This section describes how to identify and resolve problems that can occur with N port virtualization.

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Overview

N port virtualization (NPV) reduces the number of Fibre Channel domain IDs in SANs. Switches operating in the NPV mode do not join a fabric; they pass traffic between NPV core switch links and end devices, which eliminates the domain IDs for these edge switches.

Note: NPV is available only for the following Cisco MDS 9000 switches: the Cisco MDS 9124 Multilayer Fabric Switch, the Cisco MDS 9134 Fabric Switch, the Cisco Fabric Switch for HP c-Class BladeSystem and the Cisco Fabric Switch for IBM BladeCenter.

With NPV a fabric or blade switch appears as a host to the core Fibre Channel switch, and appears as a Fibre Channel switch to the servers in the fabric switch or blade switch. NPV aggregates multiple locally connected N ports into one or more external NP links, which shares the domain ID of the NPV core switch among multiple NPV switches. NPV also allows multiple devices to attach to the same port on the NPV core switch.

NPV uses N port identifier virtualization (NPIV) to get multiple FCIDs allocated from the core switch on the NP port.

A switch is in NPV mode after a user has enabled NPV and the switch has successfully rebooted. NPV mode applies to an entire switch. All end devices connected to a switch that is in NPV mode must log in as an N port to use this feature (loop-attached devices are not supported). All links from the edge switches (in NPV mode) to the NPV core switches are established as NP ports. NPIV is used by the switches in NPV mode to log in to multiple end-devices that share a link to the NPV core switch.

For a complete description of NPV, refer to the *Cisco MDS 9000 Family CLI Configuration Guide*.

Initial Troubleshooting Checklist

Troubleshooting an NPV problem involves gathering information about the switch configuration and connectivity of individual devices and the entire SAN fabric. Begin your troubleshooting activity by using this checklist:

Checklist	Check off
Verify that the NPV core switch supports NPIV and that NPIV is enabled.	
Verify that NPV is enabled on the NPV device.	
Verify that the ports are properly connected.	
For all NPV core switch links, ensure that the port mode on the NPV device is NP port, and ensure that the port mode on the NPV core switch is F port.	
Ensure that the VSAN values configured on both sides of NPV core switch link are the same.	
For all the device links, ensure that the port mode on the NPV device is F port.	
Ensure that the VSAN value configured on the device links is correct.	
Verify the status of servers and external interfaces, using the **show npv status** command.	

Limitations and Restrictions

- NPV core switches must support NPIV.
- You cannot manually assign the server interfaces to a specific NPV core switch link. If an NPIV capable module is connected to the server interface, all of the logins from the NPIV-capable module will use the same NPIV core switch link.
- Remote SPAN is not supported.
- A maximum of 16 VSANs are supported on an NPV device.
- Local switching is not supported; all traffic is switched via the NPV core switch.
- Only F, NP, and SD ports are supported in NPV mode.
- CFS and QoS are not supported.
- IVR, SDV, and FICON are not supported.
- If an NPV link failover occurs, servers that are booted over the SAN with NPV will temporarily lose access to their boot LUNs.

Common CLI Commands for NPV

Note: Because the output is based on name server database information, the **show fcns database npv** commands can be run from any MDS switch running SAN-OS 3.2(1) or later. The switch does not need to be NPV enabled.

To display the status and VSAN membership of the different servers and external interfaces, and to verify that NPIV is enabled on the switch, enter the **show npv status** command.

```
switch# show npv status
npiv is enabled
External Interfaces:
====================
  Interface: fc1/1, VSAN: 1, FCID: 0xee0006, State: Up
  Interface: fc1/9, VSAN: 1, FCID: 0xee0007, State: Up
  Number of External Interfaces: 2
Server Interfaces:
==================
  Interface: fc1/19, VSAN: 1, NPIV: Yes, State: Up
  Number of Server Interfaces: 1
```

To view all the NPV devices in the name server database, enter the **show fcns database npv** command.

```
switch# show fcns database npv
VSAN 1:
--------------------------------------------------------------------------------
NPV NODE-NAME            NPV IP_ADDR   NPV IF  CORE SWITCH WWN          CORE IF
--------------------------------------------------------------------------------
20:00:00:0d:ec:3d:62:80  10.1.96.24    fc1/20  20:00:00:0d:ec:2d:af:40  fc4/4
20:00:00:0d:ec:3d:62:80  10.1.96.24    fc1/19  20:00:00:0d:ec:2d:af:40  fc4/3
20:00:00:0d:ec:3d:62:80  10.1.96.24    fc1/17  20:00:00:0d:ec:2d:af:40  fc4/1
```

For additional details about the NPV devices you see in the **show fcns database npv** output (including IP addresses, switch names and interface names), enter the **show fcns database npv detail** command.

```
switch# show fcns database npv detail
------------------------------------------------------------
VSAN:1   NPV Node Name: 20:00:00:0d:ec:3d:62:80
------------------------------------------------------------
NPV Fabric Port-WWN         :20:14:00:0d:ec:3d:62:80
class                       :2,3
NPV IP Address              :10.1.96.24
ipa                         :ff ff ff ff ff ff ff ff
fc4-types:fc4_features      :npv
NPV Switch Name:Interface   :sw24-gd96:fc1/20
port-type                   :N P
Core Switch fabric-port-wwn :20:c4:00:0d:ec:2d:af:40
permanent-port-wwn (vendor) :20:14:00:0d:ec:3d:62:80 (Cisco)
For details about a specific node, including FCID, type and pWWN, enter the show fcns database npv

switch# show fcns database npv node_wwn 20:00:00:0d:ec:3d:42:40
VSAN 1:
--------------------------------------------------------------------------
FCID     TYPE     PWWN                    (VENDOR)        FC4-TYPE:FEATURE
--------------------------------------------------------------------------
0x330f00 N        2f:ff:00:06:2b:10:c7:b2 (LSI)           scsi-fcp:init
0x331000 N        2f:ff:00:06:2b:10:c7:b3 (LSI)           scsi-fcp:init
Total number of npv-attached entries = 2
```

If you need to contact support, enter the **show tech-support NPV** command and save the output so that support can use it to troubleshoot, if necessary.

To display a list of the NPV devices that are logged in, along with VSANs, source information, pWWNs, and FCIDs, enter the **show npv flogi-table** command.

```
switch# show npv flogi-table
```

```
--------------------------------------------------------------------------------
SERVER                                                                  EXTERNAL
INTERFACE VSAN FCID             PORT NAME               NODE NAME       INTERFACE
--------------------------------------------------------------------------------
fc1/19    1    0xee0008 10:00:00:00:c9:60:e4:9a 20:00:00:00:c9:60:e4:9a fc1/9
fc1/19    1    0xee0009 20:00:00:00:0a:00:00:01 20:00:00:00:c9:60:e4:9a fc1/1
fc1/19    1    0xee000a 20:00:00:00:0a:00:00:02 20:00:00:00:c9:60:e4:9a fc1/9
fc1/19    1    0xee000b 33:33:33:33:33:33:33:33 20:00:00:00:c9:60:e4:9a fc1/1
Total number of flogi = 4.
```

Common Problems with NPV

This section includes common NPV issues.

Moving the Login of an End Device

If an uplink fails, all of the end devices that were logged in through the failed uplink are logged out. When the end devices log in again, the login requests are evenly distributed between all the operational uplink ports.

When a failed uplink comes back up, no existing logins are reassigned to that uplink. New logins are assigned to the operational uplink that has the least number of logins at the time; this is likely to be the previously failed uplink that has come back up.

You can move the login of an end device from its existing uplink to the one with least number of logins by performing the following tasks:

---

1. Enter the **shutdown** command on the server interface that needs to be migrated.

2. Enter the **no shutdown** command on the same server interface.

NPIV is Not Enabled

If NPIV is not enabled on the NPV core switch:

---

1. Enter the **show npv status** command to check the status of the link:

```
switch# show npv status
npiv is enabled
External Interfaces:
====================
  Interface: fc1/2, VSAN: 1, FCID: 0xe00200,
  State: Failed(NPIV is not enabled in upstream switch)
  Number of External Interfaces: 1
```

2. If the state is Failed with the reason "NPIV is not enabled in upstream switch," you must enable NPIV on the core NPV switch.

The NPV core switch is defined as an upstream switch on which NPIV is enabled. The NPV core switch receives traffic that is passed to it from a downstream switch that has NPV enabled on it. A switch that is in NPV mode does not switch traffic; instead, it passes traffic to the upstream NPV core switch on which NPIV is enabled.

After NPIV is enabled on the core NPV switch, the port should automatically come up (unless there are other

issues).

VSAN Mismatches

If there is a VSAN mismatch in VSAN for the core NPV switch ports:

1. Enter the **show npv status** command to check the status of the link.

```
switch# show npv status
npiv is enabled
External Interfaces:
====================
  Interface: fc1/1, VSAN: 1, FCID: 0x110000, State: Failed(Mismatch in VSAN for this
  upstream port)
  Number of External Interfaces: 1
```

2. If the state is Failed and displays the reason "Mismatch in VSAN for this upstream port" the external interface is configured to have different VSAN on both ends.

Correct the VSAN configuration. The VSAN configured on both ends of the NPV core switch link must be same.

Core NPV Device is Not a Switch

To confirm that the core NPV device is not a switch, follow these steps:

1. Enter the **show npv status** command to check the status of the link.

```
switch# show npv status
npiv is enabled
External Interfaces:
====================
  Interface: ext17, FCID: 0x000000, State: Failed(neighbor on the upstream
  port is not fabric)
  Number of External Interfaces: 3
```

2. If the state is Failed and displays the reason "neighbor on upstream port is not fabric," the external link is connected to a non-fabric switch.

NPV Core Switch Port Is Down

If the NPV core switch port is in the shutdown state, or is not an F port:

1. Enter the **show npv status** command to check the status.

```
switch# show npv status
npiv is enabled
External Interfaces:
====================
  Interface: fc1/1, VSAN: 1, FCID: 0x000000, State: Other
  Number of External Interfaces: 7
```

2. If the state is Other, verify that the physical link to the NPV core switch or core port is in F port mode or is in administrative shutdown state.

Server Interface is Down

If the server interface is down:

1. Ensure that the port is properly connected.

2. Ensure that the port mode on the NPV device side is set to F port and that the **no shutdown** command has been entered.

Waiting on FLOGI from the Server or Target

If you are waiting for the FLOGI from the server or target:

1. Enter the **show npv status** command to check the status of the link.

```
switch# show npv status
npiv is enabled
Server Interfaces:
===================
  Interface: fc1/6, VSAN: 1, NPIV: No, State: Waiting for FLOGI
  Number of Server Interfaces: 7
```

2. If the State is Waiting for FLOGI, no FLOGI request was received from the server or target.

Waiting on External Link to Come Up

If you are waiting for the external link to come up:

1. Enter the **show npv status** command to check the status of the link.

```
switch# show npv status
npiv is enabled
Server Interfaces:
==================
  Interface: fc1/6, VSAN: 1, NPIV: No, State: Waiting for External Interface
  Number of Server Interfaces: 7
```

2. If the state is Waiting for External Interface, check the status of external link. At least one external link must be up for server interface to be up.

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