwn (vendor)     :22:04:00:05:30:00:35:e1 (Cisco)
node-wwn              :22:03:00:05:30:00:35:e1
class                 :2,3
node-ip-addr          :10.2.2.12                 <--- iSCSI initiator's IPv4 address
ipa                   :ff ff ff ff ff ff ff ff
fc4-types:fc4_features:scsi-fcp:init iscsi-gw
symbolic-port-name    :
symbolic-node-name    :iqn.1991-05.com.microsoft:oasis2-dell <--- iSCSI initiator's IQN
port-type             :N
port-ip-addr          :0.0.0.0
fabric-port-wwn       :22:01:00:05:30:00:35:de
hard-addr             :0x000000
------------------------
VSAN:1     FCID:0x020102
------------------------
port-wwn (vendor)     :22:02:00:05:30:00:35:e1 (Cisco)
node-wwn              :22:01:00:05:30:00:35:e1
class                 :2,3
node-ip-addr          :10.2.2.11
ipa                   :ff ff ff ff ff ff ff ff
fc4-types:fc4_features:scsi-fcp:init iscsi-gw
symbolic-port-name    :
symbolic-node-name    :iqn.1987-05.com.cisco.01.14ac33ba567f986f174723b5f9f2377
port-type             :N
port-ip-addr          :0.0.0.0
fabric-port-wwn       :22:01:00:05:30:00:35:de
hard-addr             :0x000000
...
```

```
Total number of entries = 10
======================================================================
------------------------
VSAN:2     FCID:0xef0001
------------------------
port-wwn (vendor)     :22:02:00:05:30:00:35:e1 (Cisco)
node-wwn              :22:01:00:05:30:00:35:e1
class                 :2,3
node-ip-addr          :10.2.2.11
ipa                   :ff ff ff ff ff ff ff ff
fc4-types:fc4_features:scsi-fcp:init iscsi-gw
symbolic-port-name    :
symbolic-node-name    :iqn.1987-05.com.cisco.01.14ac33ba567f986f174723b5f9f2377
port-type             :N
port-ip-addr          :0.0.0.0
fabric-port-wwn       :22:01:00:05:30:00:35:de
hard-addr             :0x000000
Total number of entries = 1
...
```

Use the **show iscsi initiator configured** to display information about all the configured iSCSI initiators. Specifying the name shows information about the desired initiator. See Example 4-14.

Example 4-14 Displaying Information About Configured Initiators

```
switch# show iscsi initiator configured
iSCSI Node name is iqn.1987-05.com.cisco:02.3021b0f2fda0.avanti12-w2k
    Member of vsans: 1, 2, 10
    Node WWN is 22:01:00:05:30:00:10:e1
    No. of PWWN: 5
      Port WWN is 22:04:00:05:30:00:10:e1
      Port WWN is 22:05:00:05:30:00:10:e1
      Port WWN is 22:06:00:05:30:00:10:e1
      Port WWN is 22:07:00:05:30:00:10:e1
      Port WWN is 22:08:00:05:30:00:10:e1

iSCSI Node name is 10.10.100.199
    Member of vsans: 1, 5
    Node WWN is 22:03:00:05:30:00:10:e1
    No. of PWWN: 4
      Port WWN is 22:00:00:05:30:00:10:e1
      Port WWN is 22:09:00:05:30:00:10:e1
      Port WWN is 22:0a:00:05:30:00:10:e1
      Port WWN is 22:0b:00:05:30:00:10:e1

    User Name for Mutual CHAP: testuser
```

Displaying iSCSI Virtual Targets

Use the **show iscsi virtual-target** to display information about the Fibre Channel targets exported as iSCSI virtual targets to the iSCSI initiators. The output includes static as well as dynamic targets. See Example 4-15.

Example 4-15 Displaying Exported Targets

```
switch# show iscsi virtual-target
target: VT1
  * Port WWN 21:00:00:20:37:62:c0:0c
    Configured node
    all initiator permit is enabled
```

```
target: VT2
    Port WWN 21:00:00:04:cf:4c:52:c1
    Configured node
    all initiator permit is disabled
target: iqn.1987-05.com.cisco:05.switch.04-01.2100002037a6be32
    Port WWN 21:00:00:20:37:a6:be:32 , VSAN 1
    Auto-created node
```

Displaying iSCSI User Information

The **show user-account iscsi** command displays all configured iSCSI user names. See Example 4-16.

Example 4-16 Displaying iSCSI User Names

```
switch# show user-account iscsi
username:iscsiuser
secret: dsfffsffsffasffsdffg

username:user2
secret:cshadhdhsadadjajdjas
```

Configuring iSLB

The iSCSI server load balancing (iSLB) feature provides a means to easily configure large scale iSCSI deployments containing hundreds or even thousands of initiators. iSLB provides the following features:

- The iSLB initiator configuration is simplified with support for initiator targets and auto-zones.
- Cisco Fabric Services (CFS) eliminates the need for manual configuration by distributing the iSLB initiator configuration among all MDS switches in the fabric.
- Dynamic load balancing of iSLB initiators is available using iSCSI login redirect and VRRP.

When not using iSLB, configuring iSCSI requires the following:

- You need to perform multiple configuration steps on the MDS switch, including the following:
  - Initiator configuration using static pWWN and VSAN.
  - Zoning configuration for initiators and targets.
  - Optional create virtual target and give access to the initiator.
  - Configuration of target LUN mapping and masking on the storage system for the initiator based on the static pWWN created for the initiator on the MDS switch.
- You need to duplicate the configuration manually on multiple MDS switches.
- There is no load balancing for IPS ports. For example:
  - The Virtual Router Redundancy Protocol (VRRP) only supports active and backup, not load balancing.
  - You must use multiple VRRP groups and configure hosts in different groups.

iSLB provides the following features:

- The iSLB initiator configuration is simplified with support for initiator targets and auto-zones.
- Cisco Fabric Services (CFS) eliminates the need for manual configuration by distributing the iSLB initiator configuration among all MDS switches in the fabric.

Note Only statically mapped iSLB initiator configuration is distributed throughout the fabric using CFS. Dynamically and statically mapped iSCSI initiator configurations are not distributed.

- Dynamic load balancing of iSLB initiators is available using iSCSI login redirect and VRRP.

This section covers the following topics:

- iSCSI Configuration Limits, page 4-lxxx
- iSLB Configuration Prerequisites, page 4-cxxxi
- iSLB Initiators, page 4-cxxxi
- Configuring iSLB Using Device Manager, page 4-cxxxi
- Configuring iSLB Initiators, page 4-cxxxiii
- Load Balancing Using VRRP, page 4-cxliii
- Configuring Load Balancing Using VRRP, page 4-cxlviii
- iSLB Configuration Distribution Using CFS, page 4-cxlix
- Distributing iSLB Configuration Using CFS, page 4-cl

Note Before configuring iSLB, you must enable iSCSI (see the "Enabling iSCSI" section on page 4-lxxx).

Note For iSLB, all switches in the fabric must be running Cisco MDS SAN-OS Release 2.1(1a) or later.

iSLB Configuration Limits

iSLB configuration has the following limits:

- The maximum number of iSLB and iSCSI initiators supported in a fabric is 2000.
- The maximum number of iSLB and iSCSI sessions supported by an IPS port in either transparent or proxy initiator mode is 500.
- The maximum number of iSLB initiators supported in a fabric is 2000.
- The maximum number of iSLB initiators and iSCSI sessions supported by a switch is 5000.
- The maximum number of iSLB sessions per IPS port in either transparent or proxy initiator mode is 500.
- The maximum number of iSLB and iSCSI targets supported in a fabric is 6000.
- The maximum number of switches in a fabric that can have iSLB with CFS distribution enabled is four.
- No more than 200 new iSLB initiators can be added to the pending configuration. Before adding more initiators, you must commit the configuration.
- You cannot disable iSCSI if you have more than 200 iSLB initiators in the running configuration. Reduce the number of iSLB initiators to fewer than 200 before disabling iSCSI.
- iSLB can be used without CFS distribution but if iSLB auto-zone feature is used, traffic is disrupted when any zoneset is activated.
- If IVR and iSLB features are enabled in the same fabric, you should have at least one switch in the fabric where both these features are enabled. Any zoning-related configuration and activation (for normal zones, IVR zones, or iSLB zones) must be performed on this switch. Otherwise, there may be traffic disruption in the fabric.

iSLB Configuration Prerequisites

Perform the following prerequisite actions prior to configuring iSLB:

- Enable iSCSI (see the "Enabling iSCSI" section on page 4-lxxx for more information).
- Configure the Gigabit Ethernet interfaces (see the "Basic Gigabit Ethernet Configuration for IPv4" section on page 7-cclviii).
- Configure the VRRP groups (see the "Configuring Load Balancing Using VRRP" section on page 4-cxlviii).
- Configure and activate a zone set (see the *Cisco Fabric Manager Fabric Configuration Guide* and *Cisco MDS 9000 Family NX-OS Fabric Configuration Guide* for more information).
- Enable CFS distribution for iSLB (see the "Enabling iSLB Configuration Distribution" section on page 4-cli).

iSLB Initiators

iSLB initiators provide the following features in addition to those supported by iSCSI initiators:

- An iSLB initiator also supports iSLB virtual targets.
- Initiator targets–These targets are configured for a particular initiator.
- Load balancing using iSCSI login redirect and VRRP–If iSCSI login redirect is enabled, the IPS Manager redirects incoming sessions to the best interface based on the calculated load for each interface.
- Configuration distribution to other switches using CFS.

iSLB initiators provide the following features in addition to those supported by iSCSI initiators:

- An iSLB initiator also supports iSLB virtual targets. These targets are very similar to iSCSI virtual targets with the exception that they do not include the advertise interface option and as a result are distributable using CFS.
- Initiator targets——These targets are configured for a particular initiator.
- Load balancing using iSCSI login redirect and VRRP—If load balancing is enabled, the IPS Manager redirects incoming sessions to the best interface based on the calculated load for each interface.
- Configuration distribution to other switches using CFS.

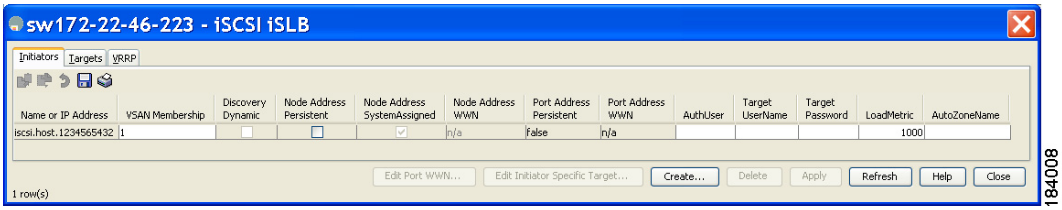
Configuring iSLB Using Device Manager

To configure iSLB using Device Manager, follow these steps:

Step 1 Choose **IP > iSCSI iSLB**.

You see the iSCSI iSLB dialog box (see Figure 4-32).

Figure 4-32 iSCSI iSLB Dialog Box



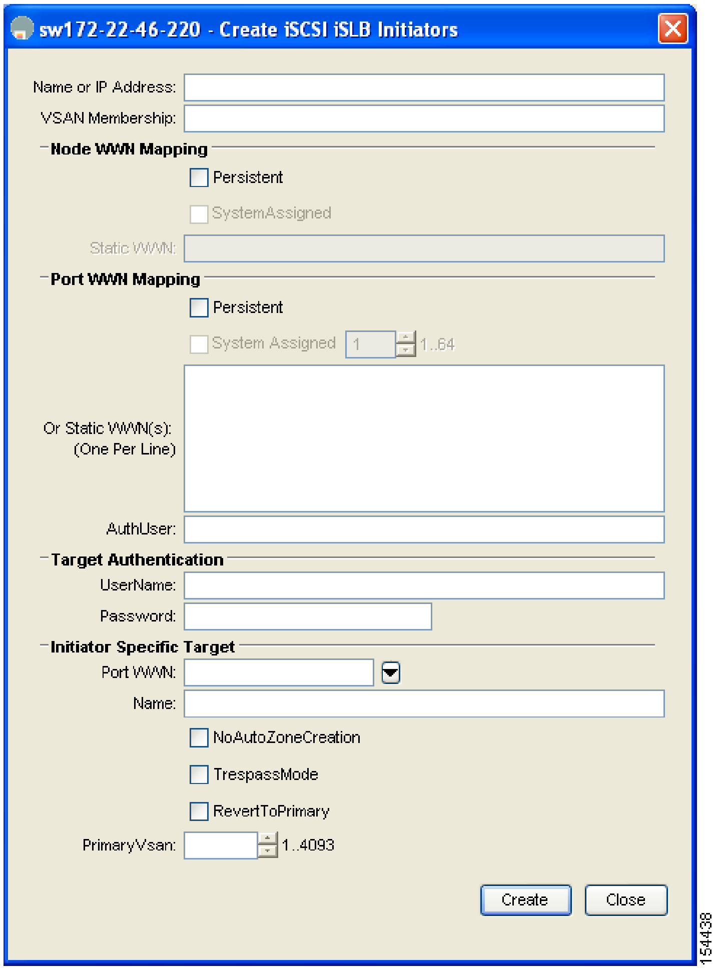
Name or IP Address	VSAN Membership	Discovery Dynamic	Node Address Persistent	Node Address SystemAssigned	Node Address WWN	Port Address Persistent	Port Address WWN	AuthUser	Target UserName	Target Password	LoadMetric	AutoZoneName
iscsi.host.1234565432	1	☐	☐	☑	n/a	false	n/a				1000	

1 row(s)

Step 2 Click **Create** to create a new iSCSI iSLB initiator.

You see the Create iSCSI iSLB Initiators dialog box (see Figure 4-33).

Figure 4-33 Create iSCSI iSLB Initiators Dialog Box


sw172-22-46-220 - Create iSCSI iSLB Initiators
Name or IP Address:
VSAN Membership:
Node WWN Mapping
☐ Persistent
☐ SystemAssigned
Static WWN:
Port WWN Mapping
☐ Persistent
☐ System Assigned 1 1..64
Or Static WWN(s):
(One Per Line)
AuthUser:
Target Authentication
UserName:
Password:
Initiator Specific Target
Port WWN:
Name:
☐ NoAutoZoneCreation
☐ TrespassMode
☐ RevertToPrimary
PrimaryVsan: 1..4093
Create
Close
154438

Step 3 Set the Name or IP Address field to the iSLB name or IP address.

Step 4 Set the VSAN Membership field to the VSAN that you want the iSLB initiator in.

Also see the "Assigning VSAN Membership for iSLB Initiators" section on page 4-cxxxvi.

Step 5 Check the **Persistent** check box to convert a dynamic nWWN to static for the iSLB initiator.

Also see the "Making the Dynamic iSLB Initiator WWN Mapping Static" section on page 4-cxxxv.

Step 6 (Optional) Check the **SystemAssigned** check box to have the switch assign the nWWN.

Step 7 (Optional) Set the Static WWN field to manually assign the static nWWN. You must ensure uniqueness for this nWWN.

Step 8 (Optional) Check the Port WWN Mapping **Persistent** check box to convert dynamic pWWNs to static for the iSLB initiator.

See the "Making the Dynamic iSLB Initiator WWN Mapping Static" section on page 4-cxxxv.

Step 9 (Optional) Check the **SystemAssigned** check box and set the number of pWWNs you want to have the switch assign the PWWN.

Step 10 (Optional) Set the Static WWN(s) field to manually assign the static pWWNs.

You must ensure uniqueness for these pWWN.

Step 11 (Optional) Set the AuthUser field to the username that you want to restrict the iSLB initiator to for iSLB authentication.

Also see the "Restricting iSLB Initiator Authentication" section on page 4-cxlii.

Step 12 Fill in the Username and Password fields to configure iSLB initiator target CHAP authentication.

Also see the "Configuring iSLB Session Authentication" section on page 4-cxlii.

Step 13 In the Initiator Specific Target section, set the pWWN to configure an iSLB initiator target.

Step 14 (Optional) Set the Name field to a globally unique identifier (IQN).

Step 15 (Optional) Check the **NoAutoZoneCreation** check box to disable auto-zoning.

Step 16 (Optional) Check the **TresspassMode** check box.

Also see the "LUN Trespass for Storage Port Failover" section on page 4-clix.

Step 17 (Optional) Check the **RevertToPrimary** check box to revert back to the primary port after an HA failover when the primary port comes back up.

Step 18 Set the PrimaryVsan to the VSAN for the iSLB initiator target.

Step 19 Click **Create** to create this iSLB initiator.

Step 20 If CFS is enabled, select **commit** from the CFS drop-down menu.

Configuring iSLB Initiators

This section includes the following topics:

- Configuring iSLB Initiator Names or IP Addresses, page 4-cxxxiii
- Assigning WWNs to iSLB Initiators, page 4-cxxxiv
- Making the Dynamic iSLB Initiator WWN Mapping Static, page 4-cxxxv
- Assigning VSAN Membership for iSLB Initiators, page 4-cxxxvi
- Configuring Metrics for Load Balancing, page 4-cxxxvii
- Verifying iSLB Initiator Configuration, page 4-cxxxviii
- Verifying iSLB Authentication Configuration, page 4-cxliii
- Configuring Load Balancing Using VRRP, page 4-cxlviii
- Configuring iSLB Session Authentication, page 4-cxlii
- Verifying iSLB Authentication Configuration, page 4-cxliii

Configuring iSLB Initiator Names or IP Addresses

You must specify the iSLB initiator name or IP address before configuring it.

Note Specifying the iSLB initiator name or IP address is the same as for an iSCSI initiator. See the "Static Mapping" section on page 4-xcvi.

To enter iSLB initiator configuration submode using the **name** option for an iSLB initiator, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# islb initiator name iqn.1987-02.com.cisco.initiator` `switch(config-islb-init)#`	Configures an iSLB initiator using the iSCSI name of the initiator node (iqn.1987-02.com.cisco.initiator) and enters iSLB initiator configuration submode. The maximum name length is 223 alphanumeric characters. The minimum length is 16.
	`switch(config)# no lslb initiator name iqn.1987-02.com.cisco.initiator`	Deletes the configured iSLB initiator.

To enter iSLB initiator configuration submode using the **ip-address** option for an iSLB initiator, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# islb initiator ip-address 10.1.1.3` `switch(config-islb-init)#`	Configures an iSLB initiator using the IPv4 address of the initiator node and enters iSLB initiator configuration submode.
	`switch(config)# no islb initiator ip-address 10.1.1.3`	Deletes the configured iSLB initiator.
	`switch(config)# islb initiator ip-address 2001:0DB8:800:200C::417A` `switch(config-islb-init)#`	Configures an iSLB initiator using the IPv6 unicast address of the initiator node and enters iSLB initiator configuration submode.
	`switch(config)# no islb initiator ip-address 2001:0DB8:800:200C::417A`	Deletes the configured iSLB initiator.

Assigning WWNs to iSLB Initiators

An iSLB host is mapped to an N port's WWNs by one of the following mechanisms:

- Dynamic mapping (default)
- Static mapping

Note Assigning WWNs for iSLB initiators is the same as for iSCSI initiators. For information on dynamic and static mapping, see the "WWN Assignment for iSCSI Initiators" section on page 4-xcv.

Tip We recommend using the **SystemAssign system-assign** option. If you manually assign a WWN, you must ensure its uniqueness (see the *Cisco Fabric Manager Fabric Configuration Guide* and *Cisco MDS 9000 Family NX-OS Fabric Configuration Guide* for more information). You should not use any previously assigned WWNs.

See the "Configuring iSLB Using Device Manager" procedure on page 4-cxxxi.

Making the Dynamic iSLB Initiator WWN Mapping Static

After a dynamic iSLB initiator has logged in, you may decide to permanently keep the automatically assigned nWWN/pWWN mapping to allow this initiator to use the same mapping the next time it logs in (see the "Dynamic Mapping" section on page 4-lxxxvi).

You can convert a dynamic iSLB initiator to a static iSLB initiator and make its WWNs persistent

Note You cannot convert a dynamic iSCSI initiator to a static iSLB initiator or a dynamic iSLB initiator to a static iSCSI initiator (see the "Dynamic Mapping" section on page 4-20).

Note Making the dynamic mapping for iSLB initiators static is the same as for iSCSI. See the "Making the Dynamic iSLB Initiator WWN Mapping Static" section on page 4-cxxxv"Making the Dynamic iSCSI Initiator WWN Mapping Static" section on page 4-xcviii.

Note Only statically mapped iSLB initiator configuration is distributed throughout the fabric using CFS. Dynamically and statically configured iSCSI initiator configurations are not distributed.

See the "Configuring iSLB Using Device Manager" procedure on page 4-cxxxi.

To permanently keep the automatically assigned nWWN/pWWN mapping, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# islb save-initiator name iqn.1987-02.com.cisco.initiator`	Saves the nWWNs and pWWNs that have automatically been assigned to the iSLB initiator whose name is specified.
	`switch(config)# islb save-initiator 10.10.100.11`	Saves the nWWNs and pWWNs that have automatically been assigned to the iSLB initiator whose IPv4 address is specified.
	`switch(config)# iscsi save-initiator ip-address 2001:0DB8:800:200C::417A`	Saves the nWWNs and pWWNs that have automatically been assigned to the iSCSI initiator whose IPv6 unicast address is specified.
	`switch(config)# islb save-initiator`	Saves the nWWNs and pWWNs that have automatically been assigned to all the iSLB initiators.
Step 3	`switch(config)# exit` `switch#`	Returns to EXEC mode.
Step 4	`switch# copy running-config startup-config`	Saves the nWWN/pWWN mapping configuration across system reboots.

Configuring iSLB Target Access Mapping

In iSLB, all fabric distributed configurations including iSCSI virtual target access are part of the iSCSI initiator configuration. Access is granted using the pWWN or the device alias. You can specify the one or more of the following optional parameters:

- Secondary pWWN
- Secondary device alias

- LUN mapping
- IQN

In addition, you can disable auto zoning.

If you configure an IQN for an initiator target then that name is used to identify the target. Otherwise, an unique IQN is generated for the initiator target.

To configure iSLB initiator access to an iSCSI virtual target, follow these steps:

	Command	Purpose
Step 1	`switch#` **`config terminal`**	Enters configuration mode.
Step 2	`switch(config)#` **`islb initiator ip-address 10.1.1.3`** `switch(config-iscsi-islb-init)#`	Configures the initiator using a name and enters iSLB initiator configuration submode.
Step 3	`switch(config-iscsi-islb-init)#` **`target pwwn 26:00:01:02:03:04:05:06`**	Grants iSLB initiator access to the target using a pWWN with auto zoning enabled (default).
	`switch(config-iscsi-islb-init)#` **`target pwwn 26:00:01:02:03:04:05:06 no-zone`**	Grants iSLB initiator access to the target using a pWWN with auto zoning disabled.
	`switch(config-iscsi-islb-init)#` **`target device-alias SampleAlias`**	Grants iSLB initiator access to the target using a device alias with auto zoning enabled (default).
	`switch(config-iscsi-islb-init)#` **`target device-alias SampleAlias fc-lun 0x1234 iscsi-lun 0x2345`**	Grants iSLB initiator access to the target using a devices alias and optional LUN mapping.
	`switch(config-iscsi-islb-init)#` **`target device-alias SampleAlias iqn-name iqn.1987-01.com.cisco.initiator`**	Grants iSLB initiator access to the target using a devices alias and an optional IQN.
	`switch(config-iscsi-islb-init)#` **`target device-alias SampleAlias sec-device-alias SecondaryAlias`**	Grants iSLB initiator access to the target using a devices alias and an optional secondary device alias.
	`switch(config-iscsi-islb-init)#` **`target device-alias SampleAlias sec-pwwn 26:01:02:03:04:05:06:07`**	Grants iSLB initiator access to the target using a devices alias and an optional secondary pWWN.
	`switch(config-iscsi-init)#` **`no target pwwn 26:00:01:02:03:04:05:06`**	Removes the target access.

To verify the iSLB target configuration, use the **show islb initiator configured** command.

```
switch# show islb initiator configured
iSCSI Node name is 10.1.1.3

  Number of Initiator Targets: 1

  Initiator Target: iqn.1987-05.com.cisco:05.ips-hac4
    Port WWN 50:06:04:82:ca:e1:26:8d
    Zoning Enabled
    No. of LU mapping: 3
      iSCSI LUN: 0x0001, FC LUN: 0x0001
      iSCSI LUN: 0x0002, FC LUN: 0x0002
      iSCSI LUN: 0x0003, FC LUN: 0x0003
```

Assigning VSAN Membership for iSLB Initiators

Individual iSLB hosts can be configured to be in a specific VSAN (similar to the DPVM feature for Fibre Channel. The specified VSAN overrides the iSCSI interface VSAN membership.

For more information, see the *Cisco MDS 9000 Family NX-OS Fabric Manager Fabric Configuration Guide*.

Note Specifying the iSLB initiator VSAN is the same as for an iSCSI initiator. See the VSAN Membership for iSCSI, page 4-cii.

To assign VSAN membership for iSLB initiators, follow these steps:

	Command	Purpose
Step 1	`switch#` **`config terminal`** `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)#` **`islb initiator ip-address 10.1.1.3`** `switch(config-islb-init)#`	Configures an iSLB initiator using its IPv4 address and enters iSLB initiator configuration submode.
Step 3	`switch(config-islb-init)#` **`vsan 3`**	Assigns the iSLB initiator node to a specified VSAN. **Note** You can assign this host to one or more VSANs.
	`switch(config-islb-init)#` **`no vsan 3`**	Removes the iSLB initiator from the specified VSAN.

Note When an iSLB initiator is configured in any other VSAN (other than VSAN 1, the default VSAN), for example VSAN 2, the initiator is automatically removed from VSAN 1. If you also want it to be present in VSAN 1, you must explicitly configure the initiator in VSAN 1.

See the "Configuring iSLB Using Device Manager" procedure on page 4-cxxxi.

Configuring Metrics for Load Balancing

You can assign a load metric to each initiator for weighted load balancing. The load calculated is based on the number of initiators on a given iSCSI interface. This feature accommodates initiators with different bandwidth requirements. For example, you could assign a higher load metric to a database server than to a web server. Weighted load balancing also accommodates initiators with different link speeds.

Also, you can configure initiator targets using the device alias or the pWWN. If you configure an IQN for an initiator target, then that name is used to identify the initiator target. Otherwise, a unique IQN is generated for the initiator target.

For more information on load balancing, see the "Load Balancing Using VRRP" section on page 4-cxliii.

Choose **IP > iSCSI iSLB** in Device Manager and set the LoadMetric field to change the load balancing metric for an iSLB initiator.

See the "Configuring iSLB Using Device Manager" procedure on page 4-cxxxi.

To configure a weight for load balancing, follow these steps:

	Command	Purpose
Step 1	`switch#` **`config terminal`** `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)#` **`islb initiator name iqn.1987-02.com.cisco.initiator`** `switch(config-iscsi-init)#`	Configures an iSLB initiator using the name of the initiator node and enters iSLB initiator configuration mode.

	Command	Purpose
Step 3	switch(config-iscsi-init)# **metric 100**	Assigns 100 as the weight metric for this iSLB initiator.
Step 4	switch(config-iscsi-init)# **no metric 100**	Reverts to the default value (1000).

Verifying iSLB Initiator Configuration

To verify the iSLB initiator configuration, use the **show islb initiator configured** command.

```
switch# show islb initiator configured
iSCSI Node name is 10.1.1.2
    Member of vsans: 10
    Node WWN is 23:02:00:0c:85:90:3e:82
    Load Balance Metric: 100
    Number of Initiator Targets: 1

    Initiator Target: test-targt
      Port WWN 01:01:01:01:02:02:02:02
      Primary PWWN VSAN 1
      Zoning support is enabled
      Trespass support is disabled
      Revert to primary support is disabled
```

Configuring iSLB Initiator Targets

You can configure initiator targets using the device alias or the pWWN. You can also optionally specify one or more of the following optional parameters:

- Secondary pWWN
- Secondary device alias
- LUN mapping
- IQN
- VSAN identifier

Note The VSAN identifier is optional if the target is online. If the target is not online, the VSAN identifier is required.

In addition, you can disable auto-zoning.

If you configure an IQN for an initiator target, then that name is used to identify the initiator target. Otherwise, a unique IQN is generated for the initiator target.

To configure iSLB initiator targets, follow these steps:

	Command	Purpose
Step 1	switch# **config terminal** switch(config)#	Enters configuration mode.
Step 2	switch(config)# **islb initiator ip-address 10.1.1.3** switch(config-islb-init)#	Configures an iSLB initiator using its IPv4 address and enters iSLB initiator configuration submode.

	Command	Purpose
Step 3	`switch(config-iscsi-islb-init)# target pwwn 26:00:01:02:03:04:05:06`	Configures the iSLB initiator target using a pWWN with auto-zoning enabled (default).
	`switch(config-iscsi-islb-init)# target pwwn 26:00:01:02:03:04:05:06 no-zone`	Configures the iSLB initiator target using a pWWN with auto-zoning disabled.
	`switch(config-iscsi-islb-init)# target device-alias SampleAlias`	Configures the iSLB initiator target using a device alias with auto-zoning enabled (default).
	`switch(config-iscsi-islb-init)# target device-alias SampleAlias fc-lun 0x1234 iscsi-lun 0x2345`	Configures the iSLB initiator target using a device alias and optional LUN mapping. **Note** The CLI interprets the LUN identifier value as a hexadecimal value whether or not the **0x** prefix is included.
	`switch(config-iscsi-islb-init)# target device-alias SampleAlias iqn-name iqn.1987-01.com.cisco.initiator`	Configures the iSLB initiator target using a device alias and an optional IQN.
	`switch(config-iscsi-islb-init)# target device-alias SampleAlias sec-device-alias SecondaryAlias`	Configures the iSLB initiator target using a device alias and an optional secondary device alias.
	`switch(config-iscsi-islb-init)# target device-alias SampleAlias sec-pwwn 26:01:02:03:04:05:06:07`	Configures the iSLB initiator target using a device alias and an optional secondary pWWN.
	`switch(config-iscsi-islb-init)# target device-alias SampleAlias vsan 10`	Configures the iSLB initiator target using a device alias and the VSAN identifier. **Note** The VSAN identifier is optional is if the target is online. If the target is not online, the VSAN identifier is required.
	`switch(config-iscsi-init)# no target pwwn 26:00:01:02:03:04:05:06`	Removes the iSLB initiator target.

To configure additional iSLB initiator targets using Device Manager, follow these steps:

Step 1 Choose **IP > iSCSI iSLB**.

You see the iSCSI iSLB dialog box (see Figure 4-32).

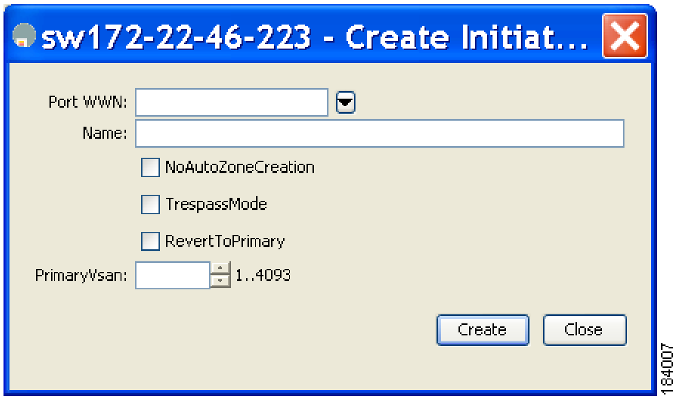
Step 2 Click on the initiator you want to add targets to and click **Edit Initiator Specific Targets**.

You see the Initiator Specific Target dialog box.

Step 3 Click **Create** to create a new initiator target.

You see the Create Initiator Specific Target dialog box (see Figure 4-34).

Figure 4-34 Create Initiator Specific Target Dialog Box



Step 4 Fill in the pWWN field with the initiator target pWWN.

Step 5 (Optional) Set the Name field to a globally unique identifier (IQN).

Step 6 (Optional) Check the **NoAutoZoneCreation** check box to disable auto-zoning (see Figure 4-33).

Step 7 (Optional) Check the **TresspassMode** check box. See the "LUN Trespass for Storage Port Failover" section on page 4-clix.

Step 8 (Optional) Check the **RevertToPrimary** check box to revert back to the primary port after an HA failover when the primary port comes back up.

Step 9 Set the PrimaryVsan to the VSAN for the iSLB initiator target.

Step 10 Click **Create** to create this iSLB initiator target.

Step 11 If CFS is enabled, select **commit** from the CFS drop-down menu.

Configuring and Activating Zones for iSLB Initiators and Initiator Targets

You can configure a zone name where the iSLB initiators and initiator targets are added. If you do not specify a zone name, the IPS manager creates one dynamically. iSLB zone sets have the following considerations:

- Auto-zoning of the initiator with the initiator targets is enabled by default.
- A zone set must be active in a VSAN for auto-zones to be created in that VSAN.
- iSLB zone set activation might fail if another zone set activation is in process or if the zoning database is locked. Retry the iSLB zone set activation if a failure occurs. To avoid this problem, only perform only one zoning related operation (normal zones, IVR zones, or iSLB zones) at a time.
- Auto-zones are created when the zone set is activated and there has been at least one change in the zoneset. The activation has no effect if only the auto-zones have changed.

Caution If IVR and iSLB are enabled in the same fabric, at least one switch in the fabric must have both features enabled. Any zoning related configuration or activation operation (for normal zones, IVR zones, or iSLB zones) must be performed on this switch. Otherwise, traffic might be disrupted in the fabric.

To configure the iSLB initiator optional auto-zone name and activate the zone set, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal`	Enters configuration mode.
Step 2	`switch(config)# islb initiator ip-address 10.1.1.3` `switch(config-islb-init)#`	Configures an iSLB initiator using its IPv4 address and enters iSLB initiator configuration submode.
Step 3	`switch(config-islb-init)# zonename IslbZone`	Specifies the zone name where the initiators and the initiator targets are added (optional).
	`switch(config-islb-init)# no zonename IslbZone`	Removes the initiators and initiator targets from the zone and adds them to a dynamically created zone (default).
Step 4	`switch(config-islb-init)# exit`	Returns to configuration mode.
Step 5	`switch(config)# islb zoneset activate`	Activates zoning for the iSLB initiators and initiator targets with zoning enabled and creates auto-zones if no zone names are configured. **Note** This step is not required if CFS is enabled. CFS automatically activates the zone when the configuration changes are committed.

Choose **IP > iSCSI iSLB** in Device Manager and set the autoZoneName field to change the auto zone name for an iSLB initiator.

See the "Configuring iSLB Using Device Manager" procedure on page 4-cxxxi.

Verifying iSLB Zoning Configuration

The following example shows the **show zoneset active** command output when the dynamically generated zone name is used:

```
switch# show zoneset active
zoneset name zoneset-1 vsan 1
  zone name ips_zone_5d9603bcff68008a6fc5862a6670ca09 vsan 1
  * fcid 0x010009 [ip-address 10.1.1.3]
    pwwn 22:00:00:04:cf:75:28:4d
    pwwn 22:00:00:04:cf:75:ed:53
    pwwn 22:00:00:04:cf:75:21:d5
    pwwn 22:00:00:04:cf:75:ee:59
.
.
.
```

The following example shows the **show zoneset active** command output when the configured zone name IslbZone is used:

```
switch# show zoneset active
zoneset name zoneset-1 vsan 1
  zone name ips_zone_IslbZone vsan 1
    ip-address 10.1.1.3
    pwwn 22:00:00:04:cf:75:28:4d
    pwwn 22:00:00:04:cf:75:ed:53
    pwwn 22:00:00:04:cf:75:21:d5
    pwwn 22:00:00:04:cf:75:ee:59
.
.
.
```

Configuring iSLB Session Authentication

The Fibre Channel module with IPS ports and MPS-14/2 module support the iSLB authentication mechanism to authenticate iSLB hosts that request access to storage. By default, the Fibre Channel module with IPS ports and MPS-14/2 module allow CHAP or None authentication of iSCSI initiators. If authentication is always used, you must configure the switch to allow only CHAP authentication.

For CHAP user name or secret validation you can use any method supported and allowed by the Cisco MDS AAA infrastructure (see the *Cisco Fabric Manager Security Configuration GuideCisco MDS 9000 Family NX-OS Security Configuration Guide* for more information). AAA authentication supports RADIUS, TACACS+, or a local authentication device.

Note Specifying the iSLB session authentication is the same as for iSCSI. See the "iSCSI Session Authentication" section on page 4-cx.

Restricting iSLB Initiator Authentication

By default, the iSLB initiator can use any user name in the RADIUS or local AAA database in authenticating itself to the Fibre Channel module with IPS ports or MPS-14/2 module (the CHAP user name is independent of the iSLB initiator name). The Fibre Channel module with IPS ports or MPS-14/2 module allows the initiator to log in as long as it provides a correct response to the CHAP challenge sent by the switch. This can be a problem if one CHAP user name and password have been compromised.

To restrict an initiator to use a specific user name for CHAP authentication, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# islb initiator name iqn.1987-02.com.cisco.init` `switch(config-islb-init)#`	Configures an iSLB initiator using the IQN of the initiator node and enters iSLB initiator configuration mode.
Step 3	`switch(config-islb-init)# username user1`	Restricts the initiator iqn.1987-02.com.cisco.init to only authenticate using user1 as its CHAP user name. **Note** Be sure to define user1 as an iSCSI user in the local AAA database or the RADIUS server.

Choose **IP > iSCSI iSLB** in Device Manager and set the AuthName field to restrict an initiator to use a specific user name for CHAP authentication.

See the "Configuring iSLB Using Device Manager" procedure on page 4-cxxxi.

Mutual CHAP Authentication

In addition to the Fibre Channel module with IPS ports and MPS-14/2 module authentication of the iSLB initiator, the Fibre Channel module with IPS ports and MPS-14/2 module also support a mechanism for the iSLB initiator to authenticate the Cisco MDS switch's initiator target during the iSCSI login phase. This authentication requires the user to configure a user name and password for the switch to present to the iSLB initiator. The provided password is used to calculate a CHAP response to a CHAP challenge sent to the IPS port by the initiator.

To configure a per-initiator user name and password used by the switch to authenticate itself to an initiator, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# islb initiator name iqn.1987-02.com.cisco.initiator` `switch(config-islb-init)#`	Configures an iSLB initiator using the name of the initiator node and enters iSLB initiator configuration mode.
Step 3	`switch(config-islb-init)# mutual-chap username testuser password dcba12LKJ`	Configures the switch user account (testuser) along with a password (dcba12LKJ) specified in clear text (default). The password is limited to 128 characters.
	`switch(config-islb-init)# mutual-chap username testuser password 7!@*asdsfsdfjh!@df`	Configures the switch user account (testuser) along with the encrypted password specified by 7 (!@*asdsfsdfjh!@df).
Step 4	`switch(config-iscsi-init)# no mutual-chap username testuser`	Removes the switch authentication configuration.

Choose **IP > iSCSI iSLB** in Device Manager and set the Target Username and Target Password fields to configure a per-initiator user name and password used by the switch to authenticate itself to an initiator.

See the "Configuring iSLB Using Device Manager" procedure on page 4-cxxxi.

Verifying iSLB Authentication Configuration

Use the **show running-config** and the **show iscsi global** (see Example 4-6) commands to display the global configuration. Use the **show running-config** and the **show islb initiator configured** (see Example 4-14) commands to display the initiator specific configuration.

To verify the iSLB user name and mutual CHAP configuration, use the **show islb initiator configured** command:

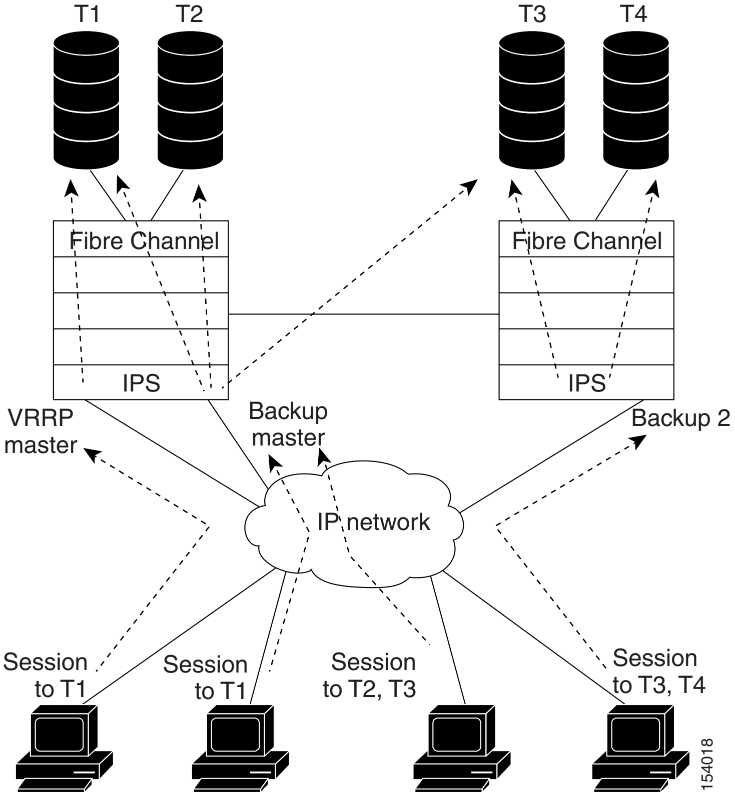
```
switch# show islb initiator configured
iSCSI Node name is 10.1.1.3
  Member of vsans: 3
  User Name for login authentication: user1
  User Name for Mutual CHAP: testuser
  Load Balance Metric: 1000  Number of Initiator Targets: 1
  Number of Initiator Targets: 1

  Initiator Target: iqn.1987-05.com.cisco:05.ips-hac4
    Port WWN 50:06:04:82:ca:e1:26:8d
    Zoning Enabled
    No. of LU mapping: 3
      iSCSI LUN: 0x0001, FC LUN: 0x0001
      iSCSI LUN: 0x0002, FC LUN: 0x0002
      iSCSI LUN: 0x0003, FC LUN: 0x0003
```

Load Balancing Using VRRP

You can configure Virtual Router Redundancy Protocol (VRRP) load balancing for iSLB. The host is configured with a VRRP address as the portal address. When the VRRP master port receives the first iSCSI session from an initiator, it assigns a backup port to serve that particular host. The information is synchronized to all switches through CFS if recovery is needed when a master port fails. The initiator gets a temporary redirect iSCSI login response. The host then logs in to the backup port at its physical IP address. All iSCSI interfaces in a VRRP group that has load balancing enabled must have the same interface VSAN, authentication, proxy initiator mode, and forwarding mode.

You can configure Virtual Router Redundancy Protocol (VRRP) load balancing for iSLB. Figure 4-35 shows an example of load balancing using iSLB.

Figure 4-35 iSLB Initiator Load Balancing Example



The host is configured with a VRRP address as the portal address. When the VRRP master port receives the first iSCSI session from an initiator, it assigns a backup port to serve that particular host. This information is synchronized to all switches through CFS if recovery is needed when a master port fails. The initiator gets a temporary redirect iSCSI login response. The host then logs in to the backup port at its physical IP address. If the backup port goes down, the host will revert to the master port. The master port knows through CFS that the backup port has gone down and redirects the host to another backup port.

Note If an Ethernet port channel is configured between the Fibre Channel module with IPS ports and an Ethernet switch, the load balancing policy on the Ethernet switch must be based on source/destination IP address only, not port numbers, for load balancing with VRRP to operate correctly.

Note An initiator can also be redirected to the physical IP address of the master interface.

Tip iSLB VRRP load balancing is based on the number of iSLB initiators and not number of sessions. Any iSLB initiator that has more targets configured than the other iSLB initiators (resulting in more sessions) should be configured with a higher load metric. For example, you can increase the load metric of the iSLB initiator with more targets to 3000 from the default value of 1000.

Caution A Gigabit Ethernet interface configured for iSLB can only be in one VRRP group because redirected sessions do not carry information about the VRRP IP address or group. This restriction allows the slave backup port to uniquely identify the VRRP group to which it belongs.

Changing iSCSI Interface Parameters and the Impact on Load Balancing

All iSCSI interfaces in a VRRP group that has load balancing enabled must have the same interface VSAN, authentication, proxy initiator mode, and forwarding mode. When you need to change any of these parameters for the iSCSI interfaces in a VRRP group, you must do so one interface at a time. During the transition time when the parameter is changed on some interfaces in the VRRP group and not the others, the master port does not redirect new initiators and instead handles them locally.

Caution Changing the VSAN, proxy initiator, authentication, and forwarding mode for iSCSI interfaces in a VRRP group can cause sessions to go down multiple times.

VRRP Load Balancing Algorithm for Selecting Gigabit Ethernet Interfaces

When the VRRP master receives an iSCSI session request from an initiator, it first checks for an existing mapping to one of the interfaces in that VRRP group. If such a mapping exists, the VRRP master redirects the initiator to that interface. If no such mapping exists, the VRRP master selects the least loaded interface and updates the selected interface's load with the initiator's iSLB metric (weight).

Note The VRRP master interface is treated specially and it needs to take a lower load compared to the other interfaces. This is to account for the redirection work performed by the master interface for every session. A new initiator is assigned to the master interface only if the following is true for every other interface:

VRRP backup interface load > [2 * VRRP master interface load + 1]

Example 4-17 and Example 4-18 are based on the following configurations:

- GigabitEthernet2/1.441 is the VRRP master interface for Switch1.
- GigabitEthernet2/2.441 is the VRRP backup interface for Switch1.
- GigabitEthernet1/1.441 is the VRRP backup interface for Switch2.
- GigabitEthernet1/2.441 is the VRRP backup interface for Switch2.

Example 4-17 Load Distribution with the Default Metric

The follow example output shows the initial load distribution for three initiators with the default load metric value:

```
switch# show islb vrrp summary
.
.
.
--------------------------------------------------------------------------------
VR Id   VRRP IP        Switch WWN                Ifindex                 Load
--------------------------------------------------------------------------------
M 1     10.10.122.115  20:00:00:0b:5f:3c:01:80   GigabitEthernet2/1.441  0
  1     10.10.122.115  20:00:00:0b:5f:3c:01:80   GigabitEthernet2/2.441  1000
  1     10.10.122.115  20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/1.441  1000
  1     10.10.122.115  20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/2.441  1000
```

```
                -- Initiator To Interface Assignment --
--------------------------------------------------------------------------------
Initiator                VR Id VRRP IP      Switch WWN              Ifindex
--------------------------------------------------------------------------------
iqn.cisco.test-linux.init0 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/2.441
iqn.cisco.test-linux.init1 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/1.441
iqn.cisco.test-linux.init  1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/2.441
```

The following example output shows load distribution for four initiators. The interface load metric value for the master interface changed from 0 to 1000.

```
switch# show islb vrrp summary
.
.
.
--------------------------------------------------------------------------------
VVR Id   VRRP IP        Switch WWN                Ifindex                 Load
--------------------------------------------------------------------------------
M 1     10.10.122.115   20:00:00:0b:5f:3c:01:80   GigabitEthernet2/1.441  1000
  1     10.10.122.115   20:00:00:0b:5f:3c:01:80   GigabitEthernet2/2.441  1000
  1     10.10.122.115   20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/1.441  1000
  1     10.10.122.115   20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/2.441  1000
                 -- Initiator To Interface Assignment --
--------------------------------------------------------------------------------
Initiator                VR Id VRRP IP      Switch WWN              Ifindex
--------------------------------------------------------------------------------
iqn.cisco.test-linux.init0 1 10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/2.441
iqn.cisco.test-linux.init1 1 10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/1.441
iqn.cisco.test-linux.init2 1 10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/2.441
iqn.cisco.test-linux.init3 1 10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/1.441
```

The following example output shows load distribution for nine initiators. The interface load metric values for the backup interfaces have changed.

```
switch# show islb vrrp summary
.
.
.
--------------------------------------------------------------------------------
VVR Id   VRRP IP        Switch WWN                Ifindex                 Load
--------------------------------------------------------------------------------
M 1      10.10.122.115  20:00:00:0b:5f:3c:01:80   GigabitEthernet2/1.441  1000
  1      10.10.122.115  20:00:00:0b:5f:3c:01:80   GigabitEthernet2/2.441  3000
  1      10.10.122.115  20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/1.441  3000
  1      10.10.122.115  20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/2.441  2000
                    -- Initiator To Interface Assignment --
--------------------------------------------------------------------------------
Initiator                VR Id VRRP IP      Switch WWN              Ifindex
--------------------------------------------------------------------------------
iqn.cisco.test-linux.init0 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/2.441
iqn.cisco.test-linux.init1 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/1.441
iqn.cisco.test-linux.init2 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/2.441
iqn.cisco.test-linux.init3 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/1.441
iqn.cisco.test-linux.init4 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/2.441
iqn.cisco.test-linux.init5 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/1.441
iqn.cisco.test-linux.init6 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/2.441
iqn.cisco.test-linux.init7 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/2.441
iqn.cisco.test-linux.init8 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/1.441
```

Example 4-18 Load Distribution with the Metric Set to 3000 on One Initiator

The following example output shows the initial load distribution for three initiators with one initiator having load metric of 3000 and the remaining initiator with the default metric value:

```
switch# show islb vrrp summary
.
.
.
--------------------------------------------------------------------------------
VVR Id   VRRP IP        Switch WWN                Ifindex                 Load
--------------------------------------------------------------------------------
M 1      10.10.122.115  20:00:00:0b:5f:3c:01:80   GigabitEthernet2/1.441  0
  1      10.10.122.115  20:00:00:0b:5f:3c:01:80   GigabitEthernet2/2.441  1000
  1      10.10.122.115  20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/1.441  3000
  1      10.10.122.115  20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/2.441  1000
                    -- Initiator To Interface Assignment --
--------------------------------------------------------------------------------
Initiator                VR Id VRRP IP      Switch WWN              Ifindex
--------------------------------------------------------------------------------
iqn.cisco.test-linux.init0 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/1.441
iqn.cisco.test-linux.init1 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/2.441
iqn.cisco.test-linux.init2 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/2.441
```

The follow example output shows load distribution for four initiators. The interface load metric value for the master interface changed from 0 to 1000.

```
switch# show islb vrrp summary
.
.
.
--------------------------------------------------------------------------------
VVR Id   VRRP IP        Switch WWN                Ifindex                 Load
--------------------------------------------------------------------------------
M 1      10.10.122.115  20:00:00:0b:5f:3c:01:80   GigabitEthernet2/1.441  1000
  1      10.10.122.115  20:00:00:0b:5f:3c:01:80   GigabitEthernet2/2.441  3000
  1      10.10.122.115  20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/1.441  1000
  1      10.10.122.115  20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/2.441  1000
                     -- Initiator To Interface Assignment --
--------------------------------------------------------------------------------
Initiator                VR Id VRRP IP      Switch WWN              Ifindex
--------------------------------------------------------------------------------
iqn.cisco.test-linux.init0 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/2.441
iqn.cisco.test-linux.init1 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/2.441
iqn.cisco.test-linux.init2 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/1.441
iqn.cisco.test-linux.init3 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/1.441
```

The following example output shows load distribution for nine initiators. The interface load metric values for the backup interfaces have changed.

```
switch# show islb vrrp summary
.
.
.
--------------------------------------------------------------------------------
VVR Id   VRRP IP        Switch WWN                Ifindex                 Load
--------------------------------------------------------------------------------
M 1      10.10.122.115  20:00:00:0b:5f:3c:01:80   GigabitEthernet2/1.441  2000
  1      10.10.122.115  20:00:00:0b:5f:3c:01:80   GigabitEthernet2/2.441  3000
  1      10.10.122.115  20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/1.441  3000
  1      10.10.122.115  20:00:00:0c:ce:5c:5b:c0   GigabitEthernet1/2.441  3000
                     -- Initiator To Interface Assignment --
--------------------------------------------------------------------------------
Initiator                VR Id VRRP IP      Switch WWN              Ifindex
--------------------------------------------------------------------------------
iqn.cisco.test-linux.init0 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/2.441
iqn.cisco.test-linux.init1 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/1.441
iqn.cisco.test-linux.init2 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/2.441
iqn.cisco.test-linux.init3 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/1.441
iqn.cisco.test-linux.init4 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/1.441
iqn.cisco.test-linux.init5 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/2.441
iqn.cisco.test-linux.init6 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/1.441
iqn.cisco.test-linux.init7 1  10.10.122.115 20:00:00:0c:ce:5c:5b:c0 GigabitEthernet1/2.441
iqn.cisco.test-linux.init8 1  10.10.122.115 20:00:00:0b:5f:3c:01:80 GigabitEthernet2/1.441
```

Configuring Load Balancing Using VRRP

You must first configure VRRP on the Gigabit Ethernet interfaces on the switch that connect to the IP network before configuring VRRP for iSLB. For information on how to configure VRRP on a Gigabit Ethernet interface, see the "Virtual Router Redundancy Protocol" section on page 5-ccxxii.

To configure VRRP load balancing using Device Manager, follow these steps:

Step 1 Choose **IP > iSCSI iSLB**.

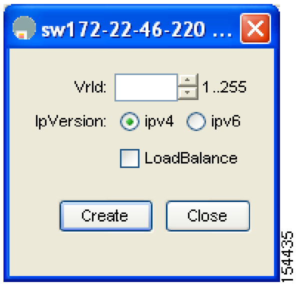
You see the iSCSI iSLB dialog box (see Figure 4-32).

Step 2 Click the **VRRP** tab.

Step 3 Click **Create** to configure VRRP load balancing for iSLB initiators.

You see the Create iSCSI iSLB VRRP dialog box (see Figure 4-36).

Figure 4-36 Create iSCSI iSLB VRRP Dialog Box



Step 4 Set the Vrld to the VRRP group number.

Step 5 Select either **ipv4** or **ipv6** and check the **LoadBalance** check box.

Step 6 Click **Create** to enable load balancing.

Step 7 If CFS is enabled, select **commit** from the CFS drop-down menu.

Enabling VRRP for Load Balancing

To enable or disable VRRP for iSLB, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# islb vrrp 10 load-balance`	Enables iSLB VRRP for IPv4 VR group 10.
Step 3	`switch(config)# no islb vrrp 10 load-balance`	Disables iSLB VRRP for IPv4 VR group 10.

	Command	Purpose
Step 4	`switch(config)# islb vrrp ipv6 20 load-balance`	Enables iSLB VRRP for IPv6 VR group 20.
Step 5	`switch(config)# no islb vrrp ipv6 20 load-balance`	Disables iSLB VRRP for IPv6 VR group 20.

Verifying iSLB VRRP Load Balancing Configuration

To verify the iSLB VRRP load balancing configuration for IPv4, use the **show vrrp vr** command:

```
switch# show vrrp vr 1
      Interface  VR IpVersion Pri   Time Pre State   VR IP addr
---------------------------------------------------------------------------
        GigE1/5   1   IPv4     100    1 s     master  10.10.10.1
        GigE1/6   1   IPv4     100    1 s     master  10.10.10.1
```

To verify the iSLB VRRP load balancing configuration for IPv6, use the **show vrrp ipv6 vr** command:

```
switch# show vrrp ipv6 vr 1
      Interface  VR IpVersion Pri   Time Pre State   VR IP addr
--------------------------------------------------------------------
        GigE6/2   1   IPv6     100  100cs     master  5000:1::100
       PortCh 4   1   IPv6     100  100cs     master  5000:1::100
```

Displaying iSLB VRRP Information

Use the **show islb vrrp summary vr** command to display VRRP load-balancing information:

```
switch# show islb vrrp summary vr 30

                         -- Groups For Load Balance --
------------------------------------------------------------------------------------------
VR Id             VRRP Address Type             Configured Status
------------------------------------------------------------------------------------------
30                       IPv4                           Enabled

                       -- Interfaces For Load Balance --
------------------------------------------------------------------------------------------
 VR Id      VRRP IP         Switch WWN                 Ifindex           Load
------------------------------------------------------------------------------------------
  30   192.168.30.40 20:00:00:0d:ec:02:cb:00      GigabitEthernet3/1      2000
  30   192.168.30.40 20:00:00:0d:ec:02:cb:00      GigabitEthernet3/2      2000
  30   192.168.30.40 20:00:00:0d:ec:0c:6b:c0      GigabitEthernet4/1      2000
M 30   192.168.30.40 20:00:00:0d:ec:0c:6b:c0      GigabitEthernet4/2      1000
```

iSLB Configuration Distribution Using CFS

You can distribute the configuration for iSLB initiators and initiator targets on an MDS switch. This feature lets you synchronize the iSLB configuration across the fabric from the console of a single MDS switch. The iSCSI initiator idle timeout, global authentication, and iSCSI dynamic initiator mode parameters are also distributed. CFS distribution is disabled by default.

Configuration for iSLB initiators and initiator targets on an MDS switch can be distributed using the Cisco Fabric Services (CFS). This feature allows you to synchronize the iSLB configuration across the fabric from the console of a single MDS switch. The iSCSI initiator idle timeout, iSCSI dynamic initiator mode, and global authentication parameters are also distributed. CFS distribution is disabled by default (see the *Cisco Fabric Manager System Management Configuration Guide* and *Cisco MDS 9000 Family NX-OS System Management Configuration Guide* for more information).

After enabling the distribution, the first configuration starts an implicit session. All server configuration changes entered thereafter are stored in a temporary database and applied to all switches in the fabric (including the originating one) when you explicitly commit the database.

When CFS is enabled for iSLB, the first iSLB configuration operation starts a CFS session and locks the iSLB configuration in the fabric. The configuration changes are applied to the pending configuration database. When you make the changes to the fabric, the pending configuration is distributed to all the switches in the fabric. Each switch then validates the configuration. This check ensures the following:

- The VSANs assigned to the iSLB initiators are configured on all the switches.
- The static WWNs configured for the iSLB initiators are unique and available on all the switches.
- The iSLB initiator node names do not conflict with the iSCSI initiators on all the switches.

After the check completes successfully, all the switches commit the pending configuration to the running configuration. If any check fails, the entire commit fails.

Note iSLB is only fully supported when CFS is enabled. Using iSLB auto-zoning without enabling CFS mode may cause traffic disruption when any zone set is activated.

Note CFS does not distribute non-iSLB initiator configurations or import Fibre Channel target settings.

Non-iSLB virtual targets will continue to support advertised interfaces option.

Tip The pending changes are only available in the volatile directory and are discarded if the switch is restarted.

Distributing iSLB Configuration Using CFS

This section contains the following:

- Enabling iSLB Configuration Distribution, page 4-cli
- Locking the Fabric, page 4-cli
- Committing Changes to the Fabric, page 4-clii
- Discarding Pending Changes, page 4-clii
- Clearing a Fabric Lock, page 4-cliii
- CFS Merge Process, page 4-cliii
- Displaying Pending iSLB Configuration Changes, page 4-cliii
- Displaying iSLB CFS Status, page 4-cliv
- Displaying iSLB CFS Distribution Session Status, page 4-cliv
- Displaying iSLB CFS Merge Status, page 4-cliv

- iSLB CFS Merge Status Conflicts, page 4-cliv

Enabling iSLB Configuration Distribution

To enable CFS distribution of the iSLB configuration, follow these steps:

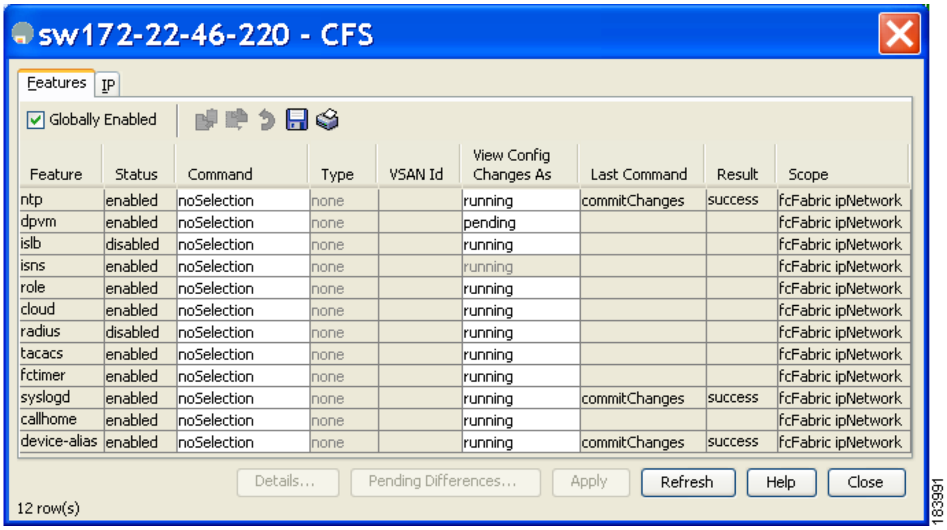
	Command	Purpose
Step 1	`switch# config terminal`	Enters configuration mode.
Step 2	`switch(config)# islb distribute`	Enables iSLB configuration distribution.
	`switch(config)# no islb distribute`	Disables (default) iSLB configuration distribution.

To enable CFS distribution of the iSLB configuration using Device Manager, follow these steps:

Step 1 Choose **Admin > CFS**.

You see the CFS dialog box (see Figure 4-37).

Figure 4-37 Enabling CFS in Device Manager



Feature	Status	Command	Type	VSAN Id	View Config Changes As	Last Command	Result	Scope
ntp	enabled	noSelection	none		running	commitChanges	success	fcFabric ipNetwork
dpvm	enabled	noSelection	none		pending			fcFabric ipNetwork
islb	disabled	noSelection	none		running			fcFabric ipNetwork
isns	enabled	noSelection	none		running			fcFabric ipNetwork
role	enabled	noSelection	none		running			fcFabric ipNetwork
cloud	enabled	noSelection	none		running			fcFabric ipNetwork
radius	disabled	noSelection	none		running			fcFabric ipNetwork
tacacs	enabled	noSelection	none		running			fcFabric ipNetwork
fctimer	enabled	noSelection	none		running			fcFabric ipNetwork
syslogd	enabled	noSelection	none		running	commitChanges	success	fcFabric ipNetwork
callhome	enabled	noSelection	none		running			fcFabric ipNetwork
device-alias	enabled	noSelection	none		running	commitChanges	success	fcFabric ipNetwork

Step 2 Set the Command field to **enable** for the iSLB feature.

Step 3 Click **Apply** to save this change.

Locking the Fabric

The first action that modifies the existing configuration creates the pending configuration and locks the feature in the fabric. Once you lock the fabric, the following conditions apply:

- No other user can make any configuration changes to this feature.
- A pending configuration is created by copying the active configuration. Modifications from this point on are made to the pending configuration and remain there until you commit the changes to the active configuration (and other switches in the fabric) or discard them.

Note iSCSI configuration changes are not allowed when an iSLB CFS session is active.

Committing Changes to the Fabric

To apply the pending iSLB configuration changes to the active configuration and to other MDS switches in the fabric, you must commit the changes. The pending configuration changes are distributed and, on a successful commit, the configuration changes are applied to the active configuration in the MDS switches throughout the fabric, the automatic zones are activated, and the fabric lock is released.

To commit iSLB configuration changes to other MDS switches in the fabric, activate iSLB automatic zones, and release the fabric lock, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal`	Enters configuration mode.
Step 2	`switch(config)# islb commit`	Commits the iSLB configuration distribution, activates iSLB automatic zones, and releases the fabric lock.

To commit iSLB configuration changes to other MDS switches in the fabric, activate iSLB automatic zones, and release the fabric lock using Device Manager, follow these steps:

Step 1 Choose **Admin > CFS**.

You see the CFS Configuration dialog box (see Figure 4-37).

Step 2 Set the Command field to **commit** for the iSLB feature.

Step 3 Click **Apply** to save this change.

Discarding Pending Changes

At any time, you can discard the pending changes to the iSLB configuration and release the fabric lock. This action has no affect on the active configuration on any switch in the fabric.

To discard the pending iSLB configuration changes and release the fabric lock, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal`	Enters configuration mode.
Step 2	`switch(config)# islb abort`	Commits the iSLB configuration distribution.

To discard the pending iSLB configuration changes and release the fabric lock using Device Manager, follow these steps:

Step 1 Choose **Admin > CFS**.

You see the CFS Configuration dialog box (see Figure 4-37).

Step 2 Set the Command field to **abort** for the iSLB feature.

Step 3 Click **Apply** to save this change.

Clearing a Fabric Lock

If you have performed an iSLB configuration task and have not released the lock by either committing or discarding the changes, an administrator can release the lock from any switch in the fabric. If the administrator performs this task, your pending changes are discarded and the fabric lock is released.

Note The pending changes are only available in the volatile directory and are discarded if the switch is restarted.

To release a fabric lock, issue the **clear islb session** command in EXEC mode using a login ID that has administrative privileges:

```
switch# clear islb session
```

To release a fabric lock using Device Manager, follow these steps:

Step 1 Choose **Admin > CFS**.

You see the CFS Configuration dialog box (see Figure 4-37).

Step 2 Set the Command field to **clear** for the iSLB feature.

Step 3 Click **Apply** to save this change.

CFS Merge Process

When two fabrics merge, CFS attempts to merge the iSLB configuration from both the fabrics. A designated switch (called the *dominant switch*) in one fabric sends its iSLB configuration to a designated switch (called the *subordinate switch*) in the other fabric. The subordinate switch compares its running configuration to the received configuration for any conflicts. If no conflicts are detected, it merges the two configurations and sends it to all the switches in both the fabrics. Each switch then validates the configuration. This check ensures the following:

- VSANs assigned to the iSLB initiators are configured on all the switches.
- The static WWNs configured for the iSLB initiators are unique and available on all the switches.
- The iSLB initiator node names have no conflicts with iSCSI initiators on all the switches.

If this check completes successfully, the subordinate switch directs all the switches to commit the merged configuration to running configuration. If any check fails, the merge fails.

The **show islb merge status** command displays the exact reason for the failure. The first successful commit request after a merge failure takes the fabric out of the merge failure state.

Displaying Pending iSLB Configuration Changes

You can display the pending configuration changes using the **show islb pending** command:

```
switch# show islb pending
iscsi initiator idle-timeout 10
islb initiator ip-address 10.1.1.1
static pWWN 23:01:00:0c:85:90:3e:82
static pWWN 23:06:00:0c:85:90:3e:82
username test1
islb initiator ip-address 10.1.1.2
static nWWN 23:02:00:0c:85:90:3e:82
```

You can display the differences between the pending configuration and the current configuration using the **show islb pending-diff** command:

```
switch# show islb pending-diff
+iscsi initiator idle-timeout 10
islb initiator ip-address 10.1.1.1
+ static pWWN 23:06:00:0c:85:90:3e:82
+islb initiator ip-address 10.1.1.2
+ static nWWN 23:02:00:0c:85:90:3e:82
```

Displaying iSLB CFS Status

You can display the iSLB CFS status using the **show islb session status** command:

```
switch# show islb status
iSLB Distribute is enabled
iSLB CFS Session exists
```

Displaying iSLB CFS Distribution Session Status

You can display the status of the iSLB CFS distribution session using the **show islb cfs-session status** command:

```
switch# show islb cfs-session status
last action               : fabric distribute enable
last action result        : success
last action failure cause : success
```

Displaying iSLB CFS Merge Status

You can display the iSLB CFS merge status using the **show islb merge status** command:

```
switch# show islb merge status
Merge Status: Success
```

iSLB CFS Merge Status Conflicts

Merge conflicts may occur. User intervention is required for the following merge conflicts:

- The iSCSI global authentication or iSCSI initiator idle timeout parameters are not configured the same in the two fabrics.
- The same iSLB initiator is configured differently in the two fabrics.
- An iSLB initiator in one fabric has the same name as an iSCSI initiator in the other fabric.
- Duplicate pWWN/nWWN configuration is detected in the two fabric. For example, a pWWN/nWWN configured for an iSLB initiator on one fabric is configured for an iSCSI initiator or a different iSLB initiator in the other fabric.
- A VSAN configured for an iSLB initiator in one fabric does not exist in the other fabric.

Tip Check the syslog for details on merge conflicts.

User intervention is not required when the same iSLB initiator has a different set of non-conflicting initiator targets. The merged configuration is the union of all the initiator targets.

iSCSI High Availability

The following high availability features are available for iSCSI configurations:

- Transparent Target Failover, page 4-clv
- Multiple IPS Ports Connected to the Same IP Network, page 4-clx
- VRRP-Based High Availability, page 4-clx
- Ethernet Port Channel-Based High Availability, page 4-clxi

Transparent Target Failover

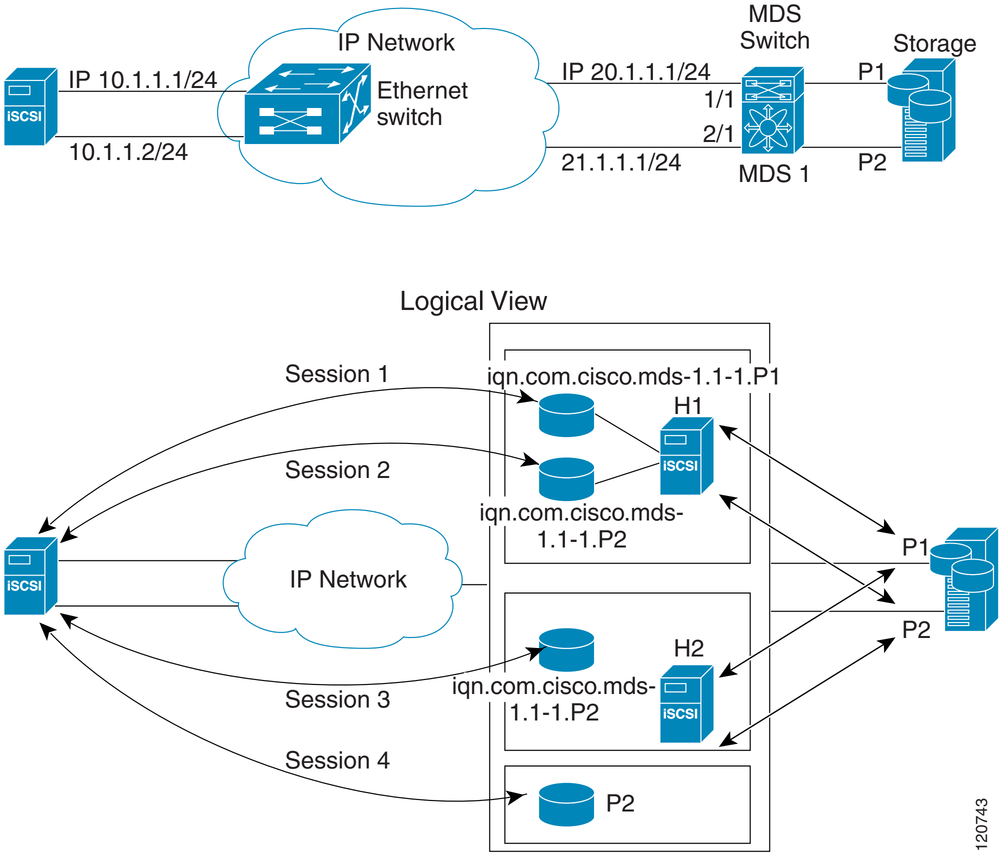
The following high-availability features are available for iSCSI configurations:

- iSCSI high availability with host running multi-path software—In this topology, you have recovery from failure of any of the components. The host multi-path software takes care of load balancing or failover across the different paths to access the storage.
- iSCSI high availability with host not having multi-path software—Without multi-path software, the host does not have knowledge of the multiple paths to the same storage.

iSCSI High Availability with Host Running Multipath Software

Figure 4-38 shows the physical and logical topology for an iSCSI HA solution for hosts running multi-path software. In this scenario, the host has four iSCSI sessions. There are two iSCSI sessions from each host NIC to the two IPS ports.

Figure 4-38 Host Running Multipath Software


IP Network
Ethernet switch
MDS Switch
Storage
IP 10.1.1.1/24
iSCSI
10.1.1.2/24
IP 20.1.1.1/24
1/1
2/1
21.1.1.1/24
MDS 1
P1
P2
Logical View
Session 1
iqn.com.cisco.mds-1.1-1.P1
H1
iSCSI
Session 2
iqn.com.cisco.mds-1.1-1.P2
iSCSI
IP Network
P1
P2
H2
iSCSI
Session 3
iqn.com.cisco.mds-1.1-1.P2
Session 4
P2
120743

Each IPS ports is exporting the same two Fibre Channel target ports of the storage but as different iSCSI target names if you use dynamic iSCSI targets). So the two IPS ports are exporting a total of four iSCSI target devices. These four iSCSI targets map the same two ports of the Fibre Channel target.

The iSCSI host uses NIC-1 to connect to IPS port 1 and NIC-2 to connect to IPS port 2. Each IPS port exports two iSCSI targets, so the iSCSI host creates four iSCSI sessions.

If the iSCSI host NIC-1 fails (see Figure 4-38 for the physical view), then sessions 1 and 2 fail but we still have sessions 3 and 4.

If the IPS port 1 fails, the iSCSI host cannot connect to the IPS port, and sessions 1 and 2 fail. But sessions 3 and 4 are still available.

If the storage port 1 fails, then the IPS ports will terminate sessions 1 and 3 (put iSCSI virtual target iqn.com.cisco.mds-5.1-2.p1 and iqn-com.cisco.mds-5.1-1.p1 in offline state). But sessions 2 and 4 are still available.

In this topology, you have recovery from failure of any of the components. The host multi-path software takes care of load-balancing or failover across the different paths to access the storage.

iSCSI HA with Host Not Having Any Multipath Software

The above topology will not work if the host does not have multi-path software because the host has multiple sessions to the same storage. Without multi-path software the host does not have knowledge of the multiple paths to the same storage.

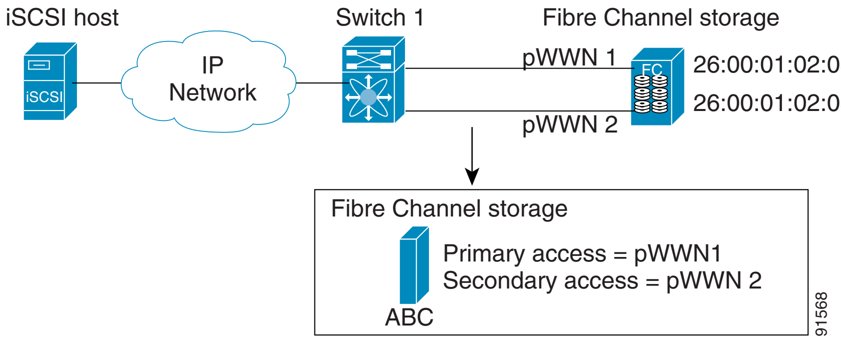
IP storage has two additional features that provide an HA solution in this scenario.

- IPS ports support the VRRP feature (see "Configuring VRRP for IPStorage Interfaces" section on page 6-ccxlv) to provide failover for IPS ports.

- IPS has transparent Fibre Channel target failover for iSCSI static virtual targets.

Statically imported iSCSI targets have an additional option to provide a secondary pWWN for the Fibre Channel target. This can be used when the physical Fibre Channel target is configured to have an LU visible across redundant ports. When the active port fails, the secondary port becomes active and the iSCSI session switches to use the new active port (see Figure 4-39).

Figure 4-39 Static Target Importing Through Two Fibre Channel Ports



In Figure 4-39, you can create an iSCSI virtual target that is mapped to both pWWN1 and pWWN2 to provide redundant access to the Fibre Channel targets.

The failover to a secondary port is done transparently by the IPS port without impacting the iSCSI session from the host. All outstanding I/Os are terminated with a check condition status when the primary port fails. New I/Os received during the failover are not completed and receive a busy status.

Tip If you use LUN mapping, you can define a different secondary Fibre Channel LUN if the LU number is different.

Enable the optional **revert-primary-port** option to direct the IPS port to switch back to the primary port when the primary port is up again. If this option is disabled (default) and the primary port is up again after a switchover, the old sessions will remain with the secondary port and do not switch back to the primary port. However, any new session will use the primary port. This is the only situation when both the primary and secondary ports are used at the same time.

To create a static iSCSI virtual target, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi virtual-target name iqn.1987-02.com.cisco.initiator`	Creates the iSCSI target name iqn.1987-02.com.cisco.initiator.

	Command	Purpose
Step 3	`switch(config-iscsi-tgt)# pwwn 26:00:01:02:03:04:05:06`	Configures the primary port for this virtual target.
	`switch(config-iscsi-tgt)# pwwn 26:00:01:02:03:04:05:06 secondary-pwwn 26:00:01:02:03:10:11:12`	Configures the primary and secondary ports for this virtual target.
	`switch(config-iscsi-tgt)# pwwn 26:00:01:02:03:04:05:06 fc-lun 0x1 iscsi-lun 0x0 sec-lun 0x3`	Configures the primary port for this virtual target with LUN mapping and different LUN on the secondary Fibre Channel port. **Note** The CLI interprets the LUN identifier value as a hexadecimal value whether or not the **0x** prefix is included.
	`switch(config-iscsi-tgt)# no pwwn 26:00:01:02:03:04:05:06`	Removes the primary port, secondary port, and LUN mapping configuration for this virtual target.
Step 4	`switch(config-iscsi-tgt)# revert-primary-port`	Configures the session failover redundancy for this virtual-target to switch all sessions back to primary port when the primary port comes back up.
Step 5	`switch(config-iscsi-tgt)# no revert-primary-port`	Directs the switch to continue using the secondary port for existing sessions and to use the primary port for new sessions (default).

To create a static iSCSI virtual target for the entire Fibre Channel target port using Device Manager, follow these steps:

Step 1 Click **IP > iSCSI**.

You see the iSCSI configuration (see Figure 4-12).

Step 2 Click the **Targets** tab to display a list of existing iSCSI targets shown (see Figure 4-13).

Step 3 Click **Create** to create an iSCSI target.

You see the Create iSCSI Targets dialog box (see Figure 4-15).

Step 4 Set the iSCSI target node name in the iSCSI Name field, in IQN format.

Step 5 Set the Port WWN field for the Fibre Channel target port you are mapping.

Step 6 Click the **Select from List** radio button and set the iSCSI initiator node names or IP addresses that you want this virtual iSCSI target to access, or click the **All** radio button to let the iSCSI target access all iSCSI initiators. See the "iSCSI Access Control" section on page 4-cv.

Step 7 Chick the **Select from List** radio button and check each interface you want to advertise the iSCSI targets on or choose the **All** radio button to advertise all interfaces.

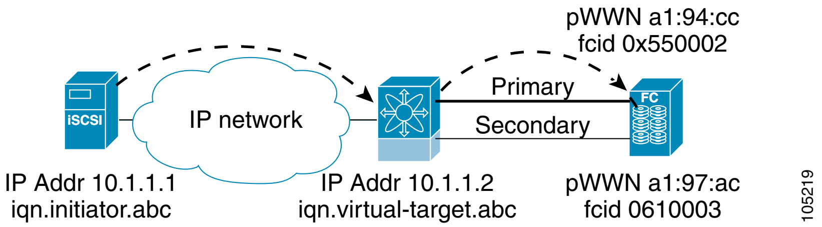
Step 8 Click **Apply** to save this change.

LUN Trespass for Storage Port Failover

In addition to the high availability of statically imported iSCSI targets, the trespass feature is available to enable the move of LUs, on an active port failure, from the active to the passive port of a statically imported iSCSI target.

In physical Fibre Channel targets, which are configured to have LUs visible over two Fibre Channel N ports, when the active port fails, the passive port takes over. Some physical Fibre Channel targets require that the trespass feature be used to move the LUs from the active port to the passive port. A statically imported iSCSI target's secondary pWWN option and an additional option of enabling the trespass feature is available for a physical Fibre Channel target with redundant ports. When the active port fails, the passive port becomes active, and if the trespass feature is enabled, the Cisco MDS switch sends a request to the target to move the LUs on the new active port. The iSCSI session switches to use the new active port and the moved LUs are accessed over the new active port (see Figure 4-40).

Figure 4-40 Virtual Target with an Active Primary Port



To enable the trespass feature for a static iSCSI virtual target, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# iscsi virtual-target name iqn.1987-02.com.cisco.initiator` `switch(config-iscsi-tgt)#`	Creates the iSCSI target name iqn.1987-02.com.cisco.initiator.
Step 3	`switch(config-iscsi-tgt)# pwwn 50:00:00:a1:94:cc secondary-pwwn 50:00:00:a1:97:ac`	Maps a virtual target node to a Fibre Channel target and configures a secondary pWWN.
Step 4	`switch(config-iscsi-tgt)# trespass`	Enables the trespass feature.
	`switch(config-iscsi-tgt)# no trespass`	Disables the trespass feature (default).

Use the **show iscsi virtual-target** command to verify:

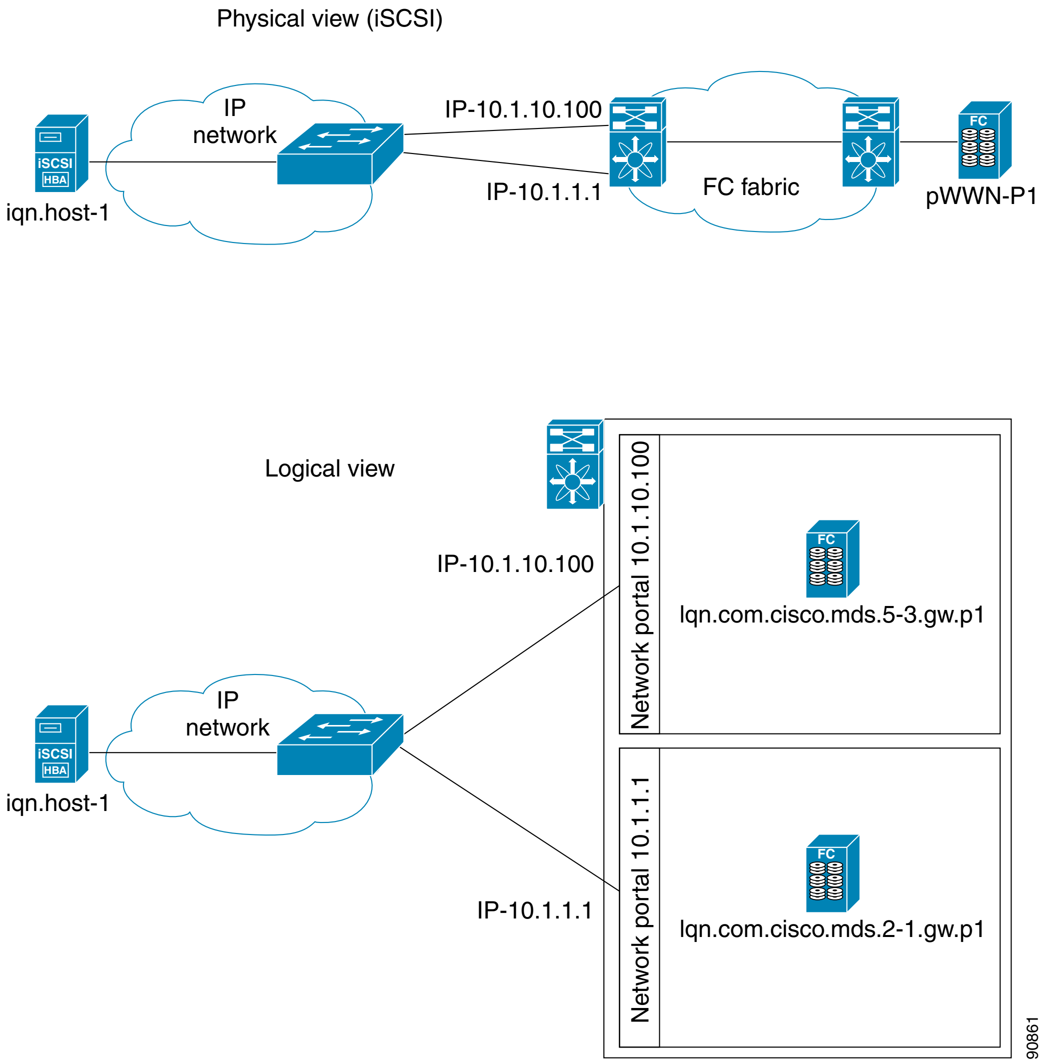
```
switch# show iscsi virtual-target iqn.1987-02.com.cisco.initiator
target: 1987-02.com.cisco.initiator
    Port WWN 10:20:10:00:56:00:70:50
    Configured node
    all initiator permit is disabled
    trespass support is enabled
```

In Device Manager, choose **IP > iSCSI**, select the **Targets** tab, and check the **Trespass Mode** check box to enable the trespass feature for a static iSCSI virtual target.

Multiple IPS Ports Connected to the Same IP Network

Figure 4-41 provides an example of a configuration with multiple Gigabit Ethernet interfaces in the same IP network.

Figure 4-41 Multiple Gigabit Ethernet Interfaces in the Same IP Network

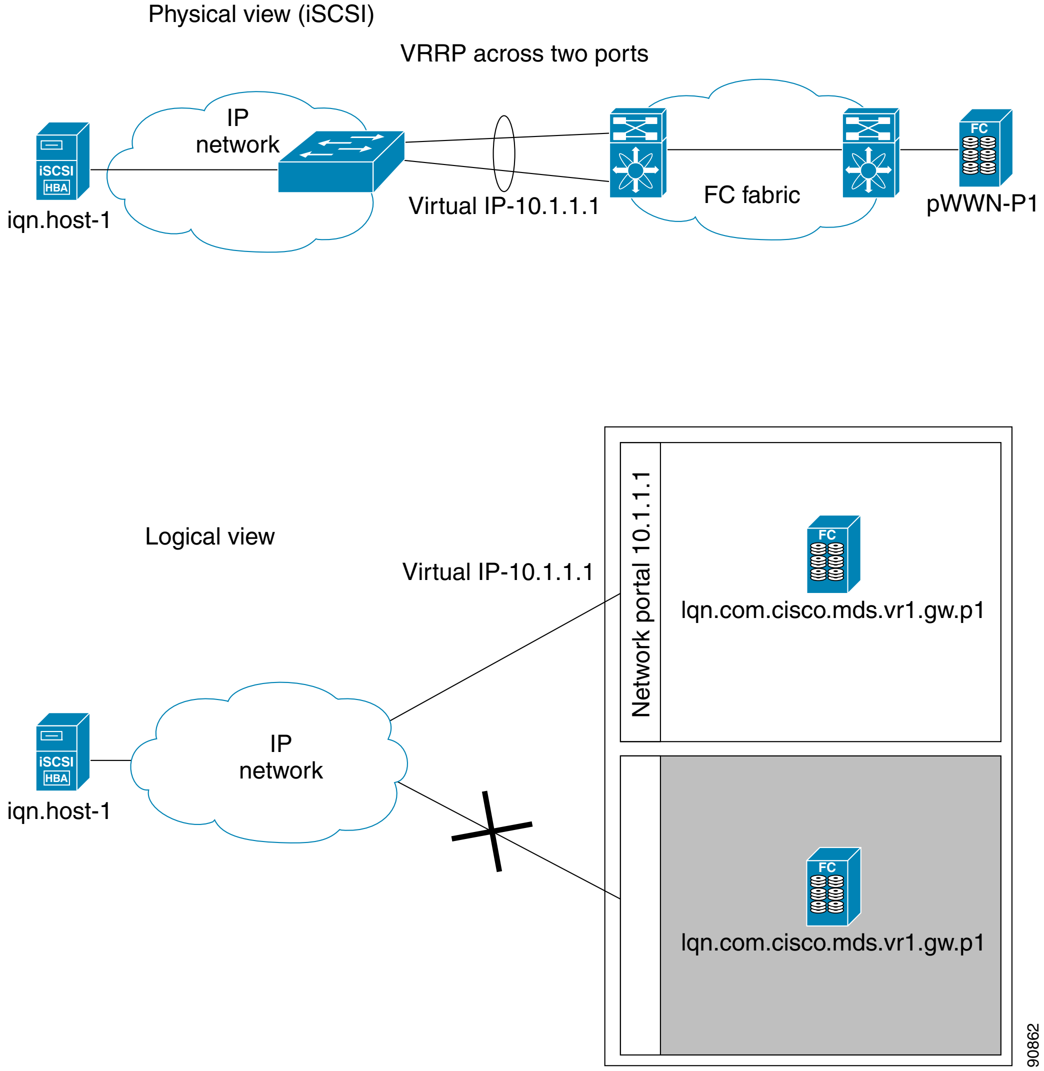

Physical view (iSCSI)
iSCSI
HBA
iqn.host-1
IP network
IP-10.1.10.100
IP-10.1.1.1
FC fabric
FC
pWWN-P1
Logical view
IP-10.1.10.100
iSCSI
HBA
iqn.host-1
IP network
IP-10.1.1.1
Network portal 10.1.10.100
FC
Iqn.com.cisco.mds.5-3.gw.p1
Network portal 10.1.1.1
FC
Iqn.com.cisco.mds.2-1.gw.p1
90861

In Figure 4-41, each iSCSI host discovers two iSCSI targets for every physical Fibre Channel target (with different names). The multi-pathing software on the host provides load-balancing over both paths. If one Gigabit Ethernet interface fails, the host multi-pathing software is not affected because it can use the second path.

VRRP-Based High Availability

Figure 4-42 provides an example of a VRRP-based high availability iSCSI configuration.

Figure 4-42 VRRP-Based iSCSI High Availability


Physical view (iSCSI)
VRRP across two ports
IP network
iSCSI
HBA
iqn.host-1
Virtual IP-10.1.1.1
FC fabric
FC
pWWN-P1
Logical view
Virtual IP-10.1.1.1
Network portal 10.1.1.1
FC
Iqn.com.cisco.mds.vr1.gw.p1
IP network
iSCSI
HBA
iqn.host-1
FC
Iqn.com.cisco.mds.vr1.gw.p1
90862

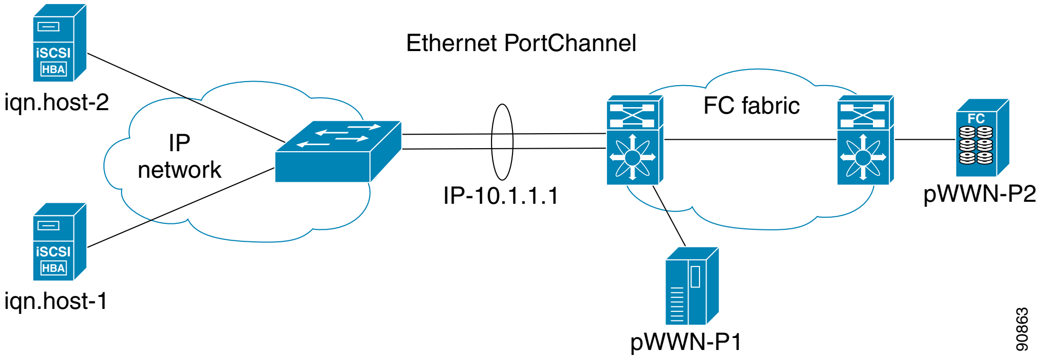
In Figure 4-42, each iSCSI host discovers one iSCSI target for every physical Fibre Channel target. When the Gigabit Ethernet interface of the VRRP master fails, the iSCSI session is terminated. The host then reconnects to the target and the session comes up because the second Gigabit Ethernet interface has taken over the virtual IP address as the new master.

Ethernet Port Channel-Based High Availability

Note All iSCSI data traffic for one iSCSI link is carried on one TCP connection. Consequently, the aggregated bandwidth is 1 Gbps for that iSCSI link.

Figure 4-43 provides a sample Ethernet Port Channel-based high availability iSCSI configuration.

Figure 4-43 Ethernet Port Channel-Based iSCSI High Availability



In Figure 4-43, each iSCSI host discovers one iSCSI target for every physical Fibre Channel target. The iSCSI session from the iSCSI host to the iSCSI virtual target (on the IPS port) uses one of the two physical interfaces (because an iSCSI session uses one TCP connection). When the Gigabit Ethernet interface fails, the Fibre Channel module with IPS ports and the Ethernet switch transparently forwards all the frames on to the second Gigabit Ethernet interface.

Note If an Ethernet port channel is configured between the Fibre Channel module with IPS ports and an Ethernet switch, the load balancing policy on the Ethernet switch must be based on source/destination IP address only, not port numbers, for load balancing with VRRP to operate correctly.

iSCSI Authentication Setup Guidelines and Scenarios

This section provides guidelines on iSCSI authentication possibilities, setup requirements, and sample scenarios. It includes the following authentication setup guidelines:

- Configuring No Authentication, page 4-clxii
- Configuring CHAP with Local Password Database, page 4-clxiii
- Configuring CHAP with External RADIUS Server, page 4-clxiv
- iSCSI Transparent Mode Initiator, page 4-clxvi
- Target Storage Device Requiring LUN Mapping, page 4-clxxiii

Note This section does not specify the steps to enter or exit EXEC mode, configuration mode, or any submode. Be sure to verify the prompt before entering any command.

Caution Changing the authentication of an iSCSI interface that is part of an iSLB VRRP group impacts load balancing on the interface. See the "Changing iSCSI Interface Parameters and the Impact on Load Balancing" section on page 4-cxlv.

Configuring No Authentication

Set the iSCSI authentication method to **none** to configure a network with no authentication:

In Fabric Manager, choose **End Devices > iSCSI** in the Physical Attributes pane. Then select the **Globals** tab and set the AuthMethod drop-down menu to **none** and click **Apply Changes**.

```
switch(config)# iscsi authentication none
```

Configuring CHAP with Local Password Database

To configure authentication using the CHAP option with the local password database, follow these steps:

Step 1 Set the AAA authentication to use the local password database for the iSCSI protocol:

```
switch(config)# aaa authentication iscsi default local
```

Step 2 Set the iSCSI authentication method to require CHAP for all iSCSI clients:

```
switch(config)# iscsi authentication chap
```

Step 3 Configure the user names and passwords for iSCSI users:

```
switch(config)# username iscsi-user password abcd iscsi
```

Note If you do not specify the **iscsi** option, the user name is assumed to be a Cisco MDS switch user instead of an iSCSI user.

Step 4 Verify the global iSCSI authentication setup:

```
switch# show iscsi global
iSCSI Global information Authentication: CHAP <----Verify
  Import FC Target: Disabled
.
.
.
```

To configure authentication using the CHAP option with the local password database, follow these steps:

Step 1 Set the AAA authentication to use the local password database for the iSCSI protocol:

a. In Fabric Manager, choose **Switches > Security > AAA** in the Physical Attributes pane.

b. Click the **Applications** tab in the Information pane.

c. Check the **Local** check box for the iSCSI row and click **Apply Changes**

Step 2 Set the iSCSI authentication method to require CHAP for all iSCSI clients:

a. In Fabric Manager, choose **End Devices > iSCSI** in the Physical Attributes pane.

b. Click the **Globals** tab in the Information pane.

c. Set the AuthMethod drop-down menu to **chap** and click **Apply Changes**.

a. **iSCSI** in the Physical Attributes pane.

b. Click the **Globals** tab in the Information pane.

Configuring CHAP with External RADIUS Server

To configure authentication using the CHAP option with an external RADIUS server, follow these steps:

Step 1 Configure the password for the Cisco MDS switch as RADIUS client to the RADIUS server:

```
switch(config)# radius-server key mds-1
```

Step 2 Configure the RADIUS server IP address by performing one of the following:

- Configure an IPv4 address:

```
switch(config)# radius-server host 10.1.1.10
```

- Configure an IPv6 address:

```
switch(config)# radius-server host 2001:0DB8:800:200C::417A
```

Step 3 Configure the RADIUS server group IP address by performing one of the following:

- Configure an IPv4 address:

```
switch(config)# aaa group server radius iscsi-radius-group
switch(config-radius)# server 10.1.1.1
```

- Configure an IPv6 address:

```
switch(config)# aaa group server radius iscsi-radius-group
switch(config-radius)# server 001:0DB8:800:200C::4180

switch(config)# aaa authentication iscsi default group iscsi-radius-group
```

Step 4 Set up the iSCSI authentication method to require CHAP for all iSCSI clients:

```
switch(config)# iscsi authentication chap
```

Step 5 Verify that the global iSCSI authentication setup is for CHAP:

```
switch# show iscsi global
iSCSI Global information
  Authentication: CHAP        <---------------- Verify CHAP
.
.
.
```

Step 6 Verify that the AAA authentication information is for iSCSI”

```
switch# show aaa authentication
         default: local
         console: local
         iscsi: group iscsi-radius-group    <--------- Group name
         dhchap: local

switch# show radius-server groups
total number of groups:2

following RADIUS server groups are configured:
        group radius:
                server: all configured radius servers
        group iscsi-radius-group:
                server: 10.1.1.1 on auth-port 1812, acct-port 1813

switch# show radius-server
Global RADIUS shared secret:mds-1    <-------- Verify secret
.
```

```
.
.
.

following RADIUS servers are configured:
        10.1.1.1:                    <----------- Verify the server IPv4 address
                available for authentication on port:1812
                available for accounting on port:1813
```

Step 1 Configure the password for the Cisco MDS switch as RADIUS client to the RADIUS server:

a. In Fabric Manager, choose **Switches > Security > AAA > RADIUS** in the Physical Attributes pane.

b. Click the **Default** tab in the Information pane.

c. Set the AuthKey field to the default password and click the **Apply Changes** icon.

Step 2 Configure the RADIUS server IP address:

a. In Fabric Manager, choose **Switches > Security > AAA > RADIUS** in the Physical Attributes pane.

b. Click the **Server** tab in the Information pane and click **Create Row**.

c. Set the Index field to a unique number.

d. Set the IP Type radio button to **ipv4** or **ipv6**.

e. Set the Name or IP Address field to the IP address of the RADIUS server and click **Create**.

Step 3 Create a RADIUS server group and add the RADIUS server to the group:

a. In Fabric Manager, choose **Switches > Security > AAA** in the Physical Attributes pane.

b. Select the **Server Groups** tab in the Information pane and click **Create Row**.

c. Set the Index field to a unique number.

d. Set the Protocol radio button to **radius**.

e. Set the Name field to the server group name.

f. Set the ServerIDList to the index value of the RADIUS server (as created in Step 2 c.) and click **Create**.

Step 4 Set up the authentication verification for the iSCSI protocol to go to the RADIUS server.

a. In Fabric Manager, choose **Switches > Security > AAA** in the Physical Attributes pane.

b. Click the **Applications** tab in the Information pane.

c. Right-click on the iSCSI row in the Type, SubType, Function column.

d. Set the ServerGroup IDList to the index value of the Server Group (as created in Step 3 c) and click **Create**.

Step 5 Set up the iSCSI authentication method to require CHAP for all iSCSI clients.

a. In Fabric Manager, choose **End Devices > iSCSI** in the Physical Attributes pane.

b. Select **chap** from the AuthMethod drop-down menu.

c. Click the **Apply Changes** icon.

Step 6 In Fabric Manager, choose **End Devices > iSCSI** in the Physical Attributes pane.

Step 7 Click the **Globals** tab in the Information pane to verify that the global iSCSI authentication setup is for CHAP.

Step 8 In Fabric Manager, choose **Switches > Security > AAA** in the Physical Attributes pane.

Step 9 Click the **Applications** tab in the Information pane to verify the AAA authentication information for iSCSI.

To configure an iSCSI RADIUS server, follow these steps:

Step 1 Configure the RADIUS server to allow access from the Cisco MDS switch's management Ethernet IP address.

Step 2 Configure the shared secret for the RADIUS server to authenticate the Cisco MDS switch.

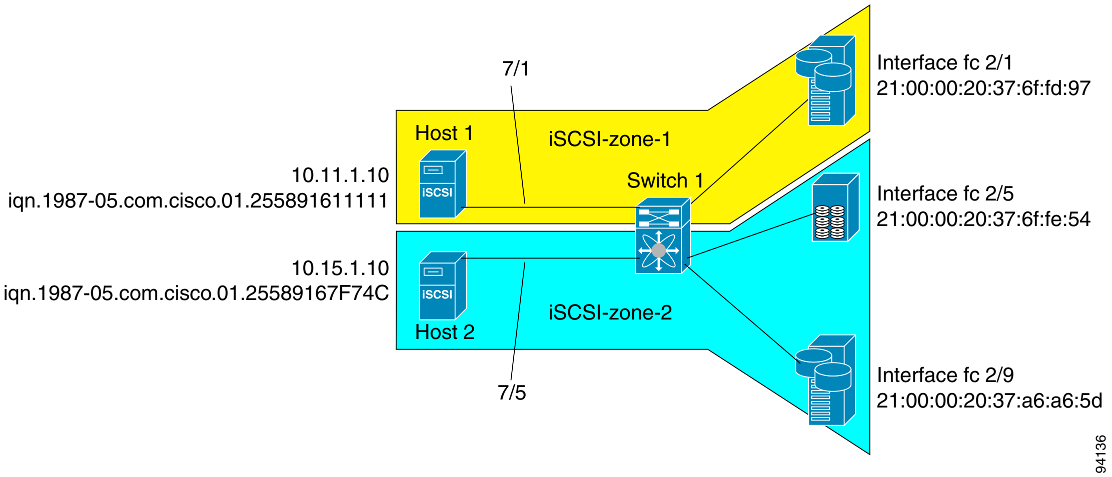
Step 3 Configure the iSCSI users and passwords on the RADIUS server.

iSCSI Transparent Mode Initiator

This scenario assumes the following configuration (see Figure 4-44):

- No LUN mapping or LUN masking or any other access control for hosts on the target device
- No iSCSI login authentication (that is, login authentication set to none)
- The topology is as follows:
  - iSCSI interface 7/1 is configured to identify initiators by IP address.
  - iSCSI interface 7/5 is configured to identify initiators by node name.
  - The iSCSI initiator host 1 with IPv4 address 10.11.1.10 and name iqn.1987-05.com.cisco:01.255891611111 connects to IPS port 7/1 is identified using IPv4 address (host 1 = 10.11.1.10).
  - The iSCSI initiator host 2 with IPv4 address 10.15.1.10 and node name iqn.1987-05.com.cisco:01.25589167f74c connects to IPS port 7/5.

Figure 4-44 iSCSI Scenario 1


7/1
Host 1
iSCSI-zone-1
10.11.1.10
iqn.1987-05.com.cisco.01.255891611111
iSCSI
Switch 1
Interface fc 2/1
21:00:00:20:37:6f:fd:97
Interface fc 2/5
21:00:00:20:37:6f:fe:54
10.15.1.10
iqn.1987-05.com.cisco.01.25589167F74C
iSCSI
iSCSI-zone-2
Host 2
7/5
Interface fc 2/9
21:00:00:20:37:a6:a6:5d
94136

To configure scenario 1 (see Figure 4-44), follow these steps:

Step 1 Configure null authentication for all iSCSI hosts in Cisco MDS switches:

```
switch(config)# iscsi authentication none
```

Step 2 Configure iSCSI to dynamically import all Fibre Channel targets into the iSCSI SAN using auto-generated iSCSI target names:

```
switch(config)# iscsi import target fc
```

Step 3 Configure the Gigabit Ethernet interface in slot 7 port 1 with an IPv4 address and enable the interface:

```
switch(config)# interface gigabitethernet 7/1
switch(config-if)# ip address 10.11.1.1 255.255.255.0
switch(config-if)# no shutdown
```

Note Host 2 is connected to this port.

Step 4 Configure the iSCSI interface in slot 7 port 1 to identify all dynamic iSCSI initiators by their IP address, and enable the interface:

```
switch(config)# interface iscsi 7/1
switch(config-if)# switchport initiator id ip-address
switch(config-if)# no shut
```

Step 5 Configure the Gigabit Ethernet interface in slot 7 port 5 with the IPv4 address and enable the interface:

```
switch(config)# interface gigabitethernet 7/5
switch(config-if)# ip address 10.15.1.1 255.255.255.0
switch(config-if)# no shutdown
```

Step 6 Configure the iSCSI interface in slot 7 port 5 to identify all dynamic iSCSI initiators by node name and enable the interface:

```
switch(config)# interface iscsi 7/5
switch(config-if)# switchport initiator id name
switch(config-if)# no shutdown
```

Note Host 1 is connected to this port.

Step 7 Verify the available Fibre Channel targets (see Figure 4-44):

```
switch# show fcns database
VSAN 1:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x6d0001    NL    21:00:00:20:37:6f:fd:97 (Seagate)       scsi-fcp:target
0x6d0101    NL    21:00:00:20:37:6f:fe:54 (Seagate)       scsi-fcp:target
0x6d0201    NL    21:00:00:20:37:a6:a6:5d (Seagate)       scsi-fcp:target
Total number of entries = 3
```

Step 8 Create a zone named *iscsi-zone-1* with host 1 and one Fibre Channel target in it:

Note Use the IP address of the host in zone membership configuration because the iSCSI interface is configured to identify all hosts based on IP address.

```
switch(config)# zone name iscsi-zone-1 vsan 1
switch(config-zone)# member pwwn 21:00:00:20:37:6f:fd:97
switch(config-zone)# member ip-address 10.11.1.10
```

Step 9 Create a zone named *iscsi-zone-2* with host 2 and two Fibre Channel targets in it:

Note Use the symbolic node name of the iSCSI host in zone membership configuration because the iSCSI interface is configured to identify all hosts based on node name.

```
switch(config)# zone name iscsi-zone-2 vsan 1
switch(config-zone)# member pwwn 21:00:00:20:37:6f:fe:54
switch(config-zone)# member pwwn 21:00:00:20:37:a6:a6:5d
switch(config-zone)# member symbolic-nodename iqn.1987-05.com.cisco:01.25589167f74c
```

Step 10 Create a zone set and add the two zones as members:

```
switch(config)# zoneset name zoneset-iscsi vsan 1
switch(config-zoneset)# member iscsi-zone-1
switch(config-zoneset)# member iscsi-zone-2
```

Step 11 Activate the zone set:

```
switch(config)# zoneset activate name zoneset-iscsi vsan 1
```

Step 12 Display the active zone set:

Note The iSCSI hosts are not connected so they do not have an FC ID yet.

```
switch# show zoneset active
zoneset name zoneset-iscsi vsan 1
  zone name iscsi-zone-1 vsan 1
  * fcid 0x6d0001 [pwwn 21:00:00:20:37:6f:fd:97] <-----------Target
    symbolic-nodename 10.11.1.10 <-------------------------------- iSCSI host (host 1, not online)

  zone name iscsi-zone-2 vsan 1
  * fcid 0x6d0101 [pwwn 21:00:00:20:37:6f:fe:54] <------------Target
  * fcid 0x6d0201 [pwwn 21:00:00:20:37:a6:a6:5d] <------------Target
    symbolic-nodename iqn.1987-05.com.cisco:01.25589167f74c <-iSCSI host (host 2, not online)
```

Step 13 Bring up the iSCSI hosts (host 1 and host 2).

Step 14 Show all the iSCSI sessions (use the **detail** option for detailed information):

```
switch# show iscsi session
    Initiator iqn.1987-05.com.cisco:01.25589167f74c <-----Host 2
    Initiator ip addr (s): 10.15.1.11
  Session #1
    Target iqn.1987-05.com.cisco:05.172.22.92.166.07-05.21000020376ffe54
```

Note The last part of the auto-created target name is the Fibre Channel target's pWWN.

```
    VSAN 1, ISID 00023d000001, Status active, no reservation

  Session #2
    Target iqn.1987-05.com.cisco:05.172.22.92.166.07-05.2100002037a6a65d
    VSAN 1, ISID 00023d000001, Status active, no reservation

Initiator 10.11.1.10 <------------------------------------Host 1
  Initiator name iqn.1987-05.com.cisco:01.e41695d16b1a
  Session #1
```

```
Target iqn.1987-05.com.cisco:05.172.22.92.166.07-01.21000020376ffd97
VSAN 1, ISID 00023d000001, Status active, no reservation
```

Step 15 Verify the details of the two iSCSI initiators:

```
switch# show iscsi initiator
iSCSI Node name is iqn.1987-05.com.cisco:01.25589167f74c <---------
    Initiator ip addr (s): 10.15.1.11
    iSCSI alias name: oasis11.cisco.com
    Node WWN is 20:02:00:0b:fd:44:68:c2 (dynamic)
    Member of vsans: 1
    Number of Virtual n_ports: 1
    Virtual Port WWN is 20:03:00:0b:fd:44:68:c2 (dynamic)
      Interface iSCSI 7/5, Portal group tag: 0x304
      VSAN ID 1, FCID 0x6d0300
```

Host 2: Initiator ID based on node name because the initiator is entering iSCSI interface 7/5

```
iSCSI Node name is 10.11.1.10  <-----------------------
    iSCSI Initiator name: iqn.1987 - 05.com.cisco:01.e41695d16b1a
    iSCSI alias name: oasis10.cisco.com
    Node WWN is 20:04:00:0b:fd:44:68:c2 (dynamic)
    Member of vsans: 1
    Number of Virtual n_ports: 1
    Virtual Port WWN is 20:05:00:0b:fd:44:68:c2 (dynamic)
      Interface iSCSI 7/1, Portal group tag: 0x300
      VSAN ID 1, FCID 0x6d0301
```

Host 1: Initiator ID based on IPv4 address because the initiator is entering iSCSI interface 7/1

Step 16 View the active zone set. The iSCSI initiators' FC IDs are resolved:

```
switch# show zoneset active
zoneset name zoneset-iscsi vsan 1
  zone name iscsi-zone-1 vsan 1
  * fcid 0x6d0001 [pwwn 21:00:00:20:37:6f:fd:97]
  * fcid 0x6d0301 [symbolic-nodename 10.11.1.10] <-------------

 zone name iscsi-zone-2 vsan 1
  * fcid 0x6d0101 [pwwn 21:00:00:20:37:6f:fe:54]
  * fcid 0x6d0201 [pwwn 21:00:00:20:37:a6:a6:5d]
  * fcid 0x6d0300 [symbolic-nodename
iqn.1987-05.com.cisco:01.25589167f74c]<------------------------
```

FC ID resolved for host 1

FC ID for host 2

Step 17 The Fibre Channel name server shows the virtual N ports created for the iSCSI hosts:

```
switch# show fcns database
VSAN 1:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x6d0001    NL    21:00:00:20:37:6f:fd:97 (Seagate)       scsi-fcp:target
0x6d0101    NL    21:00:00:20:37:6f:fe:54 (Seagate)       scsi-fcp:target
0x6d0201    NL    21:00:00:20:37:a6:a6:5d (Seagate)       scsi-fcp:target
0x6d0300    N     20:03:00:0b:fd:44:68:c2 (Cisco)         scsi-fcp:init isc..w
0x6d0301    N     20:05:00:0b:fd:44:68:c2 (Cisco)         scsi-fcp:init isc..w
```

Step 18 Verify the detailed output of the iSCSI initiator nodes in the Fibre Channel name server:

```
switch# show fcns database fcid 0x6d0300 detail vsan 1
------------------------
VSAN:1     FCID:0x6d0300
------------------------
port-wwn (vendor)     :20:03:00:0b:fd:44:68:c2 (Cisco)
node-wwn              :20:02:00:0b:fd:44:68:c2
class                 :2,3
node-ip-addr          :10.15.1.11    <----------------------
ipa                   :ff ff ff ff ff ff ff ff
fc4-types:fc4_features:scsi-fcp:init iscsi-gw   <------
symbolic-port-name    :

symbolic-node-name
:iqn.1987-05.com.cisco:01.25589167f74c<--------------------
port-type             :N
port-ip-addr          :0.0.0.0
fabric-port-wwn       :21:91:00:0b:fd:44:68:c0
hard-addr             :0x000000
Total number of entries = 1
```

IPv4 address of the iSCSI host

iSCSI gateway node

iSCSI initiator ID is based on the registered node name

```
switch# show fcns database fcid 0x6d0301 detail vsan 1
------------------------
VSAN:1     FCID:0x6d0301
------------------------
port-wwn (vendor)     :20:05:00:0b:fd:44:68:c2 (Cisco)
node-wwn              :20:04:00:0b:fd:44:68:c2
class                 :2,3
node-ip-addr          :10.11.1.10
ipa                   :ff ff ff ff ff ff ff ff
fc4-types:fc4_features:scsi-fcp:init iscsi-gw   <------
symbolic-port-name    :

symbolic-node-name    :10.11.1.10   <---------------------
port-type             :N
port-ip-addr          :0.0.0.0
fabric-port-wwn       :21:81:00:0b:fd:44:68:c0
hard-addr             :0x000000
```

iSCSI gateway node

iSCSI initiator ID is based on the IPv4 address registered in symbolic-node-name field

---

To configure scenario 1 (see Figure 4-44), follow these steps:

Step 1 Configure null authentication for all iSCSI hosts in Cisco MDS switches.

a. In Fabric Manager, choose **End Devices > iSCSI** in the Physical Attributes pane.

b. Select **none** from the AuthMethod drop-down menu in the Information pane.

c. Click the **Apply Changes** icon.

Step 2 Configure iSCSI to dynamically import all Fibre Channel targets into the iSCSI SAN using auto-generated iSCSI target names.

a. In Device Manager, click **IP > iSCSI.**

b. Click the **Targets** tab.

c. Check the **Dynamically Import FC Targets** check box.

d. Click **Apply**.

Step 3 Configure the Gigabit Ethernet interface in slot 7 port 1 with an IPv4 address and enable the interface.

a. In Fabric Manager, choose **Switches > Interfaces > Gigabit Ethernet** in the Physical Attributes pane.

b. Select the **IP Address** tab in the Information pane and click **Create Row**.

c. Set the IP address and subnet mask for the Gigabit Ethernet interface in slot 7 port 1.

d. Click **Create.**

e. Select the **General** tab and select **up** from the Admin drop-down menu for the Gigabit Ethernet interface in slot 7 port 1.

f. Click the **Apply Changes** icon.

Note Host 2 is connected to this port.

Step 4 Configure the iSCSI interface in slot 7 port 1 to identify all dynamic iSCSI initiators by their IP address, and enable the interface.

a. In Fabric Manager, choose **Switches > Interfaces > FC Logical** in the Physical Attributes pane.

b. Click the **iSCSI** tab in the Information pane.

c. Select **ipaddress** from the Initiator ID Mode drop-down menu and click the **Apply Changes** icon.

d. In Device Manager, choose **Interfaces > Ethernet and iSCSI**.

e. Click the **iSCSI** tab.

f. Select **up** from the Admin drop-down menu for the iSCSI interface in slot 7 port 1.

g. Click **Apply**.

Step 5 Configure the Gigabit Ethernet interface in slot 7 port 5 with an IPv4 address and enable the interface.

a. In Fabric Manager, choose **Switches > Interfaces > Gigabit Ethernet** in the Physical Attributes pane.

b. Click the **IP Address** tab in the Information pane and click **Create Row**.

c. Set the IP address and subnet mask for the Gigabit Ethernet interface in slot 7 port 5.

d. Click **Create.**

e. Select the **General** tab and select **up** from the Admin drop-down menu for the Gigabit Ethernet interface in slot 7 port 5.

f. Click the **Apply Changes** icon.

Step 6 Configure the iSCSI interface in slot 7 port 5 to identify all dynamic iSCSI initiators by node name and enable the interface.

a. In Fabric Manager, choose **Switches > Interfaces > FC Logical** in the Physical Attributes pane.

b. Click the **iSCSI** tab in the Information pane.

c. Select **name** from the Initiator ID Mode drop-down menu and click the **Apply Changes** icon.

d. In Device Manager, choose **Interfaces > Ethernet and iSCSI**.

e. Click the **iSCSI** tab.

f. Select **up** from the Admin drop-down menu for the iSCSI interface in slot 7 port 5.

g. Click **Apply**.

Note Host 1 is connected to this port.

Step 7 Verify the available Fibre Channel targets.

a. In Device Manager, Choose **FC > Name Server**.
b. Click the **General** tab.

Step 8 Create a zone named *iscsi-zone-1* with host 1 and one Fibre Channel target in it.

Note Use the IP address of the host in zone membership configuration because the iSCSI interface is configured to identify all hosts based on IP address.

a. In Fabric Manager, choose **Zones > Edit Local Full Zone Database**.
b. Select VSAN 1 from the VSAN drop-down menu in the Edit Local Full Zone Database dialog box.
c. Select the **Zones** folder in the left navigation pane and click **Insert**.
d. Set the Zone Name field to **iscsi-zone-1** and click **OK.**
e. Select the iscsi-zone-1 folder in the left navigation pane and click **Insert**.
f. Set the ZoneBy radio button to**WWN.**
g. Set the Port WWN to the pWWN for the Fibre Channel target (that is, 21:00:00:20:37:6f:fd:97) and click **Add**.
h. Set the ZoneBy radio button to **iSCSI IP Address/Subnet.**
i. Set the IP Address/Mask field to the IP Address for Host 1 iSCSI initiator (10.11.1.10) and click **Add**.

Step 9 Create a zone named *iscsi-zone-2* with host 2 and two Fibre Channel targets in it.

Note Use the symbolic node name of the iSCSI host in zone membership configuration because the iSCSI interface is configured to identify all hosts based on node name.

a. In Fabric Manager, choose **Zones > Edit Local Full Zone Database** from the main menu.
b. Select VSAN 2 from the VSAN drop-down menu in the Edit Local Full Zone Database dialog box.
c. Select the **Zones** folder in the left navigation pane and click **Insert**.
d. Set the Zone Name field to **iscsi-zone-2** and click **OK.**
e. Select the **iscsi-zone-2** folder in the left navigation pane and click **Insert**.
f. Set the ZoneBy radio button to**WWN.**
g. Set the Port WWN to the pWWN for one of the Fibre Channel targets (for example, 21:00:00:20:37:6f:fe:5). and click **Add**.
h. Set the Port WWN to the pWWN for another of the Fibre Channel targets (for example, 21:00:00:20:37:a6:a6:5d). and click **Add**.
i. Set the ZoneBy radio button to **iSCSI name.**
j. Set the Port Name field to the symbolic name for host 2 (iqn.1987-05.com.cisco:01.25589167f74c) and click **Add**.

Step 10 Create a zone set, add the two zones as members, and activate the zone set.

Note iSCSI interface is configured to identify all hosts based on node name.

a. In Fabric Manager, choose **Zones > Edit Local Full Zone Database**.
b. Select VSAN 1 from the VSAN drop-down menu in the Edit Local Full Zone Database dialog box.
c. Select the **Zoneset** folder in the left navigation pane and click **Insert**.

d. Set the Zoneset Name to **zonset-iscsi** and click **OK**.

e. Click on the **zoneset-iscsi** folder and click **Insert**.

f. Set the Zone Name field to **iscsi-zone-1** and click **OK.**

g. Set the Zone Name field to **iscsi-zone-2** and click **OK.**

h. Click **Activate** to activate the new zone set.

i. Click **Continue Activation** to finish the activation.

Step 11 Bring up the iSCSI hosts (host 1 and host 2).

Step 12 Show all the iSCSI sessions.

a. In Device Manager, choose **Interfaces > Monitor > Ethernet.**

b. Click the **iSCSI connections** tab to show all the iSCSI sessions.

c. In Device Manager, choose **IP > iSCSI** and select the **Session Initiators** tab.

d. Click **Details.**

Step 13 In Fabric Manager, choose **End Devices > iSCSI** in the Physical Attributes pane to verify the details of the two iSCSI initiators

Step 14 In Fabric Manager, choose **Zones > Edit Local Full Zone Database** to view the active zone set. The iSCSI initiators' FC IDs are resolved.

Step 15 In Device Manager, Choose **FC > Name Server.** The Fibre Channel name server shows the virtual N ports created for the iSCSI hosts.

Step 16 In Device Manager, Choose **FC > Name Server.**

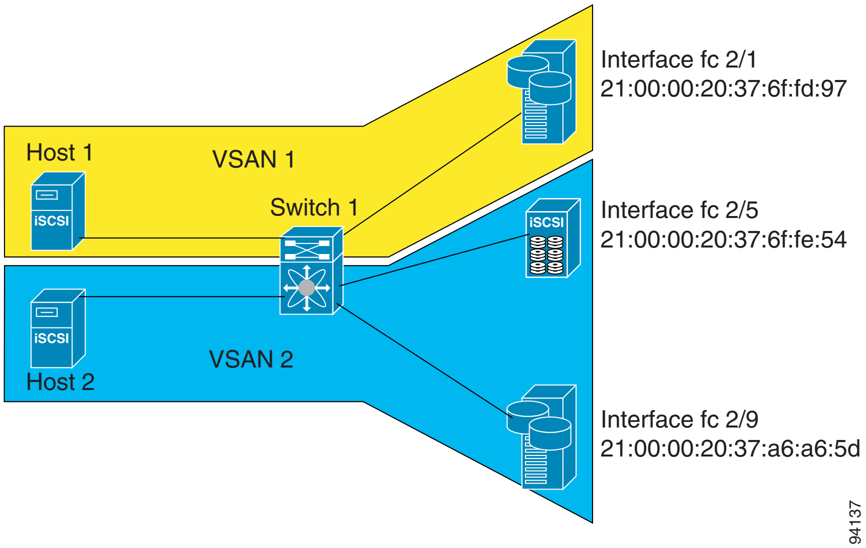
Step 17 Click the **Advanced** tab**.** Verify the detailed output of the iSCSI initiator nodes in the Fibre Channel name server.

Target Storage Device Requiring LUN Mapping

Sample scenario 2 assumes the following configuration (see Figure 4-45):

- Access control is based on Fibre Channel zoning.
- There is target-based LUN mapping or LUN masking.
- There is no iSCSI authentication (none).
- The iSCSI initiator is assigned to different VSANs.

Figure 4-45 iSCSI Scenario 2



To configure scenario 2 (see Figure 4-45), follow these steps:

Step 1 Configure null authentication for all iSCSI hosts:

```
switch(config)# iscsi authentication none
```

Step 2 Configure iSCSI to dynamically import all Fibre Channel targets into the iSCSI SAN using auto-generated iSCSI target names:

```
switch(config)# iscsi import target fc
```

Step 3 Configure the Gigabit Ethernet interface in slot 7 port 1 with an IPv4 address and enable the interface:

```
switch(config)# interface gigabitethernet 7/1
switch(config-if)# ip address 10.11.1.1 255.255.255.0
switch(config-if)# no shutdown
```

Step 4 Configure the iSCSI interface in slot 7 port 1 to identify all dynamic iSCSI initiators by their IP address and enable the interface:

```
switch(config)# interface iscsi 7/1
switch(config-if)# switchport initiator id ip-address
switch(config-if)# no shutdown
```

Step 5 Configure the Gigabit Ethernet interface in slot 7 port 5 with the IPv4 address and enable the interface:

```
switch(config)# interface gigabitethernet 7/5
switch(config-if)# ip address 10.15.1.1 255.255.255.0
switch(config-if)# no shutdown
```

Step 6 Configure the iSCSI interface in slot 7 port 5 to identify all dynamic iSCSI initiators by IP address and enable the interface:

```
switch(config)# interface iscsi 7/5
switch(config-if)# switchport initiator id ip-address
switch(config-if)# no shutdown
```

Step 7 Add static configuration for each iSCSI initiator:

```
switch(config)# iscsi initiator name iqn.1987-05.com.cisco:01.e41695d16b1a <-----Host 2
switch(config-iscsi-init)# static pWWN system-assign 1
switch(config-iscsi-init)# static nWWN system-assign

switch(config)# iscsi initiator ip address 10.15.1.11 <---------------------------------Host 1
switch(config-iscsi-init)# static pwwn system-assigned 1
switch(config-iscsi-init)# vsan 2
```

Note Host 1 is configured in VSAN 2.

Step 8 View the configured WWNs:

Note The WWNs are assigned by the system. The initiators are members of different VSANs.

```
switch# show iscsi initiator configured
iSCSI Node name is iqn.1987-05.com.cisco:01.e41695d16b1a
    Member of vsans: 1
    Node WWN is 20:03:00:0b:fd:44:68:c2
    No. of PWWN: 1
      Port WWN is 20:02:00:0b:fd:44:68:c2

iSCSI Node name is 10.15.1.11
    Member of vsans: 2
    No. of PWWN: 1
      Port WWN is 20:06:00:0b:fd:44:68:c2
```

Step 9 Create a zone with host 1:

```
switch(config)# zone name iscsi-zone-1 vsan 1
```

Step 10 Add three members to the zone named *iscsi-zone-1*:

Note Fibre Channel storage for zone membership for the iSCSI initiator, either the iSCSI symbolic node name or the pWWN, can be used. In this case, the pWWN is persistent.

- The following command is based on the symbolic node name.

  ```
  switch(config-zone)# member symbolic-nodename iqn.1987-05.com.cisco:01.e41695d16b1a
  ```

- The following command is based on the persistent pWWN assigned to the initiator. You can obtain the pWWN from the **show iscsi initiator** output.

  ```
  switch(config-zone)# member pwwn 20:02:00:0b:fd:44:68:c2
  ```

Step 11 Create a zone with host 2 and two Fibre Channel targets:

Note If the host is in VSAN 2, the Fibre Channel targets and zone must also be in VSAN 2.

```
switch(config)# zone name iscsi-zone-2 vsan 2
```

Step 12 Activate the zone set in VSAN 2:

```
switch(config)# zoneset activate name iscsi-zoneset-v2 vsan 2
Zoneset activation initiated. check zone status
switch# show zoneset active vsan 2
zoneset name iscsi-zoneset-v2 vsan 2
  zone name iscsi-zone-2 vsan 2
```

```
* fcid 0x750001 [pwwn 21:00:00:20:37:6f:fe:54]
* fcid 0x750101 [pwwn 21:00:00:20:37:a6:a6:5d]
  pwwn 20:06:00:0b:fd:44:68:c2      <-----------------Host is not online
```

Step 13 Start the iSCSI clients on both hosts and verify that sessions come up.

Step 14 Display the iSCSI sessions to verify the Fibre Channel target and the configured WWNs.

```
switch# show iscsi session
Initiator iqn.1987-05.com.cisco:01.e41695d16b1a
    Initiator ip addr (s): 10.11.1.10
  Session #1
    Discovery session, ISID 00023d000001, Status active

  Session #2
    Target
iqn.1987-05.com.cisco:05.172.22.92.166.07-01.21000020376ffd97<----  To Fibre Channel
    VSAN 1, ISID 00023d000001, Status active, no reservation        target
```

Step 15 Display the iSCSI initiator to verify the configured nWWN and pWWN:

```
switch# show iscsi initiator
iSCSI Node name is iqn.1987-05.com.cisco:01.e41695d16b1a
    Initiator ip addr (s): 10.11.1.10
    iSCSI alias name: oasis10.cisco.com

    Node WWN is 20:03:00:0b:fd:44:68:c2 (configured)<----------     The configured nWWN
    Member of vsans: 1
    Number of Virtual n_ports: 1

 Virtual Port WWN is 20:02:00:0b:fd:44:68:c2 (configured)<----      The configured pWWN
      Interface iSCSI 7/1, Portal group tag: 0x300
      VSAN ID 1, FCID 0x680102
```

Step 16 Check the Fibre Channel name server:

```
switch# show fcns database vsan 1
VSAN 1:
-----------------------------------------------------------------
FCID     TYPE PWWN                    (VENDOR)  FC4-TYPE:FEATURE
-----------------------------------------------------------------
0x680001 NL   21:00:00:20:37:6f:fd:97 (Seagate) scsi-fcp:target

0x680102 N    20:02:00:0b:fd:44:68:c2 (Cisco)   scsi-fcp:init iscw <---   iSCSI initiator
                                                                           in name server
```

Step 17 Verify the details of the iSCSI initiator's FC ID in the name server:

```
switch(config)# show fcns database fcid 0x680102 detail vsan 1
------------------------
VSAN:1     FCID:0x680102
------------------------
port-wwn (vendor)      :20:02:00:0b:fd:44:68:c2 (Cisco)
node-wwn               :20:03:00:0b:fd:44:68:c2
class                  :2,3
node-ip-addr           :10.11.1.10
ipa                    :ff ff ff ff ff ff ff ff
fc4-types:fc4_features:scsi-fcp:init iscsi-gw
symbolic-port-name     :
symbolic-node-name     :iqn.1987-05.com.cisco:01.e41695d16b1a
port-type              :N
port-ip-addr           :0.0.0.0
fabric-port-wwn        :21:81:00:0b:fd:44:68:c0
    iSCSI alias name: oasis10.cisco.com
```

Step 18 Check the Fibre Channel name server:

```
switch# show fcns database vsan 1
VSAN 1:
--------------------------------------------------------------
FCID     TYPE  PWWN                    (VENDOR) FC4-TYPE:FEATURE
-----------------------------------------------------------------
0x680001 NL    21:00:00:20:37:6f:fd:97 (Seagate) scsi-fcp:target

0x680102 N     20:02:00:0b:fd:44:68:c2 (Cisco)   scsi-fcp:init isc..w <-----   iSCSI
                                                                               initiator in
                                                                               name server
```

Step 19 Verify the details of the iSCSI initiator's FC ID in the name server:

```
switch(config)# show fcns database fcid 0x680102 detail vsan 1
------------------------
VSAN:1     FCID:0x680102
------------------------
port-wwn (vendor)      :20:02:00:0b:fd:44:68:c2 (Cisco)
node-wwn               :20:03:00:0b:fd:44:68:c2
class                  :2,3
node-ip-addr           :10.11.1.10
ipa                    :ff ff ff ff ff ff ff ff
fc4-types:fc4_features:scsi-fcp:init iscsi-gw
symbolic-port-name     :
symbolic-node-name     :iqn.1987-05.com.cisco:01.e41695d16b1a
port-type              :N
port-ip-addr           :0.0.0.0
fabric-port-wwn        :21:81:00:0b:fd:44:68:c0
hard-addr              :0x000000
```

Step 20 Verify that zoning has resolved the FC ID for the iSCSI client:

```
switch# show zoneset active vsan 1
zoneset name iscsi-zoneset-v1 vsan 1
  zone name iscsi-zone-1 vsan 1
  * fcid 0x680001 [pwwn 21:00:00:20:37:6f:fd:97]
  * fcid 0x680102 [pwwn 20:02:00:0b:fd:44:68:c2]
```

Step 21 Verify that the second initiator is connected to the two Fibre Channel targets in VSAN 2:

```
switch# show iscsi session initiator 10.15.1.11
Initiator 10.15.1.11
  Initiator name iqn.1987-05.com.cisco:01.25589167f74c
  Session #1
    Target iqn.1987-05.com.cisco:05.172.22.92.166.07-05.21000020376ffe54 <--  Session to
    VSAN 2, ISID 00023d000001, Status active, no reservation                  first target

  Session #2                                                                  Session to
    Target iqn.1987-05.com.cisco:05.172.22.92.166.07-05.2100002037a6a65d <--  second
    VSAN 2, ISID 00023d000001, Status active, no reservation                  target
```

```
switch# show iscsi initiator
iSCSI Node name is 10.15.1.11 <--- Initiator ID is the IP address
    iSCSI Initiator name: iqn.1987-05.com.cisco:01.25589167f74c
    iSCSI alias name: oasis11.cisco.com

    Node WWN is 20:04:00:0b:fd:44:68:c2 (dynamic) <-----------------------    Dynamic
    Member of vsans: 2 <--- vsan membership                                    WWN as
    Number of Virtual n_ports: 1                                               static WWN
                                                                               not
                                                                               assigned

    Virtual Port WWN is 20:06:00:0b:fd:44:68:c2 (configured) <---------        Static
      Interface iSCSI 7/5, Portal group tag: 0x304                             pWWN for
      VSAN ID 2, FCID 0x750200                                                 the initiator
```

```
switch# show fcns database vsan 2
VSAN 2:
--------------------------------------------------------------------------
FCID        TYPE  PWWN                    (VENDOR)  FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x750001    NL    21:00:00:20:37:6f:fe:54 (Seagate) scsi-fcp:target
0x750101    NL    21:00:00:20:37:a6:a6:5d (Seagate) scsi-fcp:target

0x750200    N     20:06:00:0b:fd:44:68:c2 (Cisco)   scsi-fcp:init isc..w <--  iSCSI
Total number of entries = 3                                                   initiator
                                                                              entry in
                                                                              name server
```

```
switch# show fcns database fcid 0x750200 detail vsan 2
------------------------
VSAN:2     FCID:0x750200
------------------------
port-wwn (vendor)     :20:06:00:0b:fd:44:68:c2 (Cisco)
node-wwn              :20:04:00:0b:fd:44:68:c2
class                 :2,3
node-ip-addr          :10.15.1.11
ipa                   :ff ff ff ff ff ff ff ff
fc4-types:fc4_features:scsi-fcp:init iscsi-gw
symbolic-port-name    :
symbolic-node-name    :10.15.1.11
port-type             :N
port-ip-addr          :0.0.0.0
fabric-port-wwn       :21:91:00:0b:fd:44:68:c0
hard-addr             :0x000000
Total number of entries = 1
```

```
switch# show zoneset active vsan 2
zoneset name iscsi-zoneset-v2 vsan 2
  zone name iscsi-zone-2 vsan 2
  * fcid 0x750001 [pwwn 21:00:00:20:37:6f:fe:54]
  * fcid 0x750101 [pwwn 21:00:00:20:37:a6:a6:5d]

 * fcid 0x750200 [pwwn 20:06:00:0b:fd:44:68:c2] <------------------------
```

FC ID resolved for iSCSI initiator

To configure scenario 2 (see Figure 4-45), follow these steps:

Step 1 Configure null authentication for all iSCSI hosts.

a. In Fabric Manager, choose **End Devices > iSCSI** in the Physical Attributes pane.
b. Select **none** from the AuthMethod drop-down menu in the Information pane.
c. Click the **Apply Changes** icon.

Step 2 Configure iSCSI to dynamically import all Fibre Channel targets into the iSCSI SAN using auto-generated iSCSI target names.

a. In Device Manager, click **IP > iSCSI.**
b. Click the **Targets** tab.
c. Check the **Dynamically Import FC Targets** check box.
d. Click **Apply**.

Step 3 Configure the Gigabit Ethernet interface in slot 7 port 1 with an IPv4 address and enable the interface.

a. In Fabric Manager, choose **Switches > Interfaces > Gigabit Ethernet** in the Physical Attributes pane.
b. Select the **IP Address** tab in the Information pane and click **Create Row**.
c. Set the IP address and subnet mask for the Gigabit Ethernet interface in slot 7 port 1.
d. Click **Create.**
e. Click the **General** tab and select **up** from the Admin drop-down menu for the Gigabit Ethernet interface in slot 7 port 1.
f. Click the **Apply Changes** icon.

Step 4 Configure the iSCSI interface in slot 7 port 1 to identify all dynamic iSCSI initiators by their IP address and enable the interface.

a. In Fabric Manager, choose **Switches > Interfaces > FC Logical** in the Physical Attributes pane.
b. Select the **iSCSI** tab in the Information pane.
c. Select **ipaddress** from the Initiator ID Mode drop-down menu and click the **Apply Changes** icon.
d. In Device Manager, choose **Interfaces > Ethernet and iSCSI**.
e. Click the **iSCSI** tab.
f. Select **up** from the Admin drop-down menu for the iSCSI interface in slot 7 port 1.
g. Click **Apply**.

Step 5 Configure the Gigabit Ethernet interface in slot 7 port 5 with the IPv4 address and enable the interface.

a. In Fabric Manager, choose **Switches > Interfaces > Gigabit Ethernet** in the Physical Attributes pane.

b. Click the **IP Address** tab in the Information pane and click **Create Row**.

c. Set the IP address and subnet mask for the Gigabit Ethernet interface in slot 7 port 5.

d. Click **Create.**

e. Select the **General** tab and select **up** from the Admin drop-down menu for the Gigabit Ethernet interface in slot 7 port 5.

f. Click the **Apply Changes** icon.

Step 6 Configure the iSCSI interface in slot 7 port 5 to identify all dynamic iSCSI initiators by IP address and enable the interface.

a. In Fabric Manager, choose **Switches > Interfaces > FC Logical** in the Physical Attributes pane.

b. Click the **iSCSI** tab in the Information pane.

c. Select **ipaddress** from the Initiator ID Mode drop-down menu and click the **Apply Changes** icon.

d. In Device Manager, choose **Interfaces > Ethernet and iSCSI**.

e. Click the **iSCSI** tab.

f. Select **up** from the Admin drop-down menu for the iSCSI interface in slot 7 port 5.

g. Click **Apply**.

Step 7 Configure for static pWWN and nWWN for host 1.

a. In Device Manager, choose **IP > iSCSI**.

b. Click the **Initiators** tab.

c. Check the **Node Address Persistent** and **Node Address System-assigned** check boxes the Host 1 iSCSI initiator.

d. Click **Apply**.

Step 8 Configure for static pWWN for Host 2.

a. In Device Manager, Choose **IP > iSCSI**.

b. Click the **Initiators** tab.

c. Right-click on the Host 2 iSCSI initiator and click Edit pWWN.

d. Select **1** from the System-assigned Num field and click **Apply**.

Step 9 View the configured WWNs.

Note The WWNs are assigned by the system. The initiators are members of different VSANs.

a. In Fabric Manager, choose **End Devices > iSCSI** in the Physical Attributes pane.

b. Click the **Initiators** tab.

Step 10 Create a zone for Host 1 and the iSCSI target in VSAN 1.

Note Use the IP address of the host in zone membership configuration because the iSCSI interface is configured to identify all hosts based on IP address.

a. In Fabric Manager, choose **Zones > Edit Local Full Zone Database**.

b. Select VSAN 1 from the VSAN drop-down menu in the Edit Local Full Zone Database dialog box.

c. Select the **Zones** folder in the left navigation pane and click **Insert**.

d. Set the Zone Name field to **iscsi-zone-1** and click **OK.**

e. Select the iscsi-zone-1 folder in the left navigation pane and click **Insert**.

f. Set the ZoneBy radio button to **WWN.**

g. Set the Port WWN to the pWWN for the Fibre Channel target (that is, 21:00:00:20:37:6f:fd:97). and click **Add**.

h. Set the ZoneBy radio button to **iSCSI IP Address/Subnet.**

i. Set the IP Address/Mask field to the IP Address for Host 1 iSCSI initiator (10.11.1.10) and click **Add**.

Note Fibre Channel storage for zone membership for the iSCSI initiator, either the iSCSI symbolic node name or the pWWN, can be used. In this case, the pWWN is persistent.

Step 11 Create a zone set in VSAN 1 and activate it.

a. In Fabric Manager, choose **Zones > Edit Local Full Zone Database**.

b. Select VSAN 1 from the VSAN drop-down menu in the Edit Local Full Zone Database dialog box.

c. Select the **Zoneset** folder in the left navigation pane and click **Insert**.

d. Set the Zoneset Name to **zonset-iscsi-1** and click **OK**.

e. Click on the **zoneset-iscsi-1** folder and click **Insert**.

f. Set the Zone Name field to **iscsi-zone-1** and click **OK.**

g. Click **Activate** to activate the new zone set.

h. Click **Continue Activation** to finish the activation.

Step 12 Create a zone with host 2 and two Fibre Channel targets.

Note If the host is in VSAN 2, the Fibre Channel targets and zone must also be in VSAN 2.

Note iSCSI interface is configured to identify all hosts based on node name.

a. In Fabric Manager, choose **Zones > Edit Local Full Zone Database**.

b. Select VSAN 2 from the VSAN drop-down menu in the Edit Local Full Zone Database dialog box.

c. Select the **Zones** folder in the left navigation pane and click **Insert**.

d. Set the Zone Name field to **iscsi-zone-2** and click **OK.**

e. Select the **iscsi-zone-2** folder in the left navigation pane and click **Insert**.

f. Set the ZoneBy radio button to**WWN.**

g. Set the Port WWN to the pWWN for one of the Fibre Channel targets (for example, 21:00:00:20:37:6f:fe:5) and click **Add**.

h. Set the Port WWN to the pWWN for another of the Fibre Channel targets (for example, 21:00:00:20:37:a6:a6:5d) and click **Add**.

i. Set the ZoneBy radio button to **iSCSI IP Address/Subnet.**

j. Set the IP Address/Mask field to the IP Address for Host 2 iSCSI initiator (10.15.1.11) and click **Add**.

Step 13 Create a zone set in VSAN 2 and activate it.

a. In Fabric Manager, choose **Zones > Edit Local Full Zone Database**.

b. Select VSAN 2 from the VSAN drop-down menu in the Edit Local Full Zone Database dialog box.

c. Select the **Zoneset** folder in the left navigation pane and click **Insert**.

d. Set the Zoneset Name to **zonset-iscsi-2** and click **OK**.

e. Click on the **zoneset-iscsi-2** folder and click **Insert**.

f. Set the Zone Name field to **iscsi-zone-2** and click **OK.**

g. Click **Activate** to activate the new zone set.

h. Click **Continue Activation** to finish the activation.

Step 14 Start the iSCSI clients on both hosts.

Step 15 Show all the iSCSI sessions.

a. In Device Manager, choose **Interface > Monitor > Ethernet** and select the **iSCSI connections** tab to show all the iSCSI sessions.

b. In Device Manager, choose **IP > iSCSI** and select the **Session Initiators** tab.

c. Click **Details.**

Step 16 In Fabric Manager, choose **End Devices > iSCSI** in the Physical Attributes pane to verify the details of the two iSCSI initiators.

Step 17 In Fabric Manager, choose **Zones > Edit Local Full Zone Database** to view the active zone set. The iSCSI initiators' FC IDs are resolved.

Step 18 In Device Manager, choose **FC > Name Server.** The Fibre Channel name server shows the virtual N ports created for the iSCSI hosts.

Step 19 In Device Manager, Choose **FC > Name Server.**

Step 20 Click the **Advanced** tab**.** Verify the detailed output of the iSCSI initiator nodes in the Fibre Channel name server.

Overview of Internet Storage Name Service

Internet Storage Name Service (iSNS) allows your existing TCP/IP network to function more effectively as a SAN by automating the discovery, management, and configuration of iSCSI devices. To facilitate these functions, the iSNS server and client function as follows:

- The iSNS client registers iSCSI portals and all iSCSI devices accessible through them with an iSNS server.
- The iSNS server provides the following services for the iSNS client:
  - Device registration
  - State change notification
  - Remote domain discovery services

All iSCSI devices (both initiator and target) acting as iSNS clients, can register with an iSNS server. iSCSI initiators can then query the iSNS server for a list of targets. The iSNS server will respond with a list of targets that the querying client can access based on configured access control parameters.

A Cisco MDS 9000 Family switch can act as an iSNS client and register all available iSCSI targets with an external iSNS server. All switches in the Cisco MDS 9000 Family with Fibre Channel module with IPS ports or MPS-14/2 modules installed support iSNS server functionality. This allows external iSNS clients, such as an iSCSI initiator, to register with the switch and discover all available iSCSI targets in the SAN.

This section includes the following topics:

- Overview of iSNS Client Functionality, page 4-clxxxiii
- Creating an iSNS Client Profile, page 4-clxxxiv
- Overview of iSNS Client Functionality, page 4-clxxxiii
- Configuring an iSNS Server, page 4-clxxxix

Overview of iSNS Client Functionality

Internet Storage Name Service (iSNS) allows your existing TCP/IP network to function more effectively as a SAN by automating the discovery, management, and configuration of iSCSI devices. The iSNS client registers iSCSI portals and all iSCSI devices accessible through them with an iSNS server. All iSCSI devices (both initiator and target) acting as iSNS clients can register with an iSNS server. When the iSNS client is unable to register or deregister objects with the iSNS server (for example, the client is unable to make a TCP connection to the iSNS server), it retries every minute to reregister all iSNS objects for the affected interfaces with the iSNS server.

The iSNS client functionality on each IPS interface (Gigabit Ethernet interface or subinterface or port channel) registers information with an iSNS server.

Once a profile is tagged to an interface, the switch opens a TCP connection to the iSNS server IP address (using the well-known iSNS port number 3205) in the profile and registers network entity and portal objects; a unique entity is associated with each IPS interface. The switch then searches the Fibre Channel name server (FCNS) database and switch configuration to find storage nodes to register with the iSNS server.

Statically mapped virtual targets are registered if the associated Fibre Channel pWWN is present in the FCNS database and no access control configuration prevents it. A dynamically mapped target is registered if dynamic target importing is enabled. See the "Presenting Fibre Channel Targets as iSCSI Targets" section on page 4-lxxxv for more details on how iSCSI imports Fibre Channel targets.

A storage node is deregistered from the iSNS server when it becomes unavailable when a configuration changes (such as access control change or dynamic import disabling) or the Fibre Channel storage port goes offline. It is registered again when the node comes back online.

When the iSNS client is unable to register or deregister objects with the iSNS server (for example, the client is unable to make a TCP connection to the iSNS server), it retries every minute to reregister all iSNS objects for the affected interfaces with the iSNS server. The iSNS client uses a registration interval value of 15 minutes. If the client fails to refresh the registration during this interval, the server will deregister the entries.

Untagging a profile also causes the network entity and portal to be deregistered from that interface.

Note The iSNS client is not supported on a VRRP interface.

Creating an iSNS Client Profile

To create an iSNS profile, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# isns profile name MyIsns` `switch(config-isns-profile)#`	Creates a profile called MyIsns.
Step 3	`switch(config-isns-profile)# server 10.10.100.211`	Specifies an iSNS server IPv4 address for this profile.
Step 4	`switch(config-isns-profile)# no server 10.10.100.211`	Removes a configured iSNS server from this profile.
Step 5	`switch(config-isns-profile)# server 2003::11`	Specifies an iSNS server IPv6 address for this profile.
Step 6	`switch(config-isns-profile)# no server 10.20.100.211`	Removes a configured iSNS server from this profile.

To create an iSNS profile using Fabric Manager, follow these steps:

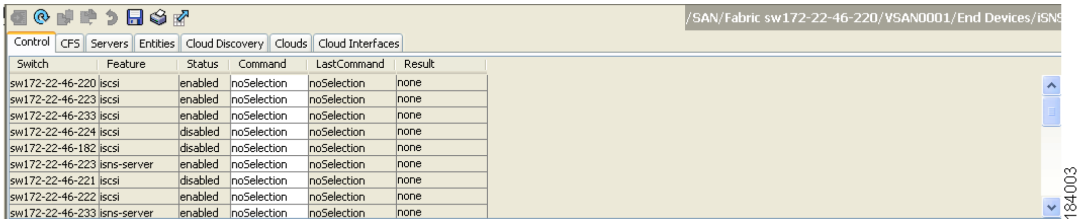
Step 1 Choose **End Devices > iSCSI** in the Physical Attributes pane.

You see the iSCSI configuration in the Information pane (see Figure 4-12).

Step 2 Select the **iSNS** tab.

Step 3 You see the iSNS profiles configured (see Figure 4-46).

Figure 4-46 iSNS Profiles in Fabric Manager



Switch	Feature	Status	Command	LastCommand	Result
sw172-22-46-220	iscsi	enabled	noSelection	noSelection	none
sw172-22-46-223	iscsi	enabled	noSelection	noSelection	none
sw172-22-46-233	iscsi	enabled	noSelection	noSelection	none
sw172-22-46-224	iscsi	disabled	noSelection	noSelection	none
sw172-22-46-182	iscsi	disabled	noSelection	noSelection	none
sw172-22-46-223	isns-server	enabled	noSelection	noSelection	none
sw172-22-46-221	iscsi	disabled	noSelection	noSelection	none
sw172-22-46-222	iscsi	enabled	noSelection	noSelection	none
sw172-22-46-233	isns-server	enabled	noSelection	noSelection	none

Step 4 Click the **Create Row** icon.

You see the Create iSNS Profiles dialog box.

Step 5 Set the ProfileName field to the iSNS profile name that you want to create.

Step 6 Set the ProfileAddr field to the IP address of the iSNS server.

Step 7 Click **Create** to save these changes.

To remove an iSNS profile, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# no isns profile name OldIsns`	Removes a configured iSNS profile called OldIsns.

To delete an iSNS profile using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSCSI** from the Physical Attributes pane.

You see the iSCSI configuration in the Information pane (see Figure 4-12).

Step 2 Select the **iSNS** tab.

You see the iSNS profiles configured (see Figure 4-46).

Step 3 Right-click on the profile that you want to delete and click the **Delete Row** icon.

To tag a profile to an interface, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# interface gigabitethernet 4/1` `switch(config-if)#`	Configures the specified Gigabit Ethernet interface.
Step 3	`switch(config-if)# isns MyIsns`	Tags a profile to an interface.

To tag a profile to an interface using Fabric Manager, follow these steps:

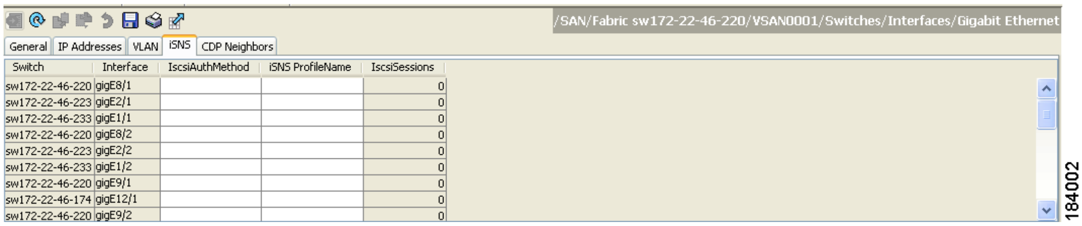
Step 1 Choose **Switches > Interfaces > Gigabit Ethernet** in the Physical Attributes pane.

You see the Gigabit Ethernet configuration in the Information pane.

Step 2 Click the **iSNS** tab.

You see the iSNS profiles configured for these interfaces (see Figure 4-47).

Figure 4-47 iSNS Profiles in Fabric Manager


/SAN/Fabric sw172-22-46-220/VSAN0001/Switches/Interfaces/Gigabit Ethernet
General
IP Addresses
VLAN
iSNS
CDP Neighbors
184002

Switch	Interface	IscsiAuthMethod	iSNS ProfileName	IscsiSessions
sw172-22-46-220	gigE8/1			0
sw172-22-46-223	gigE2/1			0
sw172-22-46-233	gigE1/1			0
sw172-22-46-220	gigE8/2			0
sw172-22-46-223	gigE2/2			0
sw172-22-46-233	gigE1/2			0
sw172-22-46-220	gigE9/1			0
sw172-22-46-174	gigE12/1			0
sw172-22-46-220	gigE9/2			0

Step 3 Set the iSNS ProfileName field to the iSNS profile name that you want to add to this interface.

Step 4 Click the **Apply Changes** icon to save these changes.

To untag a profile from an interface, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# interface gigabitethernet 5/1` `switch(config-if)#`	Configures the specified Gigabit Ethernet interface.
Step 3	`switch(config-if)# no isns OldIsns`	Untags a profile from an interface.

Use the **isns reregister** command in EXEC mode to reregister associated iSNS objects with the iSNS server.

```
switch# isns reregister gigabitethernet 1/4
switch# isns reregister port-channel 1
```

To untag a profile from an interface using Fabric Manager, follow these steps:

Step 1 Choose **Switches > Interfaces > Gigabit Ethernet** in the Physical Attributes pane.

You see the Gigabit Ethernet Configuration in the Information pane.

Step 2 Click the **iSNS** tab.

You see the iSNS profiles configured for these interfaces (see Figure 4-47).

Step 3 Right-click the iSNS ProfileName field that you want to untag and delete the text in that field.

Step 4 Click the **Apply Changes** icon to save these changes.

Verifying iSNS Client Configuration

Use the **show isns profile** command to view configured iSNS profiles. Profile ABC has two portals registered with the iSNS server. Each portal corresponds to a particular interface. Profile XYZ has a specified iSNS server, but does not have any tagged interfaces configured (see Example 4-19 and Example 4-20).

Example 4-19 Displaying Information for Configured iSNS Profiles

```
switch# show isns profile
iSNS profile name ABC
tagged interface GigabitEthernet2/3
tagged interface GigabitEthernet2/2
iSNS Server 10.10.100.204

iSNS profile name XYZ
iSNS Server 10.10.100.211
```

Example 4-20 Displaying a Specified iSNS Profile

```
switch# show isns profile ABC
iSNS profile name ABC
tagged interface GigabitEthernet2/3
tagged interface GigabitEthernet2/2
iSNS Server 10.10.100.204
```

Use the **show isns profile counters** command to view all configured profiles with the iSNS PDU statistics for each tagged interface (see Example 4-21 and Example 4-22).

Example 4-21 Displaying Configured Profiles with iSNS Statistics

```
switch# show isns profile counters
iSNS profile name ABC
tagged interface port-channel 1
iSNS statistics
  Input 54 pdus (registration/deregistration pdus only)
    Reg pdus 37,  Dereg pdus 17
  Output 54 pdus (registration/deregistration pdus only)
    Reg pdus  37,  Dereg pdus 17
iSNS Server  10.10.100.204

iSNS profile name XYZ
tagged interface  port-channel 2
iSNS statistics
  Input 30 pdus (registration/deregistration pdus only)
    Reg pdus 29,  Dereg pdus 1
  Output 30 pdus (registration/deregistration pdus only)
    Reg pdus  29,  Dereg pdus 1
iSNS Server  10.1.4.218
```

Example 4-22 Displaying iSNS Statistics for a Specified Profile

```
switch# show isns profile ABC counters
iSNS profile name ABC
tagged interface  port-channel 1
iSNS statistics
  Input 54 pdus (registration/deregistration pdus only)
    Reg pdus 37,  Dereg pdus 17
  Output 54 pdus (registration/deregistration pdus only)
    Reg pdus  37,  Dereg pdus 17
iSNS Server  10.10.100.204
```

Use the **show isns** command to view all objects registered on the iSNS server and specified in the given profile (see Example 4-23).

Example 4-23 Displaying iSNS Queries

```
switch# show isns query ABC gigabitethernet 2/3
iSNS server: 10.10.100.204
Init: iqn.1991-05.com.w2k
  Alias: <MS SW iSCSI Initiator>
Tgt : iqn.1987-05.com.cisco:05.172.22.94.22.02-03
Tgt : iqn.1987-05.com.cisco:05.172.22.94.22.02-03.210000203762fa34
  nWWN: 200000203762fa34
```

Use the **show interface** command to view the iSNS profile to which an interface is tagged (see Example 4-24).

Example 4-24 Displaying Tagged iSNS Interfaces

```
switch# show interface gigabitethernet 2/3
    GigabitEthernet2/3 is up
    Hardware is GigabitEthernet, address is 0005.3000.ae94
    Internet address is 10.10.100.201/24
    MTU 1500  bytes
    Port mode is IPS
    Speed is 1 Gbps
    Beacon is turned off
    Auto-Negotiation is turned on
    iSNS profile ABC
```

```
^^^^^^^^^^^^^^^^
5 minutes input rate 112 bits/sec, 14 bytes/sec, 0 frames/sec
5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
1935 packets input, 132567 bytes
  4 multicast frames, 0 compressed
  0 input errors, 0 frame, 0 overrun 0 fifo
1 packets output, 42 bytes, 0 underruns
  0 output errors, 0 collisions, 0 fifo
  0 carrier errors
```

iSNS Server Functionality

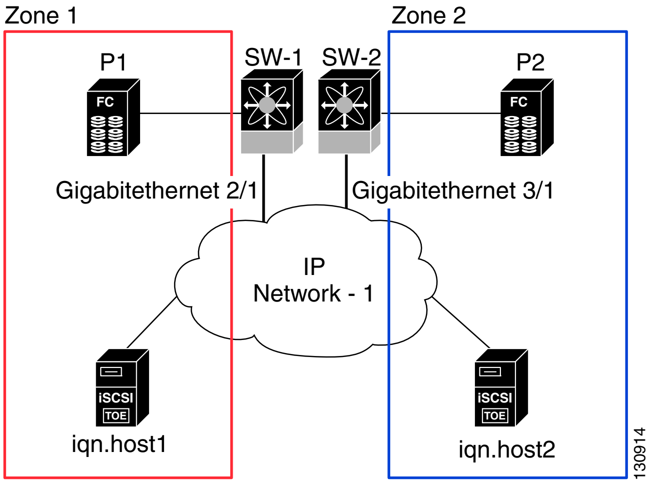
When enabled, the iSNS server on the Cisco 9000 Family MDS switch tracks all registered iSCSI devices. As a result, iSNS clients can locate other iSNS clients by querying the iSNS server. The iSNS server also provides the following functionalities:

- Allows iSNS clients to register, deregister, and query other iSNS clients registered with the iSNS server.
- Provides centralized management for enforcing access control to provide or deny access to targets from specific initiators.
- Provides a notification mechanism for registered iSNS clients to receive change notifications on the status change of other iSNS clients.
- Provides a single access control configuration for both Fibre Channel and iSCSI devices.
- Discovers iSCSI targets that do not have direct IP connectivity to the iSCSI initiators.

Sample Scenario

The iSNS server provides uniform access control across Fibre Channel and iSCSI devices by utilizing both Fibre Channel zoning information and iSCSI access control information and configuration. An iSCSI initiator acting as an iSNS client only discovers devices it is allowed to access based on both sets of access control information. Figure 4-48 provides an example of this scenario.

Figure 4-48 Using iSNS Servers in the Cisco MDS Environment



In Figure 4-48, iqn.host1 and iqn.host2 are iSCSI initiators. P1 and P2 are Fibre Channel targets. The two initiators are in different zones: Zone 1 consists of iqn.host1 and target P1, and Zone 2 consists of iqn.host2 and target P2. iSNS server functionality is enabled on both switches, SW-1 and SW-2. The registration process proceeds as follows:

1. Initiator iqn.host1 registers with SW-1, port Gigabitethernet2/1.

2. Initiator iqn.host2 registers with SW-2, port Gigabitethernet3/1.
3. Initiator iqn.host1 issues an iSNS query to SW-1 to determine all accessible targets.
4. The iSNS server in turn queries the Fibre Channel name server (FCNS) to obtain a list of devices that are accessible (that is, in the same zone) by the query originator. This query yields only P1.
5. The iSNS server then queries its own database to convert the Fibre Channel devices to the corresponding iSCSI targets. This is based on the iSCSI configuration, such as virtual-target and its access control setting or whether the dynamic Fibre Channel target import feature is enabled or disabled.
6. The iSNS server sends a response back to the query initiator. This response contains a list all iSCSI portals known to the iSNS server. This means iqn.host1 can choose to log in to target P1 through either SW-1 (at Gigabitethernet 2/1) or SW-2 (at Gigabitethernet 3/1).
7. If the initiator chooses to log in to SW-1 and later that port becomes inaccessible (for example, Gigabitethernet 2/1 goes down), the initiator has the choice to move to connect to target P1 through port Gigabitethernet 3/1 on SW-2 instead.
8. If the target either goes down or is removed from the zone, the iSNS server sends out an iSNS State Change Notification (SCN) message to the initiator so that the initiator can remove the session.

Configuring an iSNS Server

This section describe how to configure an iSNS server on a Cisco MDS 9000 Family switch.

This section includes the following topics:

- Enabling an iSNS Server, page 4-clxxxix
- iSNS Configuration Distribution, page 4-cxc
- Configuring the ESI Retry Count, page 4-cxc
- Configuring a Registration Period, page 4-cxci
- iSNS Client Registration and Deregistration, page 4-cxci
- Target Discovery, page 4-cxcii
- Verifying the iSNS Server Configuration, page 4-cxcii

Enabling an iSNS Server

Before the iSNS server feature can be enabled, iSCSI must be enabled (see the "Enabling iSCSI" section on page 4-lxxx). When you disable iSCSI, iSNS is automatically disabled. When the iSNS server is enabled on a switch, every IPS port whose corresponding iSCSI interface is up is capable of servicing iSNS registration and query requests from external iSNS clients.

To enable the iSNS server, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# isns-server enable`	Enables the iSNS server.
	`switch(config)# no isns-server enable`	Disables (default) the iSNS server.

To enable the iSNS server using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSNS**.

You see the iSNS configuration in the Information pane.

Step 2 Click the **Control** tab and select **enable** from the Command drop-down menu for the iSNS server feature.

Step 3 Click the **Apply Changes** icon to save this change.

Note If you are using VRRP IPv4 addresses for discovering targets from iSNS clients, ensure that the IP address is created using the **secondary** option (see "Adding Virtual Router IP Addresses" section on page 5-ccxxvi).

iSNS Configuration Distribution

You can use the CFS infrastructure to distribute the iSCSI initiator configuration to iSNS servers across the fabric. This allows the iSNS server running on any switch to provide a querying iSNS client a list of iSCSI devices available anywhere on the fabric. For information on CFS, see the *Cisco Fabric Manager System Management Configuration Guide* and *Cisco MDS 9000 Family NX-OS System Management Configuration Guide.*

To enable iSNS configuration distribution using, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# isns distribute`	Uses the CFS infrastructure to distribute the iSCSI virtual target configuration to all switches in the fabric.
	`switch(config)# no isns distribute`	Stops (default) the distribution of iSCSI virtual target configuration to all switches in the fabric.

To enable iSNS configuration distribution using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSNS**.

You see the iSNS configuration in the Information pane.

Step 2 Click the **CFS** tab and select **enable** from the Admin drop-down menu for iSNS.

Step 3 Select **enable** from the Global drop-down menu for iSNS.

Step 4 Click the **Apply Changes** icon to save this change.

Configuring the ESI Retry Count

The iSNS client registers information with its configured iSNS server using an iSNS profile. At registration, the client can indicate an entity status inquiry (ESI) interval of 60 seconds or more. If the client registers with an ESI interval set to zero (0), then the server does not monitor the client using ESI. In such cases, the client's registrations remain valid until explicitly deregistered or the iSNS server feature is disabled.

The ESI retry count is the number of times the iSNS server queries iSNS clients for their entity status. The default ESI retry count is 3. The client sends the server a response to indicate that it is still alive. If the client fails to respond after the configured number of retries, the client is deregistered from the server.

To configure the ESI retry count for an iSNS server, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# isns esi retries 6`	Configures the ESI to retry contacting the client up to 6 times. The range is 1 to 10.
	`switch(config)# no isns esi retries 6`	Reverts to the default value of 3 retries.

Configuring a Registration Period

The iSNS client specifies the registration period with the iSNS Server. The iSNS Server keeps the registration active until the end of this period. If there are no commands from the iSNS client during this period, then the iSNS server removes the client registration from its database.

If the iSNS client does not specify a registration period, the iSNS server assumes a default value of 0, which keeps the registration active indefinitely. You can also manually configure the registration period on the MDS iSNS Server.

To configure the registration period on an iSNS Server, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# isns registration period 300`	Configures the registration to be active for 300 seconds. The permissible registration period is between 0 to 65536 seconds.
	`switch(config)# no isns registration period`	Reverts to the client registered timeout value, or the default value of 0.

To configure the registration period on an iSNS Server using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSNS**.

You see the iSNS configuration in the Information pane.

Step 2 Click the **Servers** tab.

You see the configured iSNS servers.

Step 3 Set the **ESI NonResponse Threshold** field to the ESI retry count value.

Step 4 Click the **Apply Changes** icon to save this change.

iSNS Client Registration and Deregistration

You can use the **show isns database** command to display all registered iSNS clients and their associated configuration.

An iSNS client cannot query the iSNS server until it has registered. iSNS client deregistration can occur either explicitly or when the iSNS server detects that it can no longer reach the client (through ESI monitoring).

iSNS client registration and deregistration result in status change notifications (SCNs) being generated to all interested iSNS clients.

Target Discovery

iSCSI initiators discover targets by issuing queries to the iSNS server. The server supports *DevGetNext* requests to search the list of targets and *DevAttrQuery* to determine target and portal details, such as the IP address or port number to which to connect.

On receiving a query request from the iSCSI client, the iSNS server queries the Fibre Channel Name Server (FCNS) to obtain a list of Fibre Channel targets that are accessible by the querying initiator. The result of this query depends on zoning configuration currently active and current configuration(s) of the initiator. The iSNS server will subsequently use the iSCSI target configuration(s) (virtual target and dynamic import configuration) to translate the Fibre Channel target to an equivalent iSCSI target. At this stage it also applies any access control configured for the virtual target. A response message with the target details is then sent back to the query initiator.

The iSNS server sends a consolidated response containing all possible targets and portals to the querying initiator. For example, if a Fibre Channel target is exported as different iSCSI targets on different IPS interfaces, the iSNS server will respond with a list of all possible iSCSI targets and portals.

In order to keep the list of targets updated, the iSNS server sends state change notifications (SCN) to the client whenever an iSCSI target becomes reachable or unreachable. The client is then expected to rediscover its list of accessible targets by initiating another iSNS query. Reachability of iSCSI targets changes when any one of the following occurs:

- Target goes up or down.
- Dynamic import of FC target configuration changes.
- Zone set changes.
- Default zone access control changes.
- IPS interface state changes.
- Initiator configuration change makes the target accessible or inaccessible.

Verifying the iSNS Server Configuration

Use the **show isns config** command to view the ESI interval and the summary information about the iSNS database contents (see Example 4-25).

Example 4-25 Displaying the iSNS Server Configuration of ESI Interval and Database Contents

```
switch# show isns config
Server Name: switch1(Cisco Systems) Up since: Fri Jul 30 04:08:16 2004
    Index: 1    Version: 1     TCP Port: 3205
    fabric distribute (remote sync): ON
    ESI
       Non Response Threshold: 5 Interval(seconds): 60
   Database contents
       Number of Entities: 2
       Number of Portals: 3
       Number of ISCSI devices: 4
       Number of Portal Groups: 0
```

Use the **show isns database** command to view detailed information about the contents of the iSNS database (see Example 4-26 through Example 4-29). This command displays the full iSNS database giving all the entities, nodes, and portals registered in the database. This command without options only displays explicitly registered objects. The asterisk next to the VSAN ID indicates that the iSCSI node is in the default zone for that VSAN.

Example 4-26 Displaying Explicitly Registered Objects

```
switch# show isns database
Entity Id: dp-204
```

```
    Index: 2             Last accessed: Fri Jul 30 04:08:46 2004

iSCSI Node Name: iqn.1991-05.comdp-2041
    Entity Index: 2
    Node Type: Initiator(2)      Node Index: 0x1
    SCN Bitmap: OBJ_UPDATED|OBJ ADDED|OBJ REMOVED|TARGET&SELF
    Node Alias: <MS SW iSCSI Initiator>

    VSANS: 1(*), 5(*)
Portal IP Address: 192.168.100.2          TCP Port: 4179
    Entity Index: 2    Portal Index: 1
    ESI Interval: 0     ESI Port: 4180     SCN Port: 4180
```

Example 4-27 Displaying the Full Database with Both Registered and Configured Nodes and Portals

```
switch# show isns database full
Entity Id: isns.entity.mds9000
    Index: 1             Last accessed: Fri Jul 30 04:08:16 2004

iSCSI Node Name: iqn.com.cisco.disk1
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000001
    WWN(s):
        22:00:00:20:37:39:dc:45
    VSANS:
iSCSI Node Name: iqn.isns-first-virtual-target
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000002

    VSANS:
iSCSI Node Name: iqn.com.cisco.disk2
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000003
    WWN(s):
        22:00:00:20:37:39:dc:45

    VSANS:
Portal IP Address: 192.168.100.5          TCP Port: 3205
    Entity Index: 1    Portal Index: 3

Portal IP Address: 192.168.100.6          TCP Port: 3205
    Entity Index: 1    Portal Index: 5

Entity Id: dp-204
    Index: 2             Last accessed: Fri Jul 30 04:08:46 2004

iSCSI Node Name: iqn.1991-05.com.microsoft:dp-2041
    Entity Index: 2
    Node Type: Initiator(2)      Node Index: 0x1
    SCN Bitmap: OBJ_UPDATED|OBJ ADDED|OBJ REMOVED|TARGET&SELF
    Node Alias: <MS SW iSCSI Initiator>

    VSANS: 1(*), 5(*)
Portal IP Address: 192.168.100.2          TCP Port: 4179
    Entity Index: 2    Portal Index: 1
    ESI Interval: 0     ESI Port: 4180     SCN Port: 4180
```

Note The **local option** is only available for virtual targets.

Example 4-28 Displaying the Virtual Target Information in a Local Switch

```
switch# show isns database virtual-targets local
Entity Id: isns.entity.mds9000
    Index: 1             Last accessed: Fri Jul 30 04:08:16 2004

iSCSI Node Name: iqn.com.cisco.disk1
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000001
    WWN(s):
        22:00:00:20:37:39:dc:45

    VSANS:
iSCSI Node Name: iqn.isns-first-virtual-target
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000002

    VSANS:
iSCSI Node Name: iqn.com.cisco.disk2
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000003
    WWN(s):
        22:00:00:20:37:39:dc:45

    VSANS:
Portal IP Address: 192.168.100.5          TCP Port: 3205
    Entity Index: 1    Portal Index: 3

Portal IP Address: 192.168.100.6          TCP Port: 3205
    Entity Index: 1    Portal Index: 5
```

Example 4-29 Displaying Virtual Target for a Specified Switch

```
switch# show isns database virtual-targets switch 20:00:00:0d:ec:01:04:40
Entity Id: isns.entity.mds9000
    Index: 1             Last accessed: Fri Jul 30 04:08:16 2004

iSCSI Node Name: iqn.com.cisco.disk1
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000001
    WWN(s):
        22:00:00:20:37:39:dc:45

    VSANS:
iSCSI Node Name: iqn.isns-first-virtual-target
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000002

    VSANS:
iSCSI Node Name: iqn.com.cisco.disk2
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000003
    WWN(s):
        22:00:00:20:37:39:dc:45

    VSANS:
Portal IP Address: 192.168.100.5          TCP Port: 3205
    Entity Index: 1    Portal Index: 3

Portal IP Address: 192.168.100.6          TCP Port: 3205
    Entity Index: 1    Portal Index: 5
```

Use the **show isns node** command to display attributes of nodes registered with the iSNS server (see Example 4-30 through Example 4-32). If you do not specify any options, the server displays the name and node type attribute in a compact format; one per line.

Example 4-30 Displaying Explicitly Registered Objects

```
switch# show isns node all
--------------------------------------------------------------------------------
iSCSI Node Name                                                     Type
--------------------------------------------------------------------------------
iqn.1987-05.com.cisco:05.switch1.02-03.22000020375a6c8            Target
...
iqn.com.cisco.disk1                                                 Target
iqn.com.cisco.ipdisk                                                Target
iqn.isns-first-virtual-target                                       Target
iqn.1991-05.cw22                                                    Target
iqn.1991-05.cw53                                                    Target
```

Example 4-31 Displaying the Specified Node

```
switch# show isns node name iqn.com.cisco.disk1
iSCSI Node Name: iqn.com.cisco.disk1
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000001
    WWN(s):
        22:00:00:20:37:39:dc:45
    VSANS:  1
```

Example 4-32 Displaying the Attribute Details for All Nodes

```
switch# show isns node all detail
iSCSI Node Name: iqn.1987-05.com.cisco:05.switch1.02-03.22000020375a6c8f
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x3000003
    Configured Switch WWN: 20:00:00:0d:ec:01:04:40
        WWN(s):
            22:00:00:20:37:5a:6c:8f
        VSANS:  1
...
iSCSI Node Name: iqn.com.cisco.disk1
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000001
    Configured Switch WWN: 20:00:00:0d:ec:01:04:40
        WWN(s):
            22:00:00:20:37:39:dc:45
        VSANS:  1

iSCSI Node Name: iqn.com.cisco.ipdisk
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000002
    Configured Switch WWN: 20:00:00:0d:ec:01:04:40
        WWN(s):
            22:00:00:20:37:5a:70:1a
        VSANS:  1

iSCSI Node Name: iqn.isns-first-virtual-target
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000003
    Configured Switch WWN: 20:00:00:0d:ec:01:04:40
```

```
iSCSI Node Name: iqn.parna.121212
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000004
    Configured Switch WWN: 20:00:00:0d:ec:01:04:40

iSCSI Node Name: iqn.parna.121213
    Entity Index: 1
    Node Type: Target(1)      Node Index: 0x80000005
    Configured Switch WWN: 20:00:00:0d:ec:01:04:40
```

Use the **show isns portal** command to display the attributes of a portal along with its accessible nodes (see Example 4-33 through Example 4-37). You can specify portals by using the switch WWN-interface combination or the IP address-port number combination.

Example 4-33 Displaying the Attribute Information for All Portals

```
switch# show isns portal all
--------------------------------------------------------------------------------
IPAddress      TCP Port     Index              SCN Port             ESI  port
--------------------------------------------------------------------------------
192.168.100.5    3205         3                  -                    -
192.168.100.6    3205         5                  -                    -
```

Example 4-34 Displaying Detailed Attribute Information for All Portals

```
switch# show isns portal all detail
Portal IP Address: 192.168.100.5          TCP Port: 3205
    Entity Index: 1    Portal Index: 3

Portal IP Address: 192.168.100.6          TCP Port: 3205
    Entity Index: 1    Portal Index: 5
```

Example 4-35 Displaying Virtual Portals

```
switch# show isns portal virtual
--------------------------------------------------------------------------------
IPAddress      TCP Port     Index              SCN Port             ESI  port
--------------------------------------------------------------------------------
192.168.100.5    3205         3                  -                    -
192.168.100.6    3205         5                  -                    -
```

Example 4-36 Displaying Virtual Portals for a Specified Switch

```
switch# show isns portal virtual switch 20:00:00:0d:ec:01:04:40
--------------------------------------------------------------------------------
IPAddress      TCP Port     Index              SCN Port             ESI  port
--------------------------------------------------------------------------------
192.168.100.5    3205         3                  -                    -
192.168.100.6    3205         5                  -                    -
```

Example 4-37 Displaying Detailed Information for the Virtual Portals in a Specified Switch

```
switch# show isns portal virtual switch 20:00:00:0d:ec:01:04:40 detail
Portal IP Address: 192.168.100.5          TCP Port: 3205
    Entity Index: 1    Portal Index: 3
    Switch WWN: 20:00:00:0d:ec:01:04:40
    Interface: GigabitEthernet2/3

Portal IP Address: 192.168.100.6          TCP Port: 3205
    Entity Index: 1    Portal Index: 5
    Switch WWN: 20:00:00:0d:ec:01:04:40
    Interface: GigabitEthernet2/5
```

Use the **show isns entity** command to display the attributes of an entity along with the list of portals and nodes in that entity (see Example 4-38 through Example 4-42). If you do not specify any option, this command displays the entity ID and number of nodes or portals associated with the entity in a compact format; one per line.

Example 4-38 Displaying All Registered Entries

```
switch1# show isns entity
-------------------------------------------------------------------------------
Entity ID                                                        Last Accessed
-------------------------------------------------------------------------------
dp-204                                                  Tue Sep  7 23:15:42 2004
```

Example 4-39 Displaying All Entities in the Database

```
switch# show isns entity all

-------------------------------------------------------------------------------
Entity ID                                                        Last Accessed
-------------------------------------------------------------------------------
isns.entity.mds9000                                     Tue Sep  7 21:33:23 2004

dp-204                                                  Tue Sep  7 23:15:42 2004
```

Example 4-40 Displaying the Entity with a Specified ID

```
switch1# show isns entity id dp-204
Entity Id: dp-204
    Index: 2             Last accessed: Tue Sep  7 23:15:42 2004
```

Example 4-41 Displaying Detailed Information for All Entities in the Database

```
switch1# show isns entity all detail
Entity Id: isns.entity.mds9000
    Index: 1             Last accessed: Tue Sep  7 21:33:23 2004

Entity Id: dp-204
    Index: 2             Last accessed: Tue Sep  7 23:16:34 2004
```

Example 4-42 Displaying Virtual Entities

```
switch# show isns entity virtual
Entity Id: isns.entity.mds9000
    Index: 1             Last accessed: Thu Aug  5 00:58:50 2004

Entity Id: dp-204
    Index: 2             Last accessed: Thu Aug  5 01:00:23 2004
```

Use the **show iscsi global config** command to display information about import targets (see Example 4-43 and Example 4-44).

Example 4-43 Displaying the Import Target Settings for a Specified Switch

```
switch# show isns iscsi global config switch 20:00:00:05:ec:01:04:00
iSCSI Global configuration:
  Switch: 20:00:00:05:ec:01:04:00 iSCSI Auto Import: Enabled
```

Example 4-44 Displaying the Import Target Settings for All Switches

```
switch# show isns iscsi global config all
iSCSI Global configuration:
  Switch: 20:00:44:0d:ec:01:02:40 iSCSI Auto Import: Enabled
```

Use the **show cfs peers** command to display CFS peers switch information about the iSNS application (see Example 4-45).

Example 4-45 Displaying the CFS Peer Switch Information for the iSNS Application

```
switch# show cfs peers name isns

Scope      : Physical
--------------------------------------------------
 Switch WWN               IP Address
--------------------------------------------------
 20:00:00:00:ec:01:00:40  10.10.100.11   [Local]

Total number of entries = 1
```

iSNS Cloud Discovery

You can configure iSNS cloud discovery to automate the process of discovering iSNS servers in the IP network.

This section includes the following topics:

- Cloud Discovery, page 4-cxcviii
- Configuring iSNS Cloud Discovery, page 4-cxcix
- Verifying Cloud Discovery Status, page 4-cci
- Verifying Cloud Discovery Membership, page 4-cci
- Displaying Cloud Discovery Statistics, page 4-ccii

Cloud Discovery

When an iSNS server receives a query request, it responds with a list of available targets and the portals through which the initiator can reach the target. The IP network configuration outside the MDS switch may result in only a subset of Gigabit Ethernet interfaces being reachable from the initiator. To ensure that the set of portals returned to the initiator is reachable, the iSNS server needs to know the set of Gigabit Ethernet interfaces that are reachable from a given initiator.

Note iSNS Cloud Discovery is not supported on the Cisco Fabric Switch for IBM BladeCenter and Cisco Fabric Switch for HP c-Class BladeSystem.

The iSNS cloud discovery feature provides information to the iSNS server on the various interfaces reachable from an initiator by partitioning the interfaces on a switch into disjointed IP clouds. This discovery is achieved by sending messages to all other known IPS ports that are currently up and, depending on the response (or the lack of it), determines if the remote IPS port is in the same IP network or in a different IP network.

Cloud discovery is initiated when the following events occur:

- Manual requests from the CLI initiate cloud discovery from the CLI. This action causes the destruction of existing memberships and makes new ones.
- Auto-discovery of the interface results in an interface being assigned to its correct cloud. All other cloud members are not affected. The membership of each cloud is built incrementally and is initiated by the following events:
  - A Gigabit Ethernet interface comes up. This can be a local or remote Gigabit Ethernet interface.
  - The IP address of a Gigabit Ethernet interface changes.
  - The VRRP configuration on a port changes.

The iSNS server distributes cloud and membership information across all the switches using CFS. Therefore, the cloud membership view is the same on all the switches in the fabric.

Note For CFS distribution to operate correctly for iSNS cloud discovery, all switches in the fabric must be running Cisco SAN-OS Release 3.0(1) or NX-OS 4.1(1b) and later.

Configuring iSNS Cloud Discovery

This section describes how to configure iSNS cloud discovery and includes the following topics:

- Enabling iSNS Cloud Discovery, page 4-cxcix
- Initiating On-Demand iSNS Cloud Discovery, page 4-cc
- Configuring Automatic iSNS Cloud Discovery, page 4-cc
- Verifying Automatic iSNS Cloud Discovery Configuration, page 4-cc
- Configuring iSNS Cloud Discovery, page 4-cxcix
- Configuring iSNS Cloud Discovery Message Types, page 4-cci

Enabling iSNS Cloud Discovery

To enable iSNS cloud discovery, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# cloud-discovery enable`	Enables iSNS cloud discovery.
	`switch(config)# no cloud-discovery enable`	Disables (default) iSNS cloud discovery.

To enable iSNS cloud discovery using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSNS**.

You see the iSNS configuration in the Information pane.

Step 2 Click the **Control** tab and select **enable** from the Command drop-down menu for the cloud discovery feature.

Step 3 Click the **Apply Changes** icon to save this change.

Initiating On-Demand iSNS Cloud Discovery

To initiate on-demand iSNS cloud discovery, use the **cloud discover** command in EXEC mode.

The following example shows how to initiate on-demand cloud discovery for the entire fabric:

```
switch# cloud discover
```

To initiate on-demand iSNS cloud discovery using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSNS**.

You see the iSNS configuration in the Information pane.

Step 2 Click the **Cloud Discovery** tab and check the **Manual Discovery** check box.

Step 3 Click the **Apply Changes** icon to save this change.

Configuring Automatic iSNS Cloud Discovery

To configure automatic iSNS cloud discovery, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# cloud discovery auto`	Enables (default) automatic iSNS cloud discovery.
	`switch(config)# no cloud discovery auto`	Disables automatic iSNS cloud discovery.

To configure automatic iSNS cloud discovery using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSNS**.

You see the iSNS configuration in the Information pane.

Step 2 Click the **Cloud Discovery** tab and check the **AutoDiscovery** check box.

Step 3 Click the **Apply Changes** icon to save this change.

Verifying Automatic iSNS Cloud Discovery Configuration

To verify the automatic iSNS cloud discovery configuration, use the **show cloud discovery config** command:

```
switch# show cloud discovery config
Auto discovery: Enabled
```

Configuring iSNS Cloud Discovery Distribution

To configure iSNS cloud discovery distribution using CFS, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# cloud discovery fabric distribute`	Enables (default) iSNS cloud discovery fabric distribution.
	`switch(config)# no cloud discovery fabric distribute`	Disables iSNS cloud discovery fabric distribution.

To configure iSNS cloud discovery CFS distribution using Fabric Manager, follow these steps:

Step 1 Choose **End Devices > iSNS**.

You see the iSNS configuration in the Information pane.

Step 2 Click the **CFS** tab and select **enable** from the Admin drop-down menu for the cloud discovery feature.

Step 3 Select **enable** from the Global drop-down menu for the cloud discovery feature.

Step 4 Click the **Apply Changes** icon to save this change.

Configuring iSNS Cloud Discovery Message Types

You can configure iSNS cloud discovery the type of message to use. By default, iSNS cloud discovery uses ICMP.

To configure iSNS cloud discovery message types, follow these steps:

	Command	Purpose
Step 1	`switch# config terminal` `switch(config)#`	Enters configuration mode.
Step 2	`switch(config)# cloud discovery message icmp`	Enables (default) iSNS cloud discovery using ICMP messages. **Note** Only ICMP messages are supported.

Verifying Cloud Discovery Status

Use the **show cloud discovery status** command to verify the status of the cloud discovery operation:

```
switch# show cloud discovery status
Discovery status: Succeeded
```

Verifying Cloud Discovery Membership

Use the **show cloud membership all** command to verify the cloud membership for the switch:

```
switch# show cloud membership all
Cloud 2
    GigabitEthernet1/5[20:00:00:0d:ec:02:c6:c0] IP Addr 10.10.10.5
    GigabitEthernet1/6[20:00:00:0d:ec:02:c6:c0] IP Addr 10.10.10.6
  #members=2
```

Use the **show cloud membership unresolved** command to verify the unresolved membership on the switch:

```
switch# show cloud membership unresolved
Undiscovered Cloud
  No members
```

Displaying Cloud Discovery Statistics

Use the **show cloud discovery statistics** command to display the statistics for the cloud discovery operation:

```
switch# show cloud discovery statistics
Global statistics
    Number of Auto Discovery                        = 1
    Number of Manual Discovery                      = 0
    Number of cloud discovery (ping) messages sent = 1
    Number of cloud discovery (ping) success       = 1
```

Default Settings

Table 4-2 lists the default settings for iSCSI parameters.

Table 4-2 Default iSCSI Parameters

Parameters	Default
Number of TCP connections	One per iSCSI session
minimum-retransmit-time	300 msec
keepalive-timeout	60 seconds
max-retransmissions	4 retransmissions
PMTU discovery	Enabled
pmtu-enable reset-timeout	3600 sec
SACK	Enabled
max-bandwidth	1 Gbps
min-available-bandwidth	70 Mbps
round-trip-time	1 msec
Buffer size	4096 KB
Control TCP and data connection	No packets are transmitted
TCP congestion window monitoring	Enabled
Burst size	50 KB
Jitter	500 microseconds
TCP connection mode	Active mode is enabled
Fibre Channel targets to iSCSI	Not imported
Advertising iSCSI target	Advertised on all Gigabit Ethernet interfaces, subinterfaces, port channel interfaces, and port channel subinterfaces

Table 4-2 Default iSCSI Parameters (continued)

Parameters	**Default**
iSCSI hosts mapping to virtual Fibre Channel hosts	Dynamic mapping
Dynamic iSCSI initiators	Members of the VSAN 1
Identifying initiators	iSCSI node names
Advertising static virtual targets	No initiators are allowed to access a virtual target (unless explicitly configured)
iSCSI login authentication	CHAP or none authentication mechanism
revert-primary-port	Disabled
Header and data digest	Enabled automatically when iSCSI initiators send requests. This feature cannot be configured and is not available in store-and-forward mode.
iSNS registration interval	60 sec (not configurable)
iSNS registration interval retries	3
Fabric distribution	Disabled

Table 4-3 lists the default settings for iSLB parameters.

Table 4-3 Default iSLB Parameters

Parameters	**Default**
Fabric distribution	Disabled
Load balancing metric	1000