

# How to Configure the NFX250 NextGen

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Use this guide to perform initial provisioning, configure Junos OS features, chain multiple virtualized network functions, monitor, and manage the NFX250 NextGen devices.

## Documentation and Release Notes

To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at <https://www.juniper.net/documentation/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

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## Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.



If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

## Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xsl;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

## Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {  
    file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]  
user@host# edit system scripts  
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]  
user@host# load merge relative /var/tmp/ex-script-snippet.conf  
load complete
```

For more information about the **load** command, see [CLI Explorer](#).

## Documentation Conventions

[Table 1 on page xii](#) defines notice icons used in this guide.

Table 1: Notice Icons







| Icon  | Meaning            | Description   |
|---|--------------------|---|
|  | Informational note | Indicates important features or instructions.                               |
|  | Caution            | Indicates a situation that might result in loss of data or hardware damage. |
|  | Warning            | Alerts you to the risk of personal injury or death.                         |
|  | Laser warning      | Alerts you to the risk of personal injury from a laser.                     |
|  | Tip                | Indicates helpful information.  |
|  | Best practice      | Alerts you to a recommended use or implementation.                          |

Table 2 on page xii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

| Convention                   | Description   | Examples   |
|------------------------------|---|--|
| <b>Bold text like this</b>   | Represents text that you type.  | To enter configuration mode, type the <b>configure</b> command:<br><br>user@host> <b>configure</b>   |
| Fixed-width text like this   | Represents output that appears on the terminal screen.  | user@host> <b>show chassis alarms</b><br><br>No alarms currently active  |
| <i>Italic text like this</i> | <ul style="list-style-type: none"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies guide names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul> | <ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS CLI User Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul> |

Table 2: Text and Syntax Conventions (*continued*)

| Convention                     | Description  | Examples  |
|--------------------------------|--|---|
| <i>Italic text like this</i>   | Represents variables (options for which you substitute a value) in commands or configuration statements.   | Configure the machine's domain name:<br><br>[edit]<br>root@# <b>set system domain-name</b> <i>domain-name</i>   |
| <b>Text like this</b>          | Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.              | <ul style="list-style-type: none"><li>• To configure a stub area, include the <b>stub</b> statement at the [edit <b>protocols ospf area area-id</b>] hierarchy level.</li><li>• The console port is labeled <b>CONSOLE</b>.</li></ul> |
| < > (angle brackets)           | Encloses optional keywords or variables.   | <b>stub &lt;default-metric <i>metric</i>&gt;;</b>   |
| (pipe symbol)                  | Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity. | <b>broadcast   multicast</b><br><br><b>(<i>string1</i>   <i>string2</i>   <i>string3</i>)</b>   |
| # (pound sign)                 | Indicates a comment specified on the same line as the configuration statement to which it applies.   | <b>rsvp { # Required for dynamic MPLS only</b>  |
| [ ] (square brackets)          | Encloses a variable for which you can substitute one or more values.   | <b>community name members [ <i>community-ids</i> ]</b>  |
| Indentation and braces ( { } ) | Identifies a level in the configuration hierarchy.   | [edit]<br>routing-options {<br>static {<br>route default {<br>nexthop <i>address</i> ;<br>retain;<br>}<br>}<br>}  |
| ; (semicolon)                  | Identifies a leaf statement at a configuration hierarchy level.  |   |
| GUI Conventions                |  |   |

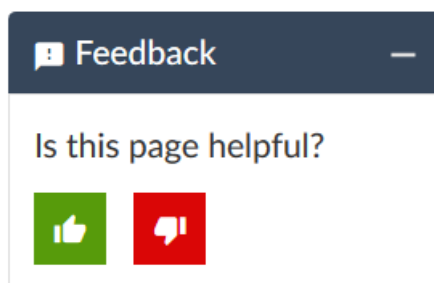
Table 2: Text and Syntax Conventions (*continued*)

| Convention                   | Description  | Examples  |
|------------------------------|--|---|
| <b>Bold text like this</b>   | Represents graphical user interface (GUI) items you click or select. | <ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul> |
| > (bold right angle bracket) | Separates levels in a hierarchy of menu selections.                  | In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .  |

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We encourage you to provide feedback so that we can improve our documentation. You can use either of the following methods:

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- Click the thumbs-down icon if the information on the page was not helpful to you or if you have suggestions for improvement, and use the pop-up form to provide feedback.
- E-mail—Send your comments to [techpubs-comments@juniper.net](mailto:techpubs-comments@juniper.net). Include the document or topic name, URL or page number, and software version (if applicable).

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- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <https://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <https://www.juniper.net/support/warranty/>.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

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- Search for known bugs: <https://prsearch.juniper.net/>
- Find product documentation: <https://www.juniper.net/documentation/>
- Find solutions and answer questions using our Knowledge Base: <https://kb.juniper.net/>
- Download the latest versions of software and review release notes: <https://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum: <https://www.juniper.net/company/communities/>
- Create a service request online: <https://myjuniper.juniper.net>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <https://entitlementsearch.juniper.net/entitlementsearch/>

## Creating a Service Request with JTAC

You can create a service request with JTAC on the Web or by telephone.

- Visit <https://myjuniper.juniper.net>.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

For international or direct-dial options in countries without toll-free numbers, see <https://support.juniper.net/support/requesting-support/>.

# 1

CHAPTER

## Overview

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NFX Product Compatibility | **29**

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# NFX250 NextGen Overview

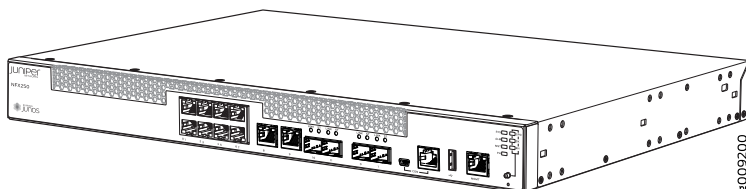
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The Juniper Networks NFX250 Network Services Platform is a secure, automated, software-driven customer premises equipment (CPE) platform that delivers virtualized network and security services on demand. The NFX250 is part of the Juniper Cloud CPE solution, which leverages Network Functions Virtualization (NFV). It enables service providers to deploy and chain multiple, secure, and high-performance virtualized network functions (VNFs) on a single device.

[Figure 1 on page 19](#) shows the NFX250 device.

**Figure 1: NFX250 Device**



The NFX250 is a complete SD-WAN CPE, which provides secure router functionality and Next-Generation Firewall (NGFW) solution.

NGFW includes security features such as

- VPN (see [VPN User Guide for Security Devices](#))
- NAT (see [NAT User Guide](#))
- ALG (see [Application Layer Gateways User Guide](#))

- Application Security (see [AppSecure User Guide](#))
- UTM features including Enhanced Web Filtering and Anti-Virus (see [UTM User Guide](#))

The NFX250 device is suitable for small to midsize businesses and large multinational or distributed enterprises.

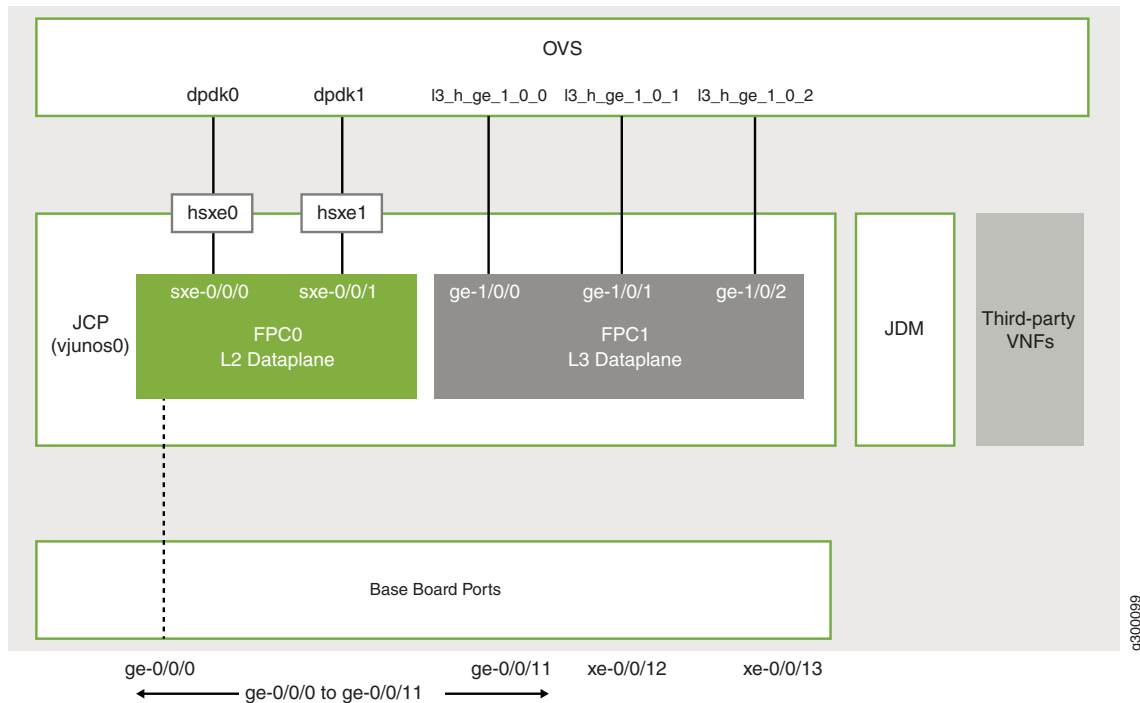
Junos OS Release 19.1R1 introduces a reoptimized architecture for NFX250 devices. This architecture enables you to use JCP as the single point of management to manage all the NFX250 components.

**NOTE:** For documentation purposes, NFX250 devices that use this architecture are referred to as NFX250 NextGen devices.

## Software Architecture

[Figure 2 on page 21](#) illustrates the software architecture of the NFX250 NextGen. The architecture is designed to provide a unified control plane that functions as a single management point. Key components in the NFX250 NextGen software include the JCP, JDM, Layer 2 data plane, Layer 3 data plane, and VNFs.

Figure 2: NFX250 NextGen Software Architecture



Key components of the system software include:

- Linux—The host OS, which functions as the hypervisor.
- VNF—A VNF is a virtualized implementation of a network device and its functions. In the NFX250 NextGen architecture, Linux functions as the hypervisor, and it creates and runs the VNFs. The VNFs include functions such as firewalls, routers, and WAN accelerators.

You can connect VNFs together as blocks in a chain to provide networking services.

- JCP—Junos virtual machine (VM) running on the host OS, Linux. The JCP functions as the single point of management for all the components.

The JCP supports:

- Layer 2 to Layer 3 routing services
- Layer 3 to Layer 4 security services
- Layer 4 to Layer 7 advanced security services

In addition, the JCP enables VNF lifecycle management.

- JDM—An application container that manages VNFs and provides infrastructure services. The JDM functions in the background. Users cannot access the JDM directly.

- L2 data plane—Manages Layer 2 traffic. The Layer 2 dataplane forwards the LAN traffic to the Open vSwitch (OVS) bridge, which acts as the NFV backplane. The Layer 2 dataplane is mapped to the virtual FPC0 on the JCP.
- L3 data plane—Provides data path functions for the Layer 3 to Layer 7 services. The Layer 3 data plane is mapped to the virtual FPC1 on the JCP.
- Open vSwitch (OVS) bridge—The OVS bridge is a VLAN-aware system bridge that acts as the NFV backplane to which the VNFs, FPC1, and FPC0 connect. Additionally, you can create custom OVS bridges to isolate connectivity between different VNFs.

For the list of supported features, see [Feature Explorer](#).

## NFX250 Models

[Table 3 on page 22](#) lists the NFX250 device models and its specifications. For more information, see the *NFX250 Hardware Guide*.

**Table 3: NFX250 Models and Specifications**

| Components  | NFX250-S1                | NFX250-S2                | NFX250-S1E               |
|-------------|--------------------------|--------------------------|--------------------------|
| CPU         | 2.0 GHz 6-core Intel CPU | 2.0 GHz 6-core Intel CPU | 2.0 GHz 6-core Intel CPU |
| RAM         | 16 GB                    | 32 GB                    | 16 GB                    |
| Storage     | 100 GB SSD               | 400 GB SSD               | 200 GB SSD               |
| Form Factor | Desktop                  | Desktop                  | Desktop                  |

Table 3: NFX250 Models and Specifications (*continued*)

| Components | NFX250-S1  | NFX250-S2  | NFX250-S1E   |
|------------|--|--|--|
| Ports      | Eight 10/100/ 1000BASE-T RJ-45 access ports  | Eight 10/100/ 1000BASE-T RJ-45 access ports  | Eight 10/100/ 1000BASE-T RJ-45 access ports  |
|            | Two 10/100/ 1000BASE-T RJ-45 ports which can be used as access ports or uplink ports | Two 10/100/ 1000BASE-T RJ-45 ports which can be used as access ports or uplink ports | Two 10/100/ 1000BASE-T RJ-45 ports which can be used as access ports or uplink ports |
|            | Two 100/1000BASE-X SFP ports which can be used as uplinks                            | Two 100/1000BASE-X SFP ports which can be used as uplinks                            | Two 100/1000BASE-X SFP ports which can be used as uplinks                            |
|            | Two 1-Gigabit or 10-Gigabit Ethernet SFP+ uplink ports                               | Two 1-Gigabit or 10-Gigabit Ethernet SFP+ uplink ports                               | Two 1-Gigabit or 10-Gigabit Ethernet SFP+ uplink ports                               |
|            | One 10/100/ 1000BASE-T RJ-45 management port   | One 10/100/ 1000BASE-T RJ-45 management port   | One 10/100/ 1000BASE-T RJ-45 management port   |
|            | Console ports (RJ-45 and mini-USB)   | Console ports (RJ-45 and mini-USB)   | Console ports (RJ-45 and mini-USB)   |
|            | One USB 2.0 port   | One USB 2.0 port   | One USB 2.0 port   |

## Interfaces

The NFX250 NextGen device includes the following network interfaces:

- Ten 1-Gigabit Ethernet RJ-45 ports and two 1-Gigabit Ethernet network ports that support small form-factor pluggable (SFP) transceivers. The ports follow the naming convention, `ge-0/0/n`, where *n* ranges from 0 to 11. These ports are used for LAN connectivity.
- Two 1-Gigabit or 10-Gigabit uplink ports that support small form-factor pluggable plus (SFP+) transceivers. The ports follow the naming convention `xe-0/0/n`, where the value of *n* is either 12 or 13. These ports are used as WAN uplink ports.
- A dedicated management port labeled **MGMT** (fxp0) functions as the out-of-band management interface. The fxp0 interface is assigned the IP address 192.168.1.1/24.
- Two static interfaces, `sxe-0/0/0` and `sxe-0/0/1`, which connect the Layer 2 data plane (FPC0) to the OVS backplane.

**NOTE:** By default, all the network ports connect to the Layer 2 data plane.

For the list of supported transceivers for your device, see <https://apps.juniper.net/hct/product/#prd=NFX250>.

## Performance Modes

Starting in Junos OS Release 19.1R1, NFX250 (NextGen) devices provide the following operational modes:

- Throughput mode—Provides maximum resources (CPU and memory) for Junos software and remaining resources, if any, for third-party VNFs. The default mode is throughput mode.
- Hybrid mode—Provides a balanced distribution of resources between the Junos software and third-party VNFs.
- Compute mode—Provides minimal resources for Junos software and maximum resources for third-party VNFs.

## Benefits and Uses

The NFX250 NextGen provides the following benefits:

- Highly scalable architecture that supports multiple Juniper VNFs and third-party VNFs on a single device. The modular software architecture provides high performance and scalability for routing, switching, and security enhanced by carrier-class reliability.
- Integrated security, routing, and switching functionality in a single control plane simplifies management and deployment.
- A variety of flexible deployments. A distributed services deployment model ensures high availability, performance, and compliance. The device provides an open framework that supports industry standards, protocols, and seamless API integration.
- Secure boot feature safeguards device credentials, automatically authenticates system integrity, verifies system configuration, and enhances overall platform security.
- Automated configuration eliminates complex device setup and delivers a plug-and-play experience.

## Junos OS Releases Supported on NFX Series Hardware

The [Table 4 on page 25](#) provides details of Junos OS software releases supported on the NFX Series devices.

**NOTE:** Linux bridge mode is supported on NFX250 devices only up to Junos OS Release 18.4.

**Table 4: Supported Junos OS Releases on NFX Series Devices**

| NFX Series Platform | Supported Junos OS Release                               | Software Package  | Software Downloads Page                       |
|---------------------|--|---|---|
| NFX150              | 18.1R1 or later  | nfx-3<br>jinstall-host-nfx-3-x86-64-<release-number>-secure-signed.tgz<br>install-media-host-usb-nfx-3-x86-64-<release-number>-secure.img           | <a href="#">NFX150 Software Download Page</a> |
| NFX250              | 15.1X53-D45, 15.1X53-D47, 15.1X53-D470, and 15.1X53-D471 | nfx-2<br>jinstall-host-nfx-2-flex-x86-64-<release-number>-secure-signed.tgz<br>install-media-host-usb-nfx-2-flex-x86-64-<release-number>-secure.img | <a href="#">NFX250 Software Download Page</a> |
|                     | 17.2R1 through 19.1R1                                    |   |   |
|                     | 19.1 R1 or later   | nfx-3<br>jinstall-host-nfx-3-x86-64-<release-number>-secure-signed.tgz<br>install-media-host-usb-nfx-3-x86-64-<release-number>-secure.img           | <a href="#">NFX250 Software Download Page</a> |
| NFX350              | 19.4 R1 or later   | nfx-3   |   |

SEE ALSO

[NFX250 Overview](#)

# Upgrade the NFX250 Software to NFX250 NextGen Software

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- [Prerequisites | 26](#)
- [Upgrade to NFX250 NextGen Software Architecture | 28](#)

## NFX250 NextGen Software Upgrade Overview

Starting in Junos OS Release 19.1R1, the NFX250 devices support the NFX250 NextGen software architecture. This is a reoptimized architecture that enables you to use JCP as the single point of management to manage all the NFX250 components. For more information about the NFX250 NextGen architecture, see [“NFX250 NextGen Overview” on page 19](#).

**NOTE:** For documentation purposes, NFX250 devices that use the reoptimized architecture are referred to as NFX250 NextGen devices.

You can upgrade the software using a USB or through a CLI. This topic provides information about prerequisites and the procedure to upgrade through a CLI from NFX250 software architecture to NFX250 NextGen software architecture.

**NOTE:** The upgrade procedure using a USB remains the same for all NFX Series devices.

## Prerequisites

To upgrade an NFX250 device, you must meet the following prerequisites:



### Device-specific prerequisites

- An NFX250 device with BIOS => CBDE\_SFP\_00.21\_01.01

To verify the BIOS version:

```
root@jdm> request execute-command "jhost dmidecode -t bios"
```

For the BIOS information, see the **BIOS Information** section in the command output message.

If the BIOS version is not CBDE\_SFP\_00.21\_01.01, you can upgrade the BIOS:

1. Download the BIOS from [Downloads](#) page.
2. Copy and save the BIOS image to the `/var/third-party/firmware` directory.
3. From the JDM CLI, access the hypervisor:

```
root@jdm> ssh hypervisor
```

4. Reboot the device to load new BIOS.

- a. Exit from hypervisor shell:

```
root@local-node:~# exit
logout
Connection to hypervisor closed.
{master:0}
root@JDM>
```

- b. Reboot the device from JDM CLI.

```
{master:0}
root@porter-p2a-sys1> request system reboot
Reboot the system ? [yes,no] (no) yes
```

5. Upgrade the BIOS:

```
root@host:~# rpm -ivh /var/third-party/firmware/BIOS RPM package name
```

The system generates the following output:

```
Preparing... ##### [100%]
1:nfx-2-secure-bios ##### [100%]
A reboot is required to install the secure BIOS
Please reboot the system to complete the install
```

- An NFX250 NextGen configuration file with minimal or necessary configurations is required for remote management access to the device after migrating to NFX250 NextGen. This file is an input data for the **request system software add clean-install *package-name*** command.

### Release-specific prerequisites

The NFX250 software must be compatible with the following releases:

- NFX250 software running Junos OS Release 18.4R2 or later to accept the configuration by using the command:

```
user@host> request system software add clean-install package-name
```



**CAUTION:** The **clean-install** command removes all contents on the hard disk. To avoid data loss, copy all important files, configuration files (JDM, JCP, vSRX, and third-party VNFs), log files, and VNF disk or image file, and save them in a secure location before you upgrade the device.

- Releases prior to 18.4R2 must be upgraded to 18.4R2 or later.



**CAUTION:** The NFX250 device will crash if you upgrade the NFX250 software image running Junos OS Release prior to 18.4R2 to a release that supports NFX250 NextGen software image.

The NFX250 NextGen configuration must be compatible with the NFX250 NextGen software version. The configuration command syntax is not validated.

**NOTE:** The NFX250 software architecture and NFX250 NextGen software architecture are different and the configurations are different for both the software.

## Upgrade to NFX250 NextGen Software Architecture

Before you upgrade the NFX device:

- Create backup of the configuration files (JDM, JCP, vSRX, and third-party VNFs), log files, VNF disk or image file, and other important files stored on the device.
- Check the prerequisites.

To upgrade the NFX250 software architecture to NFX250 NextGen software architecture:

1. Copy the configuration files that are required for in-band and out-of-band management and save it in the **/var/third-party** folder. The configuration file should be of the same format as the file format obtained by running the **show configuration** CLI command.
2. Copy the NFX250 NextGen software image and save it in the **/var/third-party/images** folder.
3. Initiate the software upgrade by using the following command:

```
root@jdm> request system software add clean-install reboot
/var/third-party/images/jinstall-image.tgz upgrade-with-config
/var/third-party/config-file
```

The device is formatted and the NFX250 NextGen software image is installed. The device loads the configurations and boots up the NFX250 Nextgen software image. You can access the device remotely through the in-band and out-of-band management.

4. The device is now ready for additional configurations and third-party VNF onboarding.

## NFX Product Compatibility

### IN THIS SECTION

- [Hardware Compatibility | 29](#)
- [Software Version Compatibility | 30](#)

## Hardware Compatibility

To obtain information about the components that are supported on your devices, and special compatibility guidelines with the release, see the Hardware Guide and the Interface Module Reference for the product.

To determine the features supported on NFX Series devices in this release, use the Juniper Networks Feature Explorer, a Web-based application that helps you to explore and compare Junos OS feature information to find the right software release and hardware platform for your network. Find Feature Explorer at: <https://pathfinder.juniper.net/feature-explorer/>.

## Hardware Compatibility Tool

For a hardware compatibility matrix for optical interfaces and transceivers supported across all platforms, see the [Hardware Compatibility Tool](#).

## Software Version Compatibility

This section lists the vSRX and Cloud CPE Solution software releases that are compatible with the Junos OS releases on the NFX Series devices.

### NOTE:

- Starting in Junos OS Release 18.1R1, NFX150 and NFX250 devices support the same version of platform software and vSRX. For example, see [Table 5 on page 30](#).
- The Linux Bridge mode is supported only up to Junos OS Release 18.4 on NFX250 devices.

## NFX250 Software Version Compatibility

This section lists the vSRX and CloudCPE Solution software releases that are compatible with the Junos OS releases on the NFX250 devices:

**Table 5: Software Compatibility Details with vSRX and Cloud CPE Solution**

| NFX250 Junos OS Release | vSRX           | Cloud CPE Solution       |
|-------------------------|----------------|--------------------------|
| 15.1X53-D40.3           | 15.1X49-D40.6  | Cloud CPE Solution 2.0   |
| 15.1X53-D41.6           | 15.1X49-D40.6  | Cloud CPE Solution 2.1   |
| 15.1X53-D102.2          | 15.1X49-D61    | Cloud CPE Solution 3.0   |
| 15.1X53-D47.4           | 15.1X49-D100.6 | Cloud CPE Solution 3.0.1 |
| 15.1X53-D490            | 15.1X49-D143   | Cloud CPE Solution 4.0   |
| 15.1X53-D495            | 15.1X49-D160   | Cloud CPE Solution 4.1   |
| 15.1X53-D496            | 15.1X49-D170   | Cloud CPE Solution 4.1   |
| 15.1X53-D45.3           | 15.1X49-D61    | Not applicable           |

Table 5: Software Compatibility Details with vSRX and Cloud CPE Solution (*continued*)

| NFX250 Junos OS Release | vSRX          | Cloud CPE Solution |
|-------------------------|---------------|--------------------|
| 17.2R1                  | 15.1X49-D78.3 | Not applicable     |
| 17.3R1                  | 15.1X49-D78.3 | Not applicable     |
| 17.4R1                  | 15.1X49-D78.3 | Not applicable     |
| 15.1X53-D471            | 15.1X49-D143  | Not applicable     |
| 18.1R1                  | 18.1R1        | Not applicable     |
| 18.1R2                  | 18.1R2        | Not applicable     |
| 18.1R3                  | 18.1R3        | Not applicable     |
| 18.2R1                  | 18.2R1        | Not applicable     |
| 18.3R1                  | 18.3R1        | Not applicable     |
| 18.4R1                  | 18.4R1        | Not applicable     |

# 2

CHAPTER

## Initial Configuration

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# Initial Configuration on NFX250 NextGen Devices

## IN THIS SECTION

- [Factory Default Settings | 35](#)
- [Enabling Basic Connectivity | 36](#)
- [Establishing the Connection | 37](#)

## Factory Default Settings

The NFX250 NextGen is shipped with the following factory default settings:

**Table 6: Security Policies**

| Source Zone | Destination Zone | Policy Action |
|-------------|------------------|---------------|
| trust       | trust            | permit        |
| trust       | untrust          | permit        |

**Table 7: Interfaces**

| Port Label   | Interface                 | Security Zone | DHCP State | IP Address     |
|--------------|---------------------------|---------------|------------|----------------|
| 0/1 to 0/11  | ge-0/0/1 to<br>ge-0/0/11  | trust         | server     | 192.168.2.1/24 |
| 0/12 to 0/13 | xe-0/0/12 to<br>xe-0/0/13 | untrust       | client     | ISP assigned   |
| MGMT         | fxp0                      | N/A           | N/A        | 192.168.1.1/24 |

The device is shipped with the following services enabled in the default security policy: DHCP, HTTP, HTTPS, and SSH.

To provide secure traffic, a basic set of screens are configured on the untrust zone.



## Enabling Basic Connectivity

1. Ensure that the device is powered on.
2. Connect to the console port:
  - a. Plug one end of the Ethernet cable into the console port on your device.
  - b. Connect the other end of the Ethernet cable to the RJ-45 to DB-9 serial port adapter shipped with your device.
  - c. Connect the RJ-45 to DB-9 serial port adapter to the serial port on the management device. Use the following values to configure the serial port:  
Bits per second—9600; Parity—None; Data bits—8; Stop bits—1; Flow control—None.

**NOTE:** Alternately, you can use the USB cable to connect to the mini-USB console port on the device. To use the mini-USB console port, you must download the USB driver from the following page and install the driver on the management device:

<https://www.juniper.net/support/downloads/junos.html>

3. Use any terminal emulation program such as HyperTerminal to connect to the device console. The CLI displays a login prompt.
4. Log in as **root**. If the software completes booting before you connect to the console, you might need to press the Enter key for the prompt to appear.

```
login: root
```

5. Start the CLI.

```
root@:~ # cli
root@>
```

6. Enter configuration mode.

```
root@> configure
[edit]
root@#
```

7. Change the password for the root administration user account.

```
[edit]  
root@# set system root-authentication plain-text-password  
New password: password  
Retype new password: password
```

8. Enable SSH service for the root user.

```
[edit]  
root@# set system services ssh root-login allow
```

9. (Optional) Enable Internet connection for the devices connected on LAN by setting the DNS IP.

```
[edit]  
root@# set access address-assignment pool junosDHCPPool family inet dhcp-attributes name-server  
dns-server-ip
```

10. Commit the configuration.

```
[edit]  
root@# commit
```

## Establishing the Connection

1. Connect the device to the ISP by connecting one of the WAN ports (0/12 and 0/13) to the ISP. The device is assigned an IP address by the ISP through DHCP.

**NOTE:** For information about NFX250 (NG) interfaces, see [Table 7 on page 35](#).

2. Connect the laptop to one of the front panel LAN ports (0/0 to 0/11). The laptop is assigned an IP address by the DHCP server running on the device.
3. Open a browser window on your laptop, navigate to <https://www.juniper.net>, and verify your connectivity.

# Zero Touch Provisioning on NFX Series Devices

## IN THIS SECTION

- Understanding Zero Touch Provisioning | 38
- Pre-staging an NFX Series Device | 39
- Provisioning an NFX Series Device | 40
- Provisioning an NFX Series Device Using Sky Enterprise | 42

## Understanding Zero Touch Provisioning

Zero Touch Provisioning (ZTP) allows you to provision and configure an NFX Series device in your network automatically, with minimal manual intervention. ZTP allows you to make configuration changes or software upgrades without logging into the device. NFX Series devices support ZTP with Sky Enterprise, which is a cloud-based network management application. For more information on Sky Enterprise, see [Sky Enterprise Documentation](#).

The initial provisioning process involves the following components:

- NFX Series device—Sends requests to Juniper's Redirect Server.
- Redirect server—Provides authentication and authorization for the devices in a network to access their assigned central servers for the boot images and initial configuration files. The redirect server resides at Juniper Networks.

Connectivity to the redirect server can be through IPv4 or IPv6 network. Depending on the source address, the redirect server redirects the ZTP to the corresponding Central Server with IPv4 or IPv6 address.

The NFX Series device is shipped with a factory default configuration. The factory default configuration includes the URL of the redirect server, that is used to connect to the central servers by using a secure encrypted connection.

- Central server—Manages the network and the NFX Series devices located remotely. The central server is located at a central geographical location. Alternately, you can use Contrail Service Orchestration (CSO) along with Sky Enterprise. CSO deploys the network services and Sky Enterprise manages the devices in the network.

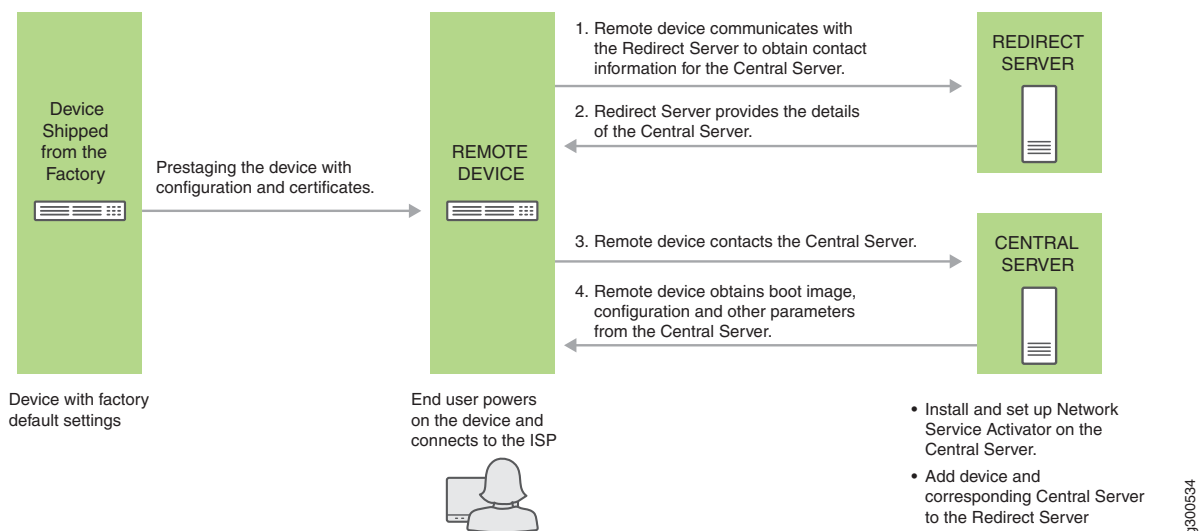
## Pre-staging an NFX Series Device

Prestaging is an optional step for the device to by-pass Juniper's Redirect Server and to connect to a customer specific Redirect Server or a Regional Server for authentication and authorization in the network. Prestaging involves copying and applying certificates and customer specific configuration from a specific directory in the device before the device is shipped to the customer site for installation.

The customer specific resources are stored internally. When the device boots up with the factory default configuration, the prestage resources are copied and the configuration is applied on the device.

Figure 3 on page 39 illustrates the workflow of prestaging the NFX Series devices.

Figure 3: Workflow for Prestaging an NFX Series Device



The prestage workflow proceeds as follows:

1. The device is shipped from the factory with the factory default configuration.
2. To prestage the device, the customer specific resources such as certificates and configuration are copied to the device by a user or ISP.

To add the prestage configuration and certificates, run:

```

user@host>request system phone-home pre-stage add configuration file
user@host>request system phone-home pre-stage add certificates file/files

```

3. After the device is prestaged, the device is shipped to the end user.

4. The end user powers on the remote device and connects the device to the ISP by connecting one of the WAN ports (0/12 and 0/13) to the ISP. For more information, see [“Initial Configuration on NFX250 NextGen Devices” on page 35](#).
5. The device applies the prestage configuration and uses the certificates to authenticate the customer specific Redirect Server or Regional Server.
6. The Redirect Server or Regional Server sends the corresponding Central Server information to the device.
7. The device sends a provisioning request to the Central Server. The Central Server responds with the boot image and the configuration that is provisioned on the Central Server for that particular device.
8. The device fetches the boot image and configuration file from the Central Server.
9. The device upgrades to the boot image and applies the configuration to start the services and become operational.

To delete the prestage configuration and certificates, run:

```
user@host>request system phone-home pre-stage delete configuration file
```

```
user@host>request system phone-home pre-stage delete certificate all | file
```

```
user@host>request system phone-home pre-stage delete all
```

To verify the prestage configuration and certificates, run:

```
user@host>show system phone-home pre-stage configuration
```

```
user@host>show system phone-home pre-stage certificate
```

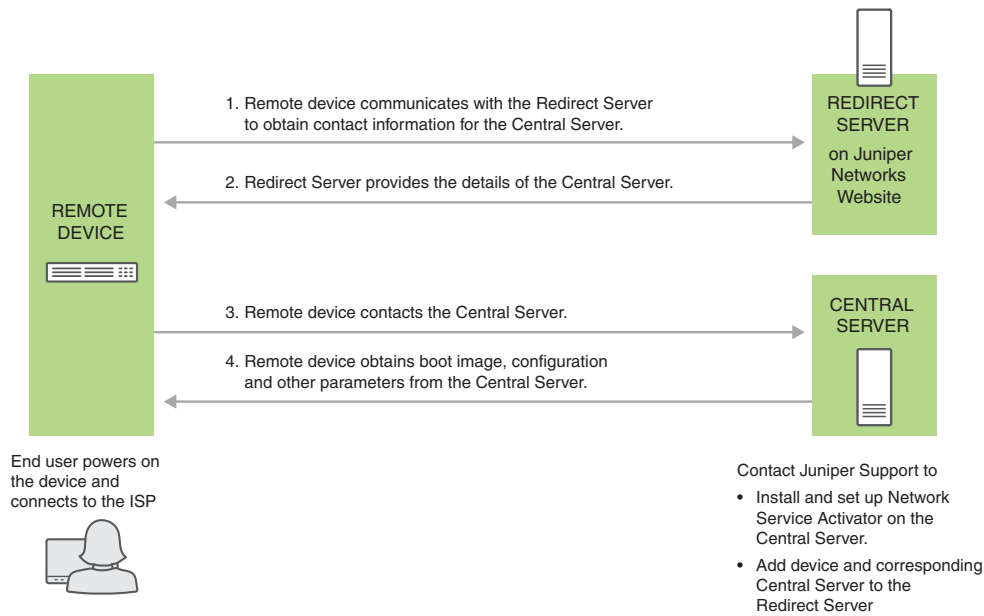
```
user@host>show system phone-home pre-stage
```

The prestage resources are not deleted when you upgrade the image by using the **request system software add image** command or when you zeroize the device by using the **request system zeroize** command.

## Provisioning an NFX Series Device

[Figure 4 on page 41](#) illustrates the workflow of the initial provisioning of NFX Series devices.

Figure 4: Workflow for Initial Provisioning of an NFX Series Device



**NOTE:** Contact Juniper Support to add the device and the corresponding central server to the redirect server.

The provisioning workflow proceeds as follows:

1. The end user powers on the remote device, and connects the remote device to the ISP through the WAN ports.
2. The remote device transmits its X.509 certificate and fully qualified domain name (FQDN) as a provisioning request to the redirect server.
3. The redirect server searches its data store for the central server that an administrator has specified for the remote device, and confirms that the remote device's request corresponds to the X.509 certificate specified for the server.
4. The redirect server sends contact information for the central server to the remote device.
5. The remote device sends a request to the central server for the URL of the boot image and the location of the initial configuration file. The central server responds with the requested information.
6. The remote device fetches the boot image and configuration file from the central server.
7. The remote device upgrades to the boot image (if the boot image is different from the image running on the NFX Series device), and applies the configuration to start the services and become operational.

## Provisioning an NFX Series Device Using Sky Enterprise

Figure 4 on page 41 illustrates the workflow of the initial provisioning of NFX Series devices using Sky Enterprise.

The provisioning workflow proceeds as follows:

1. The end user powers on the remote device, and connects the remote device to the ISP through the WAN ports.
2. The NFX Series device transmits its X.509 certificate and fully qualified domain name (FQDN) as a provisioning request to the Redirect Server.
3. The Redirect Server connects the device to Sky Enterprise.
4. Click the link in the authorization e-mail that you receive from Sky Enterprise. Alternately, you can use the Sky Enterprise application to authorize the device.
5. The NFX Series device registers with Sky Enterprise.
6. The initial configuration of the device begins. The initial configuration process takes about 60 seconds.

# 3

CHAPTER

## Configuring Interfaces

---

Configuring the In-Band Management Interface | **45**

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# Configuring the In-Band Management Interface

In in-band management, you configure a network interface as a management interface and connect it to the management device. You can configure any of the ge-1/0/x ports, where x ranges from 0 to 9, as in-band management interfaces. In-band management can be configured using either a LAN port (FPC0) or a WAN port (FPC1).

To configure a WAN port for in-band management:

1. Log in to the JCP CLI and enter configuration mode:

```
root@host% cli
root@host> configure
```

2. Configure the IP address for the in-band management interface:

```
root@host# set interfaces interface-name unit 0 family inet address address/prefix-length
```

**NOTE:** The ge-1/0/x port selected for configuration must be the same port that is mapped to the physical port (heth) being used for management connectivity.

3. Configure VLAN tagging:

```
root@host# set interfaces ge-1/0/x vlan-tagging
root@host# set interfaces ge-1/0/x unit n vlan-id mgmt-vlan-id
root@host# set interfaces ge-1/0/x unit n family inet address address/prefix-length
```

To configure a LAN port for in-band management:

1. Configure the management VLAN:

```
root@host# set vlans mgmt-vlan vlan-id vlan-id
```

2. Add the physical network interface and the service interface as members of the VLAN:

```
root@host# set interfaces ge-0/0/x unit 0 family ethernet-switching vlan members mgmt-vlan
root@host# set interfaces sxe-0/0/[01] unit 0 family ethernet-switching vlan members mgmt-vlan
```

3. Configure VLAN tagging:

```
root@host# set interfaces ge-1/0/0 vlan-tagging
```

```
root@host# set interfaces ge-1/0/0 unit n vlan-id mgmt-vlan-id
root@host# set interfaces ge-1/0/0 unit n family inet address address/prefix-length
```

## ADSL2 and ADSL2+ Interfaces on NFX250 NextGen Devices

### IN THIS SECTION

- [ADSL Interface Overview | 46](#)
- [Example: Configuring ADSL SFP Interface on NFX250 Devices | 47](#)

### ADSL Interface Overview

Asymmetric digital subscriber line (ADSL) technology is part of the xDSL family of modem technologies that use existing twisted-pair telephone lines to transport high-bandwidth data. ADSL lines connect service provider networks and customer sites over the "last mile" of the network—the loop between the service provider and the customer site.

ADSL transmission is asymmetric because the downstream bandwidth is typically greater than the upstream bandwidth. The typical bandwidths of ADSL2 and ADSL2+ circuits are defined in [Table 8 on page 46](#).

**Table 8: Standard Bandwidths of DSL Operating Modes**

| Operating Modes | Upstream   | Downstream |
|-----------------|------------|------------|
| ADSL2           | 1–1.5 Mbps | 12–14 Mbps |
| ADSL2+          | 1–1.5 Mbps | 24–25 Mbps |

ADSL2 and ADSL2+ support the following standards:

- LLC SNAP bridged 802.1q
- VC MUX bridged

Supported security devices with xDSL SFP can use PPP over Ethernet(PPPoE) to connect through ADSL lines only.

## ADSL2 and ADSL2+

The ADSL2 and ADSL2+ standards were adopted by the ITU in July 2002. ADSL2 improves the data rate and reach performance, diagnostics, standby mode, and interoperability of ADSL modems.

ADSL2+ doubles the possible downstream data bandwidth, enabling rates of 20 Mbps on telephone lines shorter than 5000 feet (1.5 km).

ADSL2 uses seamless rate adaptation (SRA) to change the data rate of a connection during operation with no interruptions or bit errors. The ADSL2 transceiver detects changes in channel conditions—for example, the failure of another transceiver in a multicarrier link—and sends a message to the transmitter to initiate a data rate change. The message includes data transmission parameters such as the number of bits modulated and the power on each channel. When the transmitter receives the information, it transitions to the new transmission rate.

## Example: Configuring ADSL SFP Interface on NFX250 Devices

### IN THIS SECTION

- [Requirements | 47](#)
- [Overview | 48](#)
- [Configuration | 48](#)
- [Results | 50](#)

### Requirements

This example uses the following hardware and software components:

- NFX250 device running the Junos OS Release 19.1R1 version, which supports the reoptimized architecture.

## Overview

In this example, you are configuring ADSL SFP interface on an NFX250 device with the following configurations:

- Physical interface - **ge-0/0/11**
- ADSL SFP options - **vpi3, vci34, and encaps llcsnap-bridged-802dot1q**

**NOTE:** Ensure that connectivity to the host is not lost during the configuration process.

## Configuration

### Step-by-Step Procedure

To configure ADSL SFP interfaces on NFX250 (NextGen) devices:

1. Connect to the host.

```
user@host> configure
[edit]
user@host#
```

2. Allocate hugepages:

```
user@host# run show system visibility memory
user@host# set system memory hugepages size 1024 count 5
Reboot the device.
```

3. Configure virtual interfaces:

```
user@host# set vmhost virtualization-options interfaces ge-1/0/3
user@host# set vmhost virtualization-options interfaces ge-1/0/4
user@host# commit
```

4. Create VLANs using VLAN IDs:

```
user@host# set vlans vlan100 vlan-id 100
user@host# set vlans vlan101 vlan-id 101
```

```
user@host# set vlans vlan200 vlan-id 200
user@host# set vlans vlan50 vlan-id 50
```

5. Configure interfaces:

```
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan50
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan100
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan101
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan200
user@host# set interfaces ge-0/0/11 native-vlan-id 50
user@host# set interfaces ge-0/0/11 dsl-sfp-options adsl-options vpi 3
user@host# set interfaces ge-0/0/11 dsl-sfp-options adsl-options vci 32
user@host# set interfaces ge-0/0/11 dsl-sfp-options adsl-options encaps llcsnap-bridged-802dot1q
user@host# set interfaces ge-0/0/11 dsl-sfp-options vdsl-options profile 17a
user@host# set interfaces ge-0/0/11 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces ge-0/0/11 unit 0 family ethernet-switching vlan members vlan50
user@host# set interfaces ge-0/0/11 unit 0 family ethernet-switching vlan members vlan101
user@host# set interfaces ge-1/0/3 vlan-tagging
user@host# set interfaces ge-1/0/3 unit 0 vlan-id 50
user@host# set interfaces ge-1/0/3 unit 0 family inet address 130.1.1.11/24
user@host# set interfaces ge-1/0/3 unit 0 family inet6 address 2001::1/64
```

6. Commit the configuration.

```
user@host# commit and-quit
user@host> exit
```

Results

From configuration mode, verify your configuration by entering the **show interfaces ge-0/0/11** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it:

[edit]

user@host# **show interfaces ge-0/0/11**

```
Physical interface: ge-0/0/11, Enabled, Physical link is Up
  Interface index: 163, SNMP ifIndex: 535
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, ADSL2P mode, Speed: 1000mbps,
  BPDU Error: None, Loop Detect PDU Error: None,
  Ethernet-Switching Error: None, MAC-REWRITE Error: None, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled,
  Auto-negotiation: Enabled, Remote fault: Online, IEEE 802.3az Energy Efficient
  Ethernet: Disabled, Auto-MDIX: Enabled
  ADSL status:
    Modem status   : Showtime (Adsl2plus)
    DSL mode       :      Auto      Annex A
  Device flags    : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags      : None
  CoS queues      : 12 supported, 12 maximum usable queues
  Current address: 08:b2:58:1e:c2:0e, Hardware address: 08:b2:58:1e:c2:0e
  Last flapped    : 2019-03-04 07:25:49 UTC (1w1d 22:55 ago)
  Input rate      : 1272 bps (2 pps)
  Output rate     : 1560 bps (2 pps)
  Active alarms   : None
  Active defects  : None
  PCS statistics          Seconds
    Bit errors            0
    Errored blocks        0
  Ethernet FEC statistics      Errors
    FEC Corrected Errors    0
    FEC Uncorrected Errors  0
    FEC Corrected Errors Rate 0
    FEC Uncorrected Errors Rate 0
  PRBS Statistics : Disabled
  Interface transmit statistics: Disabled

Logical interface ge-0/0/11.0 (Index 348) (SNMP ifIndex 536)
  Flags: Up SNMP-Traps 0x24024000 Encapsulation: Ethernet-Bridge
  Input packets : 0
  Output packets: 27874
  Protocol eth-switch, MTU: 1514
```



## RELATED DOCUMENTATION

# VDSL2 Interfaces on NFX250 NextGen Devices

**IN THIS SECTION**

- [VDSL Interface Overview | 52](#)
- [VDSL2 Network Deployment Topology | 53](#)
- [VDSL2 Interface Support on NFX Series Devices | 54](#)
- [Example: Configuring VDSL SFP Interface on NFX250 Devices | 56](#)

## VDSL Interface Overview

**IN THIS SECTION**

- [VDSL2 Vectoring Overview | 53](#)

Very-high-bit-rate digital subscriber line (VDSL) technology is part of the xDSL family of modem technologies that provide faster data transmission over a single flat untwisted or twisted pair of copper wires. The VDSL lines connect service provider networks and customer sites to provide high bandwidth applications (triple-play services) such as high-speed Internet access, telephone services like VoIP, high-definition TV (HDTV), and interactive gaming services over a single connection.

VDSL2 is an enhancement to G.993.1 (VDSL) and permits the transmission of asymmetric (half-duplex) and symmetric (full-duplex) aggregate data rates up to 100 Mbps on short copper loops using a bandwidth up to 17 MHz. The VDSL2 technology is based on the ITU-T G.993.2 (VDSL2) standard, which is the International Telecommunication Union standard describing a data transmission method for VDSL2 transceivers.

The VDSL2 uses discrete multitone (DMT) modulation. DMT is a method of separating a digital subscriber line signal so that the usable frequency range is separated into 256 frequency bands (or channels) of 4.3125 KHz each. The DMT uses the Fast Fourier Transform (FFT) algorithm for demodulation or modulation for increased speed.

VDSL2 interface supports Packet Transfer Mode (PTM). The PTM mode transports packets (IP, PPP, Ethernet, MPLS, and so on) over DSL links as an alternative to using Asynchronous Transfer Mode (ATM). PTM is based on the Ethernet in the First Mile (EFM) IEEE802.3ah standard.

VDSL2 provides backward compatibility with ADSL2 and ADSL2+ because this technology is based on both the VDSL1-DMT and ADSL2/ADSL2+ recommendations.

## VDSL2 Vectoring Overview

Vectoring is a transmission method that employs the coordination of line signals that reduce crosstalk levels and improve performance. It is based on the concept of noise cancellation, like noise-cancelling headphones. The ITU-T G.993.5 standard, "Self-FEXT Cancellation (Vectoring) for Use with VDSL2 Transceivers," also known as G.vector, describes vectoring for VDSL2.

The scope of Recommendation ITU-T G.993.5 is specifically limited to the self-FEXT (far-end crosstalk) cancellation in the downstream and upstream directions. The FEXT generated by a group of near-end transceivers and interfering with the far-end transceivers of that same group is canceled. This cancellation takes place between VDSL2 transceivers, not necessarily of the same profile.

## VDSL2 Network Deployment Topology

In standard telephone cables of copper wires, voice signals use only a fraction of the available bandwidth. Like any other DSL technology, the VDSL2 technology utilizes the remaining capacity to carry the data and multimedia on the wire without interrupting the line's ability to carry voice signals.

This example depicts the typical VDSL2 network topology deployed using NFX device.

A VDSL2 link between network devices is set up as follows:

1. Connect an end-user device such as a LAN, hub, or PC through an Ethernet interface to the customer premises equipment (CPE) (for example, an NFX device).
2. Connect the CPE to a DSLAM.
3. The VDSL2 interface uses either Gigabit Ethernet or fiber as second mile to connect to the Broadband Remote Access Server (B-RAS) as shown in [Figure 5 on page 54](#).
4. The ADSL interface uses either Gigabit Ethernet (in case of IP DSLAM) as the "second mile" to connect to the B-RAS or OC3/DS3 ATM as the second mile to connect the B-RAS as shown in [Figure 6 on page 54](#).

**NOTE:** The VDSL2 technology is backward compatible with ADSL2 and ADSL2+. VDSL2 provides an ADSL2 and ADSL2+ interface in an ATM DSLAM topology and provides a VDSL2 interface in an IP or VDSL DSLAM topology.

The DSLAM accepts connections from many customers and aggregates them to a single, high-capacity connection to the Internet.

Figure 5 on page 54 shows a typical VDSL2 network topology.

Figure 5: Typical VDSL2 End-to-End Connectivity and Topology Diagram

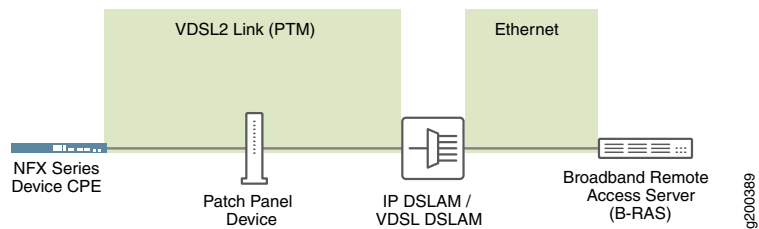
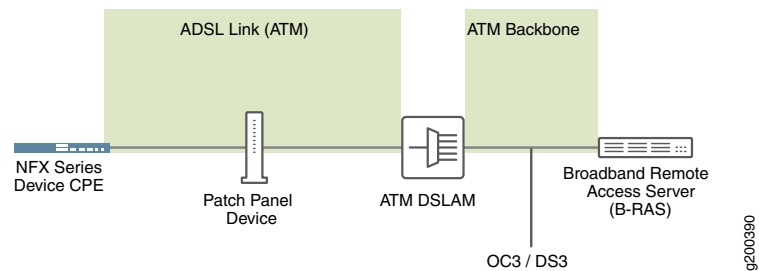


Figure 6 on page 54 shows a backward-compatible ADSL topology using ATM DSLAM.

Figure 6: Backward-Compatible ADSL Topology (ATM DSLAM)



## VDSL2 Interface Support on NFX Series Devices

The VDSL2 interface is supported on the NFX Series devices listed in Table 9 on page 55. (Platform support depends on the Junos OS release in your installation.)

Table 9: VDSL2 Annex A and Annex B Features

| Features                        | POTS                                    |
|---------------------------------|---|
| Devices                         | CPE-SFP-VDSL2                           |
| Supported annex operating modes | Annex A and Annex B*                    |
| Supported Bandplans             | Annex A 998<br>Annex B 997 and 998      |
| Supported standards             | ITU-T G.993.2 and ITU-T G.993.5 (VDSL2) |
| Used in                         | North American network implementations  |
| ADSL backward compatibility     | G 992.3 (ADSL2)<br>G 992.5 (ADSL2+)     |

**NOTE:** Only one CPE-SFP-VDSL2 device is supported at a time.

## VDSL2 Interface Compatibility with ADSL Interfaces

VDSL2 interfaces on NFX Series devices are backward compatible with most ADSL2 and ADSL2+ interface standards. The VDSL2 interface uses Ethernet in the First Mile (EFM) mode or Packet Transfer Mode (PTM) and uses the named interface ge-0/0/10 and ge-0/0/11.

**NOTE:**

- The VDSL2 interface has backward compatibility with ADSL2 and ADSL2+.
- It requires around 60 seconds to switch from VDSL2 to ADSL2 and ADSL2+ or from ADSL2 and ADSL2+ to VDSL2 operating modes.

## VDSL2 Interfaces Supported Profiles

A profile is a table that contains a list of pre-configured VDSL2 settings. [Table 10 on page 56](#) lists the different profiles supported on the VDSL2 interfaces and their properties.

Table 10: Supported Profiles on the VDSL2 Interfaces

| Profiles | Data Rate                            |
|----------|--------------------------------------|
| 8a       | 50                                   |
| 8b       | 50                                   |
| 8c       | 50                                   |
| 8d       | 50                                   |
| 12a      | 68                                   |
| 12b      | 68                                   |
| 17a      | 100                                  |
| Auto     | Negotiated (based on operating mode) |

## Example: Configuring VDSL SFP Interface on NFX250 Devices

### IN THIS SECTION

- [Requirements | 56](#)
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- [Configuration | 57](#)
- [Results | 60](#)

### Requirements

This example uses the following hardware and software components:

- NFX250 device running Junos OS Release 15.1X53-D495.

## Overview

In this example, you are configuring VDSL SFP interface on an NFX250 device with the following configurations:

- Physical interface - **ge-0/0/11**
- Virtual network function (VNF) - **nfx250-a-vsrx1**
- Memory size - **4194304**
- VDSL SFP options - **profile auto and carrier auto**

To configure VDSL SFP interface on NFX250 devices, you must configure JDM, vSRX, and vJunos0.

**NOTE:** Ensure that connectivity to the host is not lost during the configuration process.

## Configuration

### Step-by-Step Procedure

To configure VDSL SFP interfaces on NFX250 devices:

1. Connect to the host.

```
user@host> configure
[edit]
user@host#
```

2. Allocate hugepages:

```
user@host# run show system visibility memory
user@host# set system memory hugepages size 1024 count 5
Reboot the device.
```

3. Create VLANs using VLAN IDs:

```
user@host# set host-os vlans xdsl-test vlan-id 50
user@host# set host-os vlans vlan130 vlan-id 130
user@host# set host-os vlans vlan131 vlan-id 131
user@host# set host-os vlans vlan132 vlan-id 132
```

#### 4. Allocate resources for a VNF:

```

user@host# set virtual-network-functions nfx250-a-vsrx1 image
/var/public/media-vsrx-vmdisk-15.1-2018-04-24.0_DEV_X_151_X49.qcow2
user@host# set virtual-network-functions nfx250-a-vsrx1 virtual-cpu 0 physical-cpu 2
user@host# set virtual-network-functions nfx250-a-vsrx1 virtual-cpu 1 physical-cpu 6
user@host# set virtual-network-functions nfx250-a-vsrx1 virtual-cpu count 2
user@host# set virtual-network-functions nfx250-a-vsrx1 virtual-cpu features
hardware-virtualization
user@host# set virtual-network-functions nfx250-a-vsrx1 no-default-interfaces
user@host# set virtual-network-functions nfx250-a-vsrx1 memory size 4194304
user@host# set virtual-network-functions nfx250-a-vsrx1 memory features hugepages
user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth0 management out-of-band

```

#### 5. Map VNF interfaces to NFV backplane:

```

user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth1 mapping vlan mode trunk
user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth1 mapping vlan members
vlan130
user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth2 mapping vlan mode trunk
user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth2 mapping vlan members
vlan130
user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth2 mapping vlan members
vlan131
user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth2 mapping vlan members
vlan132
user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth2 mapping vlan members
xdsl-test
user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth2 mapping vlan native-vlan-id
50
user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth3 mapping vlan mode trunk
user@host# set virtual-network-functions nfx250-a-vsrx1 interfaces eth3 mapping vlan members
xdsl-test

```

#### 6. Configure the Junos Control Plane (JCP):

```

user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members xdsl-test
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan130

```

```
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan131
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan132
user@host# set interfaces ge-0/0/11 native-vlan-id 50
user@host# set interfaces ge-0/0/11 dsl-sfp-options vdsl-options profile auto
user@host# set interfaces ge-0/0/11 dsl-sfp-options vdsl-options carrier auto
user@host# set interfaces ge-0/0/11 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces ge-0/0/11 unit 0 family ethernet-switching vlan members xdsl-test
user@host# set interfaces ge-0/0/11 unit 0 family ethernet-switching vlan members vlan130
user@host# set interfaces ge-0/0/11 unit 0 family ethernet-switching vlan members vlan131
user@host# set interfaces ge-0/0/11 unit 0 family ethernet-switching vlan members vlan132
user@host# set vlans vlan130 vlan-id 130
user@host# set vlans vlan131 vlan-id 131
user@host# set vlans vlan132 vlan-id 132
user@host# set vlans xdsl-test vlan-id 50
```

7. Commit the configuration.

```
user@host# commit and-quit
user@host> exit
```



Results

From configuration mode, verify your configuration by entering the **show interfaces ge-0/0/11** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it:

[edit]

user@host# **show interfaces ge-0/0/11**

```
Physical interface: ge-0/0/11, Enabled, Physical link is Up
  Interface index: 258, SNMP ifIndex: 533
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, VDSL2 mode, Speed: 1000mbps,
  BPDU Error: None, Loop Detect PDU Error: None,
  Ethernet-Switching Error: None, MAC-REWRITE Error: None, Loopback: Disabled, Source
  filtering: Disabled, Flow control: Enabled,
  Auto-negotiation: Enabled, Remote fault: Online, IEEE 802.3az Energy Efficient
  Ethernet: Disabled, Auto-MDIX: Enabled
  VDSL status:
    Modem status   : Showtime (Profile-12a)
    VDSL profile   :      Auto      Annex B
    Device flags    : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags      : None
  CoS queues      : 12 supported, 12 maximum usable queues
  Current address: 08:b2:58:1f:0d:0d, Hardware address: 08:b2:58:1f:0d:0d
  Last flapped    : 2018-11-02 08:43:20 UTC (6d 00:29 ago)
  Input rate      : 888 bps (1 pps)
  Output rate     : 888 bps (1 pps)
  Active alarms   : None
  Active defects  : None
  PCS statistics
    Bit errors          Seconds
    Errored blocks      0
  Ethernet FEC statistics
    FEC Corrected Errors      0
    FEC Uncorrected Errors    0
    FEC Corrected Errors Rate 0
    FEC Uncorrected Errors Rate 0
    PRBS Statistics : Disabled
  Interface transmit statistics: Disabled

Logical interface ge-0/0/11.0 (Index 336) (SNMP ifIndex 535)
  Flags: Up SNMP-Traps 0x24024000 Encapsulation: Ethernet-Bridge
  Input packets : 0
  Output packets: 0
```

```
Protocol eth-switch, MTU: 1514  
Flags: Trunk-Mode
```

## RELATED DOCUMENTATION

---

[\*NFX250 Overview\*](#)

---

[\*JDM Architecture Overview\*](#)

---

[\*JDM CLI Overview\*](#)

# 4

CHAPTER

## Configuring Security

---

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Intrusion Detection and Prevention on NFX Devices | **76**

Integrated User Firewall Support on NFX Devices | **76**

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# IP Security on NFX Devices

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## Overview

IPsec provides network-level data integrity, data confidentiality, data origin authentication, and protection from replay. IPsec can protect any protocol running over IP on any medium or a mixture of application protocols running on a complex combination of media. IPsec provides security services at the network layer of the Open Systems Interconnection (OSI) model by enabling a system to select required security protocols, determine the algorithms to use for the security services, and implement any cryptographic keys required to provide the requested services. IPsec is standardized by International Engineering Task Force (IETF).

IPsec protects one or more paths between a pair of hosts or security gateways, or between a security gateway and a host. It achieves this by providing a secure way to authenticate senders/receivers and encrypt IP version 4 (IPv4) and version 6 (IPv6) traffic between network devices.

The key concepts of IPsec include:

- Security associations (SAs)—An SA is a set of IPsec specifications negotiated between devices that are establishing an IPsec relationship. These specifications include preferences for the type of authentication and encryption, and the IPsec protocol that is used to establish the IPsec connection. A security association is uniquely identified by a security parameter index (SPI), an IPv4 or IPv6 destination address, and a security protocol (AH or ESP). IPsec security associations are established either manually through configuration statements, or dynamically by IKE negotiation. For more information about SAs, see [Security Associations](#).
- IPsec key management—VPN tunnels are built using IPsec technology. Virtual private network (VPN) tunnels operate with three kinds of key creation mechanisms such as Manual Key, AutoKey Internet Key Exchange (IKE), and Diffie-Hellman (DH) Exchange. NFX150 devices support IKEv1 and IKEv2. For more information about IPsec key management, see [IPsec Key Management](#).
- IPsec security protocols—IPsec uses two protocols to secure communications at the IP layer:
  - Authentication Header (AH)—A security protocol for authenticating the source of an IP packet and verifying the integrity of its content.

- Encapsulating Security Payload (ESP)—A security protocol for encrypting the entire IP packet and authenticating its content.
- For more information about IPsec security protocols, see [IPsec Security Protocols](#).
- IPsec tunnel negotiation—To establish an IKE IPsec tunnel, two phases of negotiation are required:
    - In Phase 1, the participants establish a secure connection to negotiate the IPsec SAs.
    - In Phase 2, the participants negotiate the IPsec SAs for encrypting and authenticating the ensuing exchanges of user data.

For more information about IPsec tunnel negotiation, see [IPsec Tunnel Negotiation](#).

[Table 11 on page 66](#) lists the IPsec features supported on NFX150 devices.

**Table 11: IPsec Features Supported on NFX150**

| Features  | Reference   |
|---|---|
| AutoVPN Spoke   | <a href="#">Understanding Spoke Authentication in AutoVPN Deployments</a> |
| Auto Discovery VPN (ADVPN) Partner<br><br><b>NOTE:</b> On NFX150 devices, you cannot configure ADVPN Suggester. | <a href="#">Understanding Auto Discovery VPN</a>                          |
| Site-to-Site VPN and Dynamic Endpoints  | <a href="#">Understanding IPsec VPNs with Dynamic Endpoints</a>           |
| Route-based VPN<br><br><b>NOTE:</b> NFX150 devices do not support policy-based VPNs.                            | <a href="#">Understanding Route-Based IPsec VPNs</a>                      |
| NAT-T   | <a href="#">Understanding NAT-T</a>                                       |
| Dead Peer Detection   | <a href="#">Understanding VPN Monitoring</a>                              |

## Configuring Security

### IN THIS SECTION

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- [Configuring Routing Options | 68](#)

- [Configuring Security IKE | 68](#)
- [Configuring Security IPsec | 71](#)
- [Configuring Security Policies | 73](#)
- [Configuring Security Zones | 73](#)

On NFX150 devices, security is implemented by using IP security (IPsec). The configuration process of IP security (IPsec) includes the following tasks:

## Configuring Interfaces

To enable IPsec on a LAN or WAN, you must configure interfaces to provide network connectivity and data flow.

**NOTE:** To configure IPsec, use the FPC1 interface.

To configure interfaces, complete the following steps:

1. Log in to the JCP CLI and enter configuration mode:

```
root@host% cli
root@host> configure
```

2. Enable VLAN tagging support on the logical interface:

```
root@host# set interfaces interface-name vlan-tagging
```

3. Assign a VLAN ID to the logical interface:

```
root@host# set interfaces interface-name unit logical-interface-unit-number vlan-id vlan-id
```

4. Assign an IPv4 address to the logical interface:

```
root@host# set interfaces interface-name unit logical-interface-unit-number family inet address
interface-address
```

5. Assign an IPv6 address to the logical interface:



```
root@host# set interfaces interface-name unit interface-logical-unit-number family inet6 address
interface-address
```

## Configuring Routing Options

Routing capabilities and features that are not specific to any particular routing protocol are collectively called protocol-independent routing properties. These features often interact with routing protocols. In many cases, you combine protocol-independent properties and routing policy to achieve a goal. For example, you define a static route using protocol-independent properties, and then you use a routing policy to re-distribute the static route into a routing protocol, such as BGP, OSPF, or IS-IS.

Protocol-independent routing properties include:

- Static, aggregate, and generated routes
- Global preference
- Martian routes
- Routing tables and routing information base (RIB) groups

To configure the routing table groups into which the interface routes are imported, complete the following steps:

1. Configure RIB and static route:

```
root@host# set routing-options rib rib-name static route ip-address/prefix-length next-hop ip-address
```

2. Configure static route:

```
root@host# set routing-options static route ip-address/prefix-length next-hop ip-address
```

## Configuring Security IKE

IPsec uses the Internet Key Exchange (IKE) protocol to authenticate the IPsec peers, to negotiate the security association (SA) settings, and to exchange IPsec keys. The IKE configuration defines the algorithms and keys used to establish the secure IKE connection with the peer security gateway.

You can configure IKE traceoptions for debugging and managing the IPsec IKE.

To configure IKE traceoptions, complete the following steps:

1. Specify the maximum size of the trace file:

```
root@host# set security ike traceoptions file size file-size
```

2. Specify the parameters to trace information for IKE:

```
root@host# set security ike traceoptions flag all
```

3. Specify the level of trace information for IKE:

```
root@host# set security ike traceoptions level level
```

You can configure one or more IKE proposals. Each proposal is a list of IKE attributes to protect the IKE connection between the IKE host and its peer.

To configure IKE proposal, complete the following steps:

1. Configure pre-shared-keys as an authentication method for the IPsec IKE proposal:

**NOTE:** When you configure IPsec for secure communications in the network, the peer devices in the network must have at least one common authentication method. Only one authentication method can be used between a pair of devices, regardless of the number of authentication methods configured.

```
root@host# set security ike proposal ike-proposal-name authentication-method pre-shared-keys
```

2. Define a Diffie-Hellman group (dh-group) for the IKE proposal:

```
root@host# set security ike proposal ike-proposal-name dh-group group14
```

3. Configure an authentication algorithm for the IKE proposal:

```
root@host# set security ike proposal ike-proposal-name authentication-algorithm sha-256
```

4. Define an encryption algorithm for the IKE proposal:

```
root@host# set security ike proposal ike-proposal-name encryption-algorithm aes-256-cbc
```

5. Set a lifetime for the IKE proposal in seconds:

```
root@host# set security ike proposal ike-proposal-name lifetime-seconds 180 to 86400 seconds
```

After configuring one or more IKE proposals, you must associate these proposals with an IKE policy. An IKE policy defines a combination of security parameters (IKE proposals) to be used during IKE negotiation. It defines a peer address and the proposals needed for that connection. Depending on which authentication method is used, it defines the preshared key for the given peer. During the IKE negotiation, IKE looks for an IKE policy that is the same on both peers. The peer that initiates the negotiation sends all its policies to the remote peer, and the remote peer tries to find a match.

To configure IKE policy, complete the following steps:

1. Define an IKE policy with first phase mode:

```
root@host# set security ike policy ike-policy-name mode aggressive
```

2. Define a set of IKE proposals:

```
root@host# set security ike policy ike-policy-name proposals proposal-name
```

3. Define a pre-shared key for IKE:

```
root@host# set security ike policy ike-policy-name pre-shared-key ascii-text text-format
```

Configure an IKE gateway to initiate and terminate network connections between a firewall and a security device.

To configure IKE gateway, complete the following steps:

1. Configure an IKE gateway with an IKE policy:

```
root@host# set security ike gateway gateway-name ike-policy ike-policy-name
```

2. Configure an IKE gateway with an address or hostname of the peer:

```
root@host# set security ike gateway gateway-name address address-or-hostname-of-peer
```

3. Enable dead peer detection (DPD) feature to send DPD messages periodically:

```
root@host# set security ike gateway gateway-name dead-peer-detection always-send
```

4. Configure the local IKE identity:

```
root@host# set security ike gateway gateway-name local-identity <inet | inet6 | key-id | hostname  
| user-at-hostname | distinguished-name>
```

5. Configure the remote IKE identity:

```
root@host# set security ike gateway gateway-name remote-identity <inet | inet6 | key-id | hostname  
| user-at-hostname | distinguished-name>
```

6. Configure an external interface for IKE negotiations:

```
root@host# set security ike gateway gateway-name external-interface ge-1/0/1.0
```

7. Configure username of the client:

```
root@host# set security ike gateway gateway-name client username client-username
```

8. Configure password of the client:

```
root@host# set security ike gateway gateway-name client password client-password
```

## Configuring Security IPsec

IPsec is a suite of related protocols that provides network-level data integrity, data confidentiality, data origin authentication, and protection from replay. IPsec can protect any protocol running over IP on any medium or a mixture of application protocols running on a complex combination of media.

Configure an IPsec proposal, which lists protocols and algorithms or security services to be negotiated with the remote IPsec peer.

To configure an IPsec proposal, complete the following steps:

1. Define an IPsec proposal and protocol for the proposal:

```
root@host# set security ipsec proposal ipsec-proposal-name protocol esp
```

2. Define an authentication algorithm for the IPsec proposal:

```
root@host# set security ipsec proposal ipsec-proposal-name authentication-algorithm  
hmac-sha-256-128
```

3. Define an encryption algorithm for the IPsec proposal:

```
root@host# set security ipsec proposal ipsec-proposal-name encryption-algorithm aes-256-cbc
```

4. Set a lifetime for the IPsec proposal in seconds:

```
root@host# set security ipsec proposal ipsec-proposal-name lifetime-seconds 180..86400 seconds
```

After configuring one or more IPsec proposals, you must associate these proposals with an IPsec policy. An IPsec policy defines a combination of security parameters (IPsec proposals) used during IPsec negotiation. It defines Perfect Forward Secrecy (PFS) and the proposals needed for the connection. During the IPsec negotiation, IPsec searches for a proposal that is the same on both peers. The peer that initiates the negotiation sends all its policies to the remote peer, and the remote peer tries to find a match.

To configure IPsec policies, complete the following steps:

1. Define an IPsec policy, a perfect forward secrecy, and a Diffie-Hellman group for the policy:

```
root@host# set security ipsec policy ipsec-policy-name perfect-forward-secrecy keys group14
```

2. Define a set of IPsec proposals for the policy:

```
root@host# set security ipsec policy ipsec-policy-name proposals proposal-name
```

Configure an IPsec virtual private network (VPN) to provide a means for securely communicating among remote computers across a public WAN such as the Internet. A VPN connection can link two LANs (site-to-site VPN) or a remote dial-up user and a LAN. The traffic that flows between these two points passes through shared resources such as routers, switches, and other network equipment that make up the public WAN. To secure VPN communication while passing through the WAN, the two participants create an IPsec tunnel. For more information, see [IPsec VPN Overview](#).

To configure IPsec VPN, complete the following steps:

1. Define an IKE gateway for the IPsec VPN:

```
root@host# set security ipsec vpn vpn-name ike gateway remote-gateway-name
```

2. Define an IPsec policy for the IPsec VPN:

```
root@host# set security ipsec vpn vpn-name ike ipsec-policy ipsec-policy-name
```

3. Define a local traffic selector for the IPsec VPN:

```
root@host# set security ipsec vpn vpn-name traffic-selector traffic-selector-name local-ip  
local-traffic-selector-ip-address
```

4. Define a remote traffic selector for the IPsec VPN:

```
root@host# set security ipsec vpn vpn-name traffic-selector traffic-selector-name remote-ip  
remote-traffic-selector-ip-address
```

5. Define a criteria to establish IPsec VPN tunnels:

```
root@host# set security ipsec vpn vpn-name establish-tunnels on-traffic
```

## Configuring Security Policies

A security policy controls the traffic flow from one zone to another zone by defining the kind of traffic permitted from specified IP sources to specified IP destinations at scheduled times. Policies allow you to deny, permit, reject, encrypt and decrypt, authenticate, prioritize, schedule, filter, and monitor the traffic attempting to cross from one security zone to another. You can decide which users and what data can enter and exit, and when and where they can go.

To configure security policies, complete the following steps:

1. Configure security policy match criteria for the source address:

```
root@host# set security policies from-zone from-zone-name to-zone to-zone-name policy policy-name
match source-address any
```

2. Configure security policy match criteria for the destination address:

```
root@host# set security policies from-zone from-zone-name to-zone to-zone-name policy policy-name
match destination-address any
```

3. Configure security policy application:

```
root@host# set security policies from-zone from-zone-name to-zone to-zone-name policy policy-name
match application any
```

4. Set security policy match criteria:

```
root@host# set security policies from-zone from-zone-name to-zone to-zone-name policy policy-name
match then permit
```

## Configuring Security Zones

Security zones are the building blocks for policies. They are logical entities to which one or more interfaces are bound. Security zones provide a means of distinguishing groups of hosts (user systems and other hosts, such as servers) and their resources from one another in order to apply different security measures to them. For information, see *Understanding Security Zones*.

To configure security zones, complete the following steps:

1. Configure security zones with system services:

```
root@host# set security zones security-zone zone-name host-inbound-traffic system-services all
```

2. Define protocols for security zones:

```
root@host# set security zones security-zone zone-name host-inbound-traffic protocols all
```

### 3. Configure interfaces for security zones:

```
root@host# set security zones security-zone zone-name interfaces interface-name
```

## UTM on NFX Devices

The Unified threat management (UTM) solution consolidates several security features to protect against multiple threat types. The UTM solution for NFX devices consists of the following security features:

- **Antispam**—Examines e-mail messages to identify spam. When the device detects an e-mail spam, it drops the message or tags the message header or subject field with a preprogrammed string. For more information, see *Antispam Filtering Overview*.
- **Antivirus**—Offers a less CPU-intensive alternative to the full file-based antivirus feature. Sophos uses a scanning engine and virus signature databases to protect against virus-infected files, worms, trojans, spyware, and other malware over POP3, HTTP, SMTP, IMAP, and FTP protocols. The virus pattern and malware database is located on external servers maintained by Sophos (Sophos Extensible List) servers. For more information, see *Sophos Antivirus Protection on NFX Devices*.
- **Content filtering**—Blocks or permits certain types of traffic based on the MIME type, file extension, protocol command, and embedded object type. For more information, see *Content Filtering*.
- **Web filtering**—Allows you to manage Internet usage by preventing access to inappropriate Web content. The Web filtering solution consists of the following types:
  - Redirect web filtering
  - Local web filtering
  - Enhanced Web filtering

For more information, see *Web Filtering Overview*.

**NOTE:** Antispam, Sophos antivirus, and enhanced web filtering are licensed features and will not function until you install the respective licenses.

### RELATED DOCUMENTATION

## Application Security on NFX Devices

The NFX150 devices support the AppSecure feature, which is a suite of application-aware security services that deliver security services to provide visibility and control over the types of applications traversing in the networks. AppSecure uses a sophisticated classification engine to accurately identify applications regardless of port or protocol, including nested applications that reside within trusted network services.

The AppSecure feature comprises of the following services:

- Application identification (AppID)—Recognizes traffic at different network layers using characteristics other than port number. Once the application is determined, AppSecure service modules can be configured to monitor and control traffic for tracking, prioritization, access control, detection, and prevention based on the application ID of the traffic. For more information, see *Application Identification*.
- Application Tracking (AppTrack)—Tracks and reports applications passing through the device. For more information, see *Application Tracking on NFX Devices*.
- Application Firewall (AppFW)—Implements an application firewall using application-based rules. For more information, see *Application Firewall on NFX Devices*.
- Application Quality of Service (AppQoS)—Provides quality-of-service prioritization based on application awareness. For more information, see *Application QoS*.
- Advanced policy-based routing (APBR)—Classifies session based on applications and applies the configured rules to reroute the traffic. For more information, see *Advanced Policy-Based Routing on NFX Devices*.

AppSecure works with additional content security on the device through integrated unified threat management (UTM), intrusion prevention systems (IPS), and Juniper Networks Sky Advanced Threat Prevention (Sky ATP) for deeper protection against malware, spam, phishing, and application exploits.

### RELATED DOCUMENTATION



# Intrusion Detection and Prevention on NFX Devices

Intrusion detection is the process of monitoring the events occurring in your network and analyzing them for signs of possible incidents, violations, or imminent threats to your security policies. Intrusion prevention is the process of performing intrusion detection and then stopping the detected incidents. These security measures are available as intrusion detection systems (IDS) and intrusion prevention systems (IPS), which become part of your network to detect and stop potential incidents.

An [Intrusion Detection and Prevention \(IDP\)](#) policy lets you selectively enforce various attack detection and prevention techniques on the network traffic passing through your device. Juniper devices offer the same set of IDP signatures that are available on Juniper Networks IDP Series Intrusion Detection and Prevention Appliances to secure networks against attacks. The basic IDP configuration involves the following tasks:

- Download and install the IDP license.
- Download and install the signature database—You must download and install the IDP signature database. The signature databases are available as a security package on the Juniper Networks website. This database includes attack object and attack object groups that you can use in IDP policies to match traffic against known attacks.
- Configure recommended policy as the IDP policy—Juniper Networks provides predefined policy templates to use as a starting point for creating your own policies. Each template is a set of rules of a specific rulebase type that you can copy and then update according to your requirements.

To get started, we recommend you use the predefined policy named “Recommended”.

- Enable a security policy for IDP inspection—For transit traffic to pass through IDP inspection, you configure a security policy and enable IDP application services on all traffic that you want to inspect.

For information on configuring IDP on NFX Series devices, see the [Intrusion Detection and Prevention User Guide](#).

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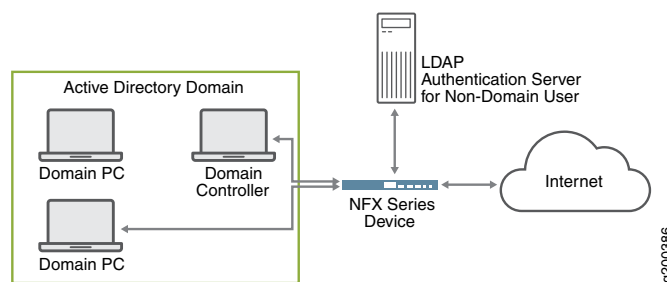
# Integrated User Firewall Support on NFX Devices

The integrated user firewall feature introduces an authentication source via integration with Microsoft Active Directory. This feature consists of the device polling the event log of the Active Directory controller

to determine, by username and source IP address, who has logged in to the device. Then the username and group information are queried from the LDAP service in the Active Directory controller. Once the device has the IP address, username, and group relationship information, it generates authentication entries. With the authentication entries, the device user firewall module enforces user-based and group-based policy control over traffic.

Figure 7 on page 77 illustrates a typical scenario where the integrated user firewall feature is deployed. Users in the Active Directory domain and users outside the Active Directory domain want access to the Internet through the device. The domain controller might also act as the LDAP server.

**Figure 7: Scenario for Integrated User Firewall**



The device reads and analyzes the event log of the domain controller and generates an authentication table as an Active Directory authentication source for this feature. The user firewall is aware of any domain user on an Active Directory domain device via the Active Directory authentication source. The device administrator configures a user firewall policy that enforces the desired user-based or group-based access control.

For information on configuring the integrated user firewall on NFX Series devices, see [Authentication and Integrated User Firewalls User Guide](#).

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# 5

CHAPTER

## Configuring Virtual Network Functions

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# Prerequisites to Onboard Virtual Network Functions on NFX250 (NextGen) Devices

You can onboard and manage Juniper Virtual Network Functions (VNFs) and third-party VNFs on NFX devices through the Junos Control Plane (JCP).

The number of VNFs that you can onboard on the device depends on the availability of system resources such as the number of CPUs and system memory.

Before you onboard the VNFs, it is recommended to check the available system resources such as CPUs, memory, and storage for VNFs. For more information, see [“Configuring VNFs on NFX250 NextGen Devices” on page 81](#).

## Prerequisites for VNFs

To instantiate VNFs, the NFX device supports:

- KVM based hypervisor deployment
- OVS or Virtio interface drivers
- raw or qcow2 VNF file types
- (Optional) SR-IOV
- (Optional) CD-ROM and USB configuration drives
- (Optional) Hugepages for memory requirements

## Configuring VNFs on NFX250 NextGen Devices

### IN THIS SECTION

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- [Prepare the Bootstrap Configuration | 83](#)
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- Configure Interfaces and VLANs for a VNF | 89
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The NFX250 NextGen devices enable you to instantiate and manage virtualized network functions (VNFs) from the Junos Control Plane (JCP). The JCP supports the creation and management of third-party VNFs.

## Load a VNF Image

To configure a VNF, you must log in to the JCP:

```
user@host:~ # cli
```

```
user@host>
```

To load a VNF image on the device from a remote location, use the **file-copy** command.

**NOTE:** You must save the VNF image in the **/var/public** directory.

```
user@host> file copy source-address /var/public
```

For example:

```
user@host> file copy scp://192.0.2.0//tftpboot/centos.img /var/public
```

Alternatively, you can load a VNF image by using the NETCONF command, **file-put**.

## Prepare the Bootstrap Configuration

You can bootstrap a VNF using an attached config drive that contains a bootstrap-config ISO file. For an example of creating an ISO file, see the procedure in [Creating a vSRX Bootstrap ISO Image](#). The procedure might differ based on the operating system (for example, Linux, Ubuntu) that you use to create the ISO file.

The config drive is a virtual drive, which can be a CD-ROM, USB drive or Disk drive associated to a VNF with the configuration data. Configuration data can be files or folders, which are bundled in the ISO file that makes a virtual CD-ROM, USB drive, or Disk drive.

A bootstrap configuration file must contain an initial configuration that allows the VNF to be accessible from an external controller, and accepts SSH, HTTP, or HTTPS connections from an external controller for further runtime configurations.

By attaching a config drive, you can pass the networking configurations such as the IP address, subnet mask, and gateway to the VNFs through a CLI. After receiving the configuration inputs, the device generates a bootstrap-config ISO file, and attaches the file to the VNF as a CD-ROM, USB drive, or Disk drive.

For more information about configuring and attaching a config drive, see [“\(Optional\) Attach a Config Drive to the VNF” on page 88](#).

### NOTE:

- The system saves the bootstrap-config ISO file in the **/var/public** folder. The file is saved only if the available space in the folder is more than double the total size of the contents in the file. If the available space in the folder is not sufficient, an error message is displayed when you commit the configuration.
- When you reboot the system, the system generates a new bootstrap-config ISO file and replaces the existing ISO file with the new ISO file on the VNF.
- The config drive is a read-only drive. Based on the VNF, you can specify the config drive as a read-only CD-ROM drive, USB drive, or a Disk drive.

The config drive supports the following data for VNFs:

- Static content as files—The device accepts one or more file paths through a CLI, converts these files to an ISO image, and attaches it to the VNF. The config drive supports multiple static files in a VNF configuration.
- Jinja2 template and parameters—Jinja2 parameters consist of key-value pairs. The key is specified in the template and the value replaces the key when the template is rendered. The system adds the rendered output file to the ISO image, and attaches it to the VNF. The maximum number of parameters for a template is 256 key-value pairs. The config drive supports multiple templates and its parameters in a VNF configuration.

**NOTE:** The config drive supports only Jinja2 templates.

- **Directory**—The device accepts the specific directory contents, converts the folder structure in the given folder to an ISO image, and attaches it to the VNF. The config drive accepts only one folder. That folder becomes the root directory in the ISO image, and all the subsequent folders and files are added to the ISO image.

**NOTE:**

- You can add multiple source templates and source files in a VNF configuration.
- To add multiple source templates and one source folder in a VNF configuration, the target template file must be inside the source folder.
- You can add only one source folder in a VNF configuration.
- If two VNFs share the same set of files, separate bootstrap-config ISO files are generated for each VNF. Deleting one VNF will not affect the other VNF.

## Allocate CPUs for a VNF

Table 12 on page 84 lists the CPUs available for VNF usage for the NFX250 models.

Table 12: CPUs Available for VNF Usage (Junos OS 19.1R1 Release)

| Model      | CPUs Available for VNF Usage |             |              |
|------------|------------------------------|-------------|--------------|
|            | Throughput Mode              | Hybrid Mode | Compute Mode |
| NFX250-S1  | 0                            | 4           | 8            |
| NFX250-S2  | 0                            | 4           | 8            |
| NFX250-S1E | 0                            | 4           | 8            |

**NOTE:** When you change the performance mode of the device, it is recommended to check the availability of the CPUs for VNFs.



To check the CPU availability and its status:

```
user@host> show system visibility cpu
```

```
CPU Statistics (Time in sec)
-----
CPU Id User Time System Time Idle Time Nice Time IOWait Time Intr. Service Time
-----
0      7762      1475      60539      0        84          0
1      191       511      70218      0        10          0
2      102       32       70841      0        12          0
3       0        0       70999      0         0          0
4       0        0       70999      0         0          0
5       0        0       70999      0         0          0
6     70949       0       50         0         0          0
7     9005      532     59602      0         0          0
8      23        7     70966      0         0          0
9      21        7     70969      0         0          0
10     20        6     70969      0         0          0
11     18        6     70970      0         0          0
```

#### CPU Usages

```
-----
CPU Id CPU Usage
-----
0      17.899999999999999
1       0.0
2       0.0
3       0.0
4       0.0
5       0.0
6     100.0
7     15.199999999999999
8       0.0
9       0.0
10      0.0
11      0.0
```

#### CPU Pinning Information

```
-----
Virtual Machine          vCPU CPU
-----
vjunos0                  0    0
```

| System Component | CPUs  |
|------------------|-------|
| -----            | ----- |
| ovs-vswitchd     | 0, 6  |

**NOTE:** vjunos0 is a system VNF, you cannot modify the CPU allocation for the vjunos0.

To specify the number of virtual CPUs that are required for a VNF:

1. Specify the number of CPUs required for the VNF:

```
user@host# set virtual-network-functions vnf-name virtual-cpu count number
```

2. Connect a virtual CPU to a physical CPU:

```
user@host# set virtual-network-functions vnf-name virtual-cpu vcpu-number physical-cpu
pcpu-number
```

3. Commit the configuration:

```
user@host# commit
```

The physical CPU number can be either a number or a number range. By default, a VNF is allocated one virtual CPU that is not connected to any physical CPU.

**NOTE:** You cannot change the CPU configuration of a VNF while the VNF is running. You must restart the VNF for the changes to take effect.

To enable hardware virtualization or hardware acceleration for VNF CPUs:

```
user@host# set virtual-network-functions vnf-name virtual-cpu features hardware-virtualization
```

## Allocate Memory for a VNF

By default, a certain amount of memory is allocated for VNFs. [Table 13 on page 87](#) lists the possible memory availability for VNF usage for the NFX250 models.

Table 13: Memory Availability for VNF Usage

| Model      | Memory Availability for VNF Usage (Junos OS 19.1R1 Release) |
|------------|---|
| NFX250-S1  | 6 GB  |
| NFX250-S1E | 6 GB  |
| NFX250-S2  | 22 GB   |

To check the available memory:

**user@host> show system visibility memory**

```

Memory Information
-----

Virtual Memory:
-----
Total      (KiB): 15914364
Used       (KiB): 13179424
Available  (KiB): 3087076
Free       (KiB): 2734940
Percent Used      : 80.6

Huge Pages:
-----
Total 1GiB Huge Pages:      7
Free 1GiB Huge Pages:      5
Configured 1GiB Huge Pages: 5
Total 2MiB Huge Pages:    1376
Free 2MiB Huge Pages:      1
Configured 2MiB Huge Pages: 0

Hugepages Usage:
-----
Name                                     Type                                     Used 1G
Hugepages  Used 2M Hugepages
-----
-----
srxpfe                                other process                            1
    1375
ovs-vswitchd                          other process                            2
    0

```

**NOTE:** vjunos0 is a system VNF, you cannot modify the memory allocation for the vjunos0.

To specify the maximum primary memory that the VNF can use:

```
user@host# set virtual-network-functions vnf-name memory size size
```

**NOTE:** You cannot change the memory configuration of a VNF while the VNF is running. You must restart the VNF for the changes to take effect.

## (Optional) Attach a Config Drive to the VNF

Add files and template to the config drive.

1. Specify the source file to add in the config drive:

```
user@host# set virtual-network-functions vnf-name config-data source file source-file1
user@host# set virtual-network-functions vnf-name config-data source file source-file2
```

2. Specify the template file to add in the config drive:

```
user@host# set virtual-network-functions vnf-name config-data source template template-name
file template-file
user@host# set virtual-network-functions vnf-name config-data source template template-name
parameters image_type image-type
user@host# set virtual-network-functions vnf-name config-data source template template-name
parameters memory-size memory-size
user@host# set virtual-network-functions vnf-name config-data source template template-name
target target-filename
```

3. Specify the device name and type to add in the config drive:

```
user@host# set virtual-network-functions vnf-name config-data target device-name
target-device-name

user@host# set virtual-network-functions vnf-name config-data target device-type target-device-type
```

The **target device-type** is optional. If you do not specify, it takes the device type as **cd-rom**.

```
user@host# set virtual-network-functions vnf-name config-data target device-label target-device-label
```

The **target device-label** is optional. If you do not specify, it takes the device label as **config-data**.

4. Commit the configuration:

```
user@host# commit
```

Add a directory to the config drive.

1. Specify the source directory to add in the config drive:

```
user@host# set virtual-network-functions vnf-name config-data source directory directory-name
```

2. Specify the device name and type to add in the config drive:

```
user@host# set virtual-network-functions vnf-name config-data target device-name  
target-device-name
```

```
user@host# set virtual-network-functions vnf-name config-data target device-type device-type
```

```
user@host# set virtual-network-functions vnf-name config-data target device-label device-label
```

3. Commit the configuration:

```
user@host# commit
```

To verify whether the config drive is attached to the VNF, see the **VNF Disk Information** section in the [show system visibility vnf](#) command output message.

## Configure Interfaces and VLANs for a VNF

You can configure a VNF interface and attach the interface to a physical NIC port, a management interface, or VLANs.

To attach a VNF interface to a physical NIC port by using the SR-IOV virtual function:

```
user@host# set virtual-network-functions vnf-name interfaces interface-name mapping  
physical-interface-name virtual-function [vlan-id vlan-id]
```

**vlan-id** is the VLAN ID of the port and is an optional value.

To attach a VNF interface to a VLAN:

- Create a VLAN:

```
user@host# set vmhost vlan vlan-name
```

- Attach a VNF interface to a VLAN:

```
user@host# set virtual-network-functions vnf-name interfaces interface-name mapping vlan members list-of-vlans [mode trunk|access]
```

**NOTE:**

- The interfaces attached to a VNF are persistent across VNF restarts.
- If the VNF supports hot-plugging, you can attach the interfaces while the VNF is running. Otherwise, you must add the interfaces, and then restart the VNF.
- You cannot change the mapping of a VNF interface while the VNF is running.

Starting in Junos OS Release 19.2R1, changes to the default MAC flooding behavior of the VNF interfaces improve the performance of multicast traffic. If a VNF interface is not attached to a VLAN, drop flow is not configured. The interface functions as a trunk port that can receive and forward the VLAN traffic. If the destination MAC address is known, the interface forwards the traffic to the destined port. If the MAC address is unknown, or if it is broadcast or multicast traffic, the interface forwards the traffic to all the ports in the same VLAN and to the ports that do not have a VLAN assigned.

In earlier releases, if a VNF interface is not attached to a VLAN, drop flow is configured and the VNF interface drops the outgoing traffic.

**NOTE:** You can prevent the VNF interface from sending or receiving traffic by using the **deny-forwarding** CLI option.

If you use an interface with **deny-forwarding** enabled to configure cross-connect, the interface receives only the cross-connect traffic and drops all other traffic.

```
set virtual-network-options vnf-name interface interface-name forwarding-options deny-forwarding
```

To specify the target PCI address for a VNF interface:

```
user@host# set virtual-network-functions vnf-name interfaces interface-name pci-address target-pci-address
```

You can use the target PCI address to rename or reorganize interfaces within the VNF.

For example, a Linux-based VNF can use udev rules within the VNF to name the interface based on the PCI address.

**NOTE:**

- The target PCI address string should be in the following format:  
**0000:00:<slot>:0**, which are the values for domain:bus:slot:function. The value for slot should be different for each VNF interface. The values for domain, bus, and function should be zero.
- You cannot change the target PCI address of VNF interface while the VNF is running.

To delete a VNF interface:

```
user@host# delete virtual-network-functions vnf-name interfaces interface-name
```

```
user@host# commit
```

**NOTE:**

- To delete a VNF interface, you must stop the VNF, delete the interface, and then restart the VNF.
- After attaching or detaching a virtual function, you must restart the VNF for the changes to take effect.
- eth0 and eth1 are reserved for the default VNF interfaces that are connected to the internal network and the out-of-band management network. Therefore, the configurable VNF interface names start from eth2.
- Within a VNF, the interface names can be different, based on guest OS naming conventions. VNF interfaces that are configured in the JCP might not appear in the same order within the VNF.
- You must use the target PCI addresses to map to the VNF interfaces that are configured in the JCP and you must name them accordingly.

- Starting in Junos OS Release 19.2R1, you can manually disable the VNF interfaces (eth0 through eth9) on the OVS or custom bridge by issuing the following command:

```
user@host# set virtual-network-functions vnf-name interfaces interface-name link disable
```



**NOTE:**

- If a link in a cross-connect configuration is down, then the cross-connect will also be down.
- You cannot manually disable the VF interfaces on the VNF.
- The eth0 and eth1 interfaces, which function as management interfaces, can be disabled only if the **no-default-interfaces** option is configured.

To identify a disabled link, issue the following command:

```
user@host> show vmhost network nf-v-back-plane
```

For example, the following output shows that the eth2 link on the centos VNF is disabled. Note that the output is truncated to provide only the details relevant to the disabled link.

```
Network Name : ovs-sys-br

Interface : centos_eth2
Type : virtual ethernet, Link type : Full-Duplex, MAC :
fe:b6:c2:cc:66:a0
MTU : [], Link State :down, Admin State : down
Native Vlan ID : None, Vlan mode : Access, Vlan Members : None
IPV4 : None, Netmask : None
IPV6 : None, IPV6 netmask : None
Rx-packets :      0
Rx-drops   :      0
Rx-errors  :      0
Tx-packets :     348
Tx-drops   :    42948
Tx-errors  :      0
```



## Configure Storage Devices for VNFs

An NFX250 (NG) device supports the following storage options for VNFs:

- CD-ROM
- Disk
- USB

To add a virtual CD or to update the source file of a virtual CD:

```
user@host# set virtual-network-functions vnf-name storage device-name type cdrom source file
file-name
```

You can specify a valid device name in the format hdx, sdx, or vdx—for example, hdb, sdc, vdb, and so on.

To add a virtual USB storage device:

```
user@host# set virtual-network-functions vnf-name storage device-name type usb source file file-name
```

To attach an additional hard disk:

```
user@host# set virtual-network-functions vnf-name storage device-name type disk [bus-type virtio |
ide] [file-type raw | qcow2] source file file-name
```

To delete a virtual CD, USB storage device, or hard disk from the VNF:

```
user@host# delete virtual-network-functions vnf-name storage device-name
```

### NOTE:

- After attaching or detaching a CD from a VNF, you must restart the device for the changes to take effect. The CD detach operation fails if the device is in use within the VNF.
- A VNF supports one virtual CD, one virtual USB storage device, and multiple virtual hard disks.
- You can update the source file in a CD or USB storage device while the VNF is running.
- You must save the source file in the **/var/public** directory, and the file must have read and write permission for all users.

## Instantiate a VNF

You can instantiate a VNF by configuring the VNF name, and by specifying the path of either an XML descriptor file or an image.

While instantiating a VNF with an image, two VNF interfaces are added by default. These interfaces are required for management and for the internal network.

**NOTE:** Only QCOW2, IMG, and RAW image types are supported.

To instantiate a VNF by using an image:

```
user@host# set virtual-network-functions vnf-name image file-path  
user@host# set virtual-network-functions vnf-name image image-type image-type  
user@host# commit
```

**NOTE:** When you configure VNFs, do not use VNF names in the format *vnfn*—for example, *vnf1*, *vnf2*, and so on. Configurations that contain such names fail to commit.

(Optional) To specify a UUID for the VNF:

```
user@host# set virtual-network-functions vnf-name [uuid vnf-uuid]
```

**uuid** is an optional parameter. We recommend that you allow the system to allocate a UUID for the VNF.

**NOTE:** You cannot change the image configuration for a VNF after saving and committing the configuration. To change the image for a VNF, you must delete the VNF and create a VNF again.

## Instantiate a VNF Using an XML Descriptor File

You can instantiate a VNF by using an XML descriptor file. You must save the XML descriptor file in the **/var/public/** directory.

```
user@host# set virtual-network-functions vnf-name init-descriptor file-path
```

```
user@host# commit
```

**NOTE:** You cannot change the init-descriptor configuration after saving and committing the init-descriptor configuration. To change the init-descriptor for a VNF, you must delete the VNF and create a VNF again.

## Verify the VNF Instantiation

To verify that the VNF is instantiated successfully:

```
user@host> show virtual-network-functions
```

| ID    | Name    | State   | Liveliness |
|-------|---------|---------|------------|
| ----- |         |         |            |
| 1     | vjunos0 | Running | alive      |
| 2     | centos1 | Running | alive      |
| 3     | centos2 | Running | alive      |

The output in the **Liveliness** field of a VNF indicates whether the IP address of the VNF is reachable over the internal management network. The default IP address of the liveliness bridge is 192.0.2.1/24. Note that this IP address is internal to the device and is used for VNF management.

# Managing VNFs on NFX Series Devices

## IN THIS SECTION

- [Managing VNF States | 96](#)
- [Managing VNF MAC Addresses | 97](#)
- [Managing the MTU of a VNF Interface | 98](#)
- [Accessing a VNF from the JCP | 99](#)
- [Viewing the List of VNFs | 99](#)
- [Displaying the Details of a VNF | 99](#)
- [Deleting a VNF | 100](#)

## Managing VNF States

By default, a VNF automatically starts when the VNF configuration is committed.

- To disable autostart of a VNF when the VNF configuration is committed:

```
user@host# set virtual-network-functions vnf-name no-autostart
```

- To manually start a VNF:

```
user@host> request virtual-network-functions vnf-name start
```

- To stop a VNF:

```
user@host> request virtual-network-functions vnf-name stop
```

- To restart a VNF:

```
user@host> request virtual-network-functions vnf-name restart
```

- To access the console of an active VNF:

```
user@host> request virtual-network-functions vnf-name console
```

**NOTE:** The **request virtual-network-functions *vnf-name* console** command is supported only for root login over ssh.

- To access a VNF through SSH:

```
user@host> request virtual-network-functions ssh vnf-name
```

- To access a VNF through Telnet:

```
user@host> request virtual-network-functions telnet vnf-name
```

## Managing VNF MAC Addresses

VNF interfaces that are defined, either using the CLI or specified in an init-descriptor XML file, are assigned a globally unique and persistent MAC address. A common pool of 64 MAC addresses is used to assign MAC addresses to VNF interfaces. You can configure a MAC address other than what is available in the common pool, and this address will not be overwritten.

There are 160 MAC addresses for the network interfaces on the VNF. These MAC addresses are automatically allocated when a VNF is instantiated.

- To configure a specific MAC address for a VNF interface:

```
user@host# set virtual-network-functions vnf-name interfaces interface-name mac-address  
mac-address
```

- To delete the MAC address configuration of a VNF interface:

```
user@host# delete virtual-network-functions vnf-name interfaces interface-name mac-address  
mac-address
```

**NOTE:**

- To delete or modify the MAC address of a VNF interface, you must stop the VNF, make the necessary changes, and then restart the VNF.
- The MAC address specified for a VNF interface can be either a system MAC address or a user-defined MAC address.
- The MAC address specified from the system MAC address pool must be unique for the VNF interfaces.

## Managing the MTU of a VNF Interface

The maximum transmission unit (MTU) is the largest data unit that can be forwarded without fragmentation. You can configure either 1500 bytes or 2048 bytes as the MTU size. The default MTU value is 1500 bytes, and the maximum MTU size for a VNF interface is 2048 bytes.

**NOTE:** MTU configuration is supported only on VLAN interfaces.

1. To configure the MTU on a VNF interface:

```
user@host# set virtual-network-functions vnf-name interfaces interface-name mtu size
```

**NOTE:** You must restart the VNF after configuring the MTU, if the VNF does not support hot-plugging functionality.

2. To delete the MTU of a VNF interface:

```
user@host# delete virtual-network-functions vnf-name interfaces interface-name mtu
```

**NOTE:** After the MTU is deleted, the MTU of the VNF interface is reset to 1500 bytes.

**NOTE:**

- The maximum number of VLAN interfaces on the OVS that are supported in the system is 25.

## Accessing a VNF from the JCP

You can access a VNF from the JCP through SSH or by using the console.

To access a VNF from the JCP through SSH:

```
user@host> request virtual-network-functions vnf-name ssh
```

To access a VNF from the JCP by using the console:

```
user@host> request virtual-network-functions vnf-name console
```

## Viewing the List of VNFs

To view the list of VNFs:

```
user@host> show virtual-network-functions
```

| ID | Name    | State   | Liveliness |
|----|---------|---------|------------|
| 1  | vjunos0 | Running | alive      |
| 2  | centos1 | Running | alive      |
| 3  | centos2 | Running | alive      |

The **Liveliness** field of a VNF indicates whether the IP address of the VNF is reachable from the JCP. The default IP address of the liveliness bridge is 192.0.2.1/24.

## Displaying the Details of a VNF

To display the details of a VNF:

```
user@host> show virtual-network-functions vnf-name detail
```

```
user@host>show virtual-network-functions centos1 detail
Virtual Network Function Information
-----

Id:                2
Name:              centos1
State:             Running
Liveliness:        Up
IP Address:        192.0.2.101
VCPUs:             1
Maximum Memory:    1048576 KiB
Used Memory:       1048576 KiB
Used 1G Hugepages: 0
Used 2M Hugepages: 0
Error:             None
```

## Deleting a VNF

To delete a VNF:

```
user@host# delete virtual-network-functions vnf-name
```

**NOTE:** The VNF image remains in the disk even after you delete a VNF.



# 6

CHAPTER

## Configuring Mapping of Address and Port with Encapsulation (MAP-E)

---

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---



# Mapping of Address and Port with Encapsulation on NFX Series Devices

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## Overview

Mapping of Address and Port with Encapsulation (MAP-E) is an IPv6 transition technique that encapsulates an IPv4 packet in an IPv6 address and carries it over an IPv4-over-IPv6 tunnel from MAP-E customer edge (CE) devices to MAP-E provider edge (PE) devices (also called as border relay [BR] devices) through an IPv6 routing topology, where the packets are detunneled for further processing.

MAP-E uses Network Address Port Translation (NAPT) features for restricting transport protocol ports, Internet Control Message Protocol (ICMP) identifiers, and fragment identifiers to the configured port sets. The existing NAPT features are enhanced to add MAP-E capability.

## Benefits of MAP-E

In most cases, during IPv4 to IPv6 migration, only the IPv6 network is available. However, an IPv4 network is required for all residual IPv4 deployment. In scenarios where service providers have an IPv6 network and the LAN subscribers are not IPv6-capable, MAP-E supports IPv4 to IPv6 migration and deployment. MAP-E transports IPv4 packets across an IPv6 network using IP encapsulation. Encapsulation is done based on the mapping of IPv6 addresses to IPv4 addresses and to transport layer ports. Typically, during IPv6 transition, service providers might have a limited pool of public IPv4 addresses. MAP-E enables the sharing of public IPv4 addresses among multiple CE devices.

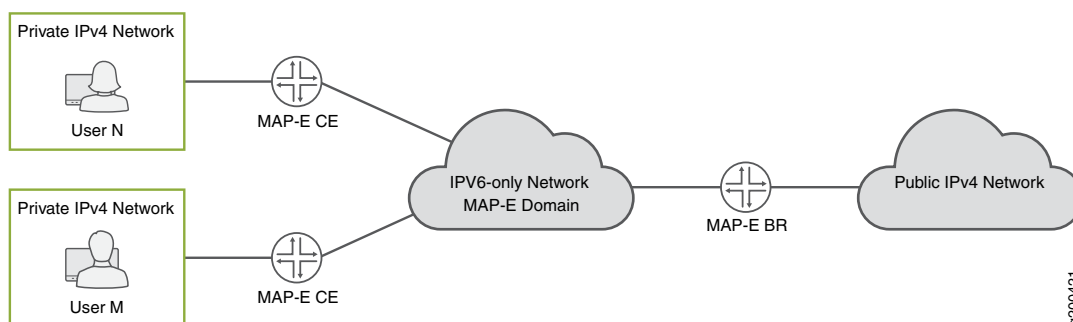
## MAP-E Terminology

| Terminology                | Description  |
|----------------------------|--|
| Border relay (BR)          | The MAP-E-enabled provider edge device in a MAP domain. A BR device has at least one IPv6-enabled interface and one IPv4 interface connected to the native IPv4 network.   |
| Embedded address (EA) bits | The EA bits in the IPv6 address identify an IPv4 prefix, IPv4 address, or a shared IPv4 address and a PSID.  |
| MAP domain                 | One or more MAP-E customer edge devices and BR devices connected to the same virtual link.   |
| MAP rule                   | <p>A set of parameters that describe the mapping of an IPv4 prefix, IPv4 address, or a shared IPv4 address with an IPv6 prefix or IPv6 address. Each domain uses a different mapping rule set.</p> <p>Every MAP node must be provisioned with a basic mapping rule, which is used by the node to configure its IPv4 address, IPv4 prefix, or shared IPv4 address. The basic mapping rule is a forwarding mapping rule that is used for forwarding, where an IPv4 destination address and optionally a destination port is mapped to an IPv6 address.</p> |
| MAP-E Customer Edge (CE)   | The MAP-E-enabled customer edge device in a MAP deployment.  |
| Port set ID (PSID)         | Separate part of the transport layer port space that is denoted as the port set ID.  |
| Softwire                   | Tunnel between two IPv6 endpoints to carry IPv4 packets or between two IPv4 endpoints to carry IPv6 packets.   |

## MAP-E Functionality

[Figure 8 on page 105](#) illustrates a simple MAP-E deployment scenario.

Figure 8: MAP-E Deployment



In a MAP-E network topology, there are two MAP-E CE devices, each connected to a private IPv4 host. The MAP-E CE devices are dual stack and are capable of NAPT. The MAP-E CE devices connect to a MAP-E BR device through an IPv6-only MAP-E network domain. The MAP-E BR device is dual stack and is connected to both a public IPv4 network and an IPv6 MAP-E network.

The MAP-E functionality is as follows:

1. The MAP-E CE devices are capable of NAPT. On receiving an IPv4 packet from the host, the MAP-E CE device performs NAT on the incoming IPv4 packets.
2. After NAT is performed, the IPv4 packets are then encapsulated into IPv6 packets by the MAP-E CE device, and are sent to the MAP-E BR device.
3. The IPv6 packets are transported through the IPv6-only service provider network and reach the MAP-E BR device.
4. The incoming IPv6 packets are decapsulated by the MAP-E BR and are routed to the IPv4 public network.

In the reverse path, the incoming IPv4 packets are encapsulated into IPv6 packets by the MAP-E BR device, and are routed to the MAP-E CE devices.

## Configure MAP-E on NFX Series Devices

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- [Requirements | 106](#)
- [Topology Overview | 106](#)
- [Configure an NFX Series Device as a MAP-E CE Device | 107](#)

- [Configure an MX Series Device as a BR Device | 109](#)
- [Verify the MAP-E Configuration | 111](#)

## Overview

This example describes how to configure Mapping of Address and Port with Encapsulation (MAP-E) functionality on NFX Series devices. For more information about MAP-E, see [“Mapping of Address and Port with Encapsulation on NFX Series Devices” on page 103](#).

## Requirements

This example uses the following hardware and software components:

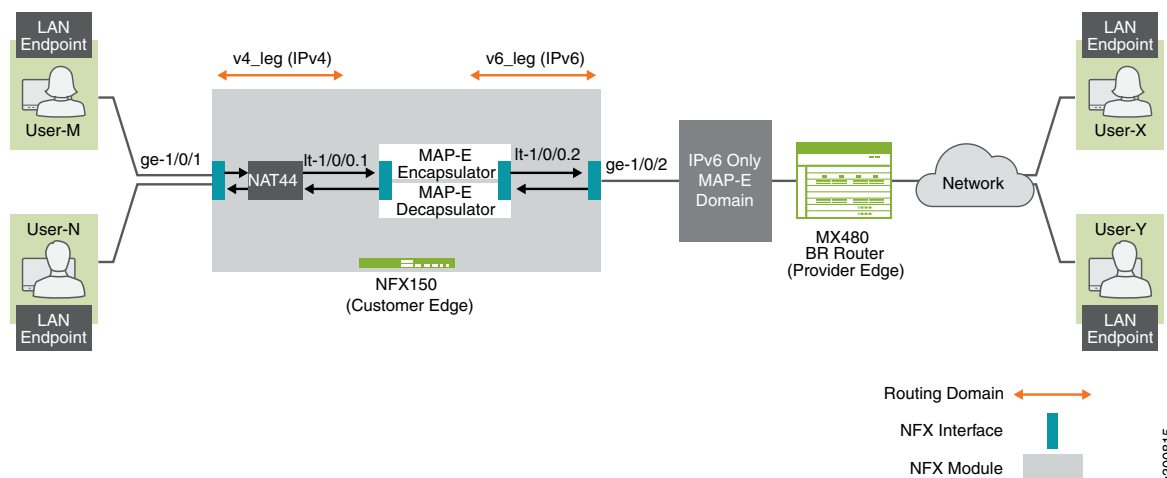
- NFX150 device running Junos OS Release 19.4R1 or later, deployed as a customer edge (CE) device.
- MX480 device, deployed as a border relay (BR) device.

## Topology Overview

This topology shows how to configure MAP-E CE functionality on NFX Series devices. This topology also shows how the IPv4 packets from MAP-E CE devices are encapsulated and transported through an IPv4-over-IPv6 tunnel to MAP-E provider edge (PE) devices (also known as border relay [BR] devices) through an IPv6 routing topology, where the packets are detunneled for further processing. An MX Series device is used as the MAP-E BR device, which is a dual-stack device connected to both a public IPv4 network and an IPv6 MAP-E network.

[Figure 9 on page 107](#) shows the MAP-E deployment on NFX Series devices.

Figure 9: MAP-E Deployment on NFX Series Device



## Configure an NFX Series Device as a MAP-E CE Device

To configure an NFX Series device as a MAP-E customer edge device:

1. Configure the security policies and zones for applying different security measures on IPv4-facing interfaces and IPv6-facing interfaces:

```
user@host# set security policies global policy my_ce match source-address any
user@host# set security policies global policy my_ce match destination-address any
user@host# set security policies global policy my_ce match application any
user@host# set security policies global policy my_ce then permit
user@host# set security policies default-policy permit-all
user@host# set security zones security-zone v4zone host-inbound-traffic system-services all
user@host# set security zones security-zone v4zone host-inbound-traffic protocols all
user@host# set security zones security-zone v4zone interfaces ge-1/0/1.0
user@host# set security zones security-zone v4zone interfaces lt-1/0/0.1
user@host# set security zones security-zone v6zone host-inbound-traffic system-services all
user@host# set security zones security-zone v6zone host-inbound-traffic protocols all
user@host# set security zones security-zone v6zone interfaces ge-1/0/2.0
user@host# set security zones security-zone v6zone interfaces lt-1/0/0.2
```

2. Configure the interfaces to provide network connectivity and data flow:

```
user@host# set interfaces ge-1/0/1 unit 0 family inet address 10.10.10.1/24
```

```
user@host# set interfaces ge-1/0/2 mtu 9192
user@host# set interfaces ge-1/0/2 unit 0 family inet6 address 2001:db8:ffff::1/64
```

3. Configure both the logical tunnel interfaces:

```
user@host# set interfaces lt-1/0/0 mtu 9192
user@host# set interfaces lt-1/0/0 unit 1 encapsulation ethernet
user@host# set interfaces lt-1/0/0 unit 1 peer-unit 2
user@host# set interfaces lt-1/0/0 unit 1 family inet address 172.16.100.1/24
user@host# set interfaces lt-1/0/0 unit 1 family inet6 address 2001:db8:ffe::1/64

user@host# set interfaces lt-1/0/0 unit 2 encapsulation ethernet
user@host# set interfaces lt-1/0/0 unit 2 peer-unit 1
user@host# set interfaces lt-1/0/0 unit 2 family inet address 172.16.100.2/24
user@host# set interfaces lt-1/0/0 unit 2 family inet6 address 2001:db8:ffe::2/64
```

4. Configure the routing instances for the IPv4 and IPv6 network:

```
user@host# set routing-instances v4_leg routing-options rib v4_leg.inet.0 static route
198.51.100.0/24 next-hop 172.16.100.2
user@host# set routing-instances v4_leg routing-options rib v4_leg.inet.0 static route 203.0.113.0/24
next-hop 172.16.100.2
user@host# set routing-instances v4_leg routing-options rib v4_leg.inet.0 static route 192.0.2.0/24
next-hop 172.16.100.2
user@host# set routing-instances v4_leg instance-type virtual-router
user@host# set routing-instances v4_leg interface lt-1/0/0.1

user@host# set routing-instances v4_leg interface ge-1/0/1.0
user@host# set routing-instances v6_leg routing-options rib v6_leg.inet.0 static route 10.10.10.0/24
next-hop 172.16.100.1
user@host# set routing-instances v6_leg routing-options rib v6_leg.inet6.0 static route
2001:db8::a/128 next-hop 2001:db8:ffff::9
user@host# set routing-instances v6_leg routing-options rib v6_leg.inet6.0 static route
2001:db8:0012:3500::/56 next-hop 2001:db8:ffff::2
user@host# set routing-instances v6_leg routing-options rib v6_leg.inet6.0 static route
2001:db8:0012:3400::/56 next-hop 2001:db8:ffe::1
user@host# set routing-instances v6_leg instance-type virtual-router
user@host# set routing-instances v6_leg interface lt-1/0/0.2
user@host# set routing-instances v6_leg interface ge-1/0/2.0
```



5. Configure the MAP-E rule to provide mapping between the IPv4 network and IPv6 network:

```
user@host# set security softwires map-e mapce1 br-address 2001:db8::a/128
user@host# set security softwires map-e mapce1 end-user-prefix 2001:db8:0012:3400::/56
user@host# set security softwires map-e mapce1 rule bmr rule-type BMR
user@host# set security softwires map-e mapce1 rule bmr ipv4-prefix 192.0.2.0/24
user@host# set security softwires map-e mapce1 rule bmr ipv6-prefix 2001:db8::/40
user@host# set security softwires map-e mapce1 rule bmr ea-bits-length 16
user@host# set security softwires map-e mapce1 rule bmr psid-offset 6
user@host# set security softwires map-e mapce1 role CE
user@host# set security softwires map-e mapce1 version 3
```

6. Configure source NAT rule and NAT pool:

```
user@host# set security nat source pool my_mape allocation-domain mapce1
user@host# set security nat source pool my_mape allocation-domain allocation-rule bmr
user@host# set security nat source rule-set mape from zone v4zone
user@host# set security nat source rule-set mape to interface lt-1/0/0.1
user@host# set security nat source rule-set mape to interface ge-1/0/1.0
user@host# set security nat source rule-set mape rule r1 match source-address 10.10.10.0/24
user@host# set security nat source rule-set mape rule r1 match destination-address 10.10.10.0/24
user@host# set security nat source rule-set mape rule r1 match destination-address 198.51.100.0/24
user@host# set security nat source rule-set mape rule r1 match destination-address 203.0.113.0/24
user@host# set security nat source rule-set mape rule r1 match destination-address 192.0.2.0/24
user@host# set security nat source rule-set mape rule r1 then source-nat pool my_mape
user@host# set security nat source rule-set mape rule r1 then source-nat pool persistent-nat permit any-remote-host
```

7. Commit the configuration:

```
user@host# commit
```

## Configure an MX Series Device as a BR Device

To configure an MX Series device as a border relay device:

1. Configure the service set for MAP-E on the MX Series device:

```
user@host# set services service-set ss1 software-rules sw-rule1
user@host# set services service-set ss1 next-hop-service inside-service-interface si-1/0/0.1
user@host# set services service-set ss1 next-hop-service outside-service-interface si-1/0/0.2
```

2. Configure the MAP-E software concentrator and associated parameters:

```
user@host# set services software software-concentrator map-e mape-domain-1 software-address
2001:db8::a
user@host# set services software software-concentrator map-e mape-domain-1 ipv4-prefix
192.0.2.0/24
user@host# set services software software-concentrator map-e mape-domain-1 mape-prefix
2001:db8::/40
user@host# set services software software-concentrator map-e mape-domain-1 ea-bits-len 16
user@host# set services software software-concentrator map-e mape-domain-1 psid-offset 6
user@host# set services software software-concentrator map-e mape-domain-1 psid-length 8
user@host# set services software software-concentrator map-e mape-domain-1 mtu-v6 9192
user@host# set services software software-concentrator map-e mape-domain-1 version-03
user@host# set services software software-concentrator map-e mape-domain-1 v4-reassembly
user@host# set services software software-concentrator map-e mape-domain-1 v6-reassembly
user@host# set services software software-concentrator map-e mape-domain-1 disable-auto-route
```

3. Configure a software rule to specify the direction of traffic to be tunneled and the MAP-E software concentrator to be used:

```
user@host# set services software rule sw-rule1 match-direction input
user@host# set services software rule sw-rule1 term t1 then map-e mape-domain-1
```

4. Configure a service interface inside the dual-stack domain:

```
user@host# set interfaces si-1/0/0 unit 1 family inet6
user@host# set interfaces si-1/0/0 unit 1 service-domain inside
```

5. Configure a service interface outside the dual-stack domain:

```
user@host# set interfaces si-1/0/0 unit 2 family inet
user@host# set interfaces si-1/0/0 unit 2 service-domain outside
```

6. Configure the maximum transmission unit (MTU) on the BR interface:

```
user@host# set interfaces ge-1/1/2 mtu 9192
```

7. Configure the logical interfaces and assign the IPv4 and IPv6 addresses:

```
user@host# set interfaces ge-1/1/2 unit 0 family inet6 address 2001:db8:ffff::9/64
user@host# set interfaces ge-1/1/3 unit 0 family inet address 203.0.113.1/24
```

8. Configure the routing instances:

```
user@host# set routing-options rib inet6.0 static route 2001:db8::/40 next-hop si-1/0/0.1
user@host# set routing-options rib inet6.0 static route 2001:db8:0012:3400::/56 next-hop
2001:db8:ffff::1
user@host# set routing-options rib inet6.0 static route 2001:db8:0012:3500::/56 next-hop
2001:db8:ffff::2
user@host# set routing-options static route 192.0.2.0/24 next-hop si-1/0/0.2
user@host# set routing-options static route 198.51.100.0/24 next-hop si-1/0/0.2
user@host# set routing-options static route 203.0.113.0/24 next-hop si-1/0/0.2
```

9. Commit the configuration:

```
user@host# commit
```

## Verify the MAP-E Configuration

### Purpose

After completing the MAP-E configuration on an NFX Series device, you can verify the status of the MAP-E configuration.

### Action

- Verify the status of the packet flow:

```
user@host> show security flow session
```

```
Session ID: 134218806, Policy name: my_ce/4, Timeout: 1800, Valid
  In: 10.10.10.2/57630 --> 203.0.113.2/22;tcp, Conn Tag: 0x0, If: ge-1/0/1.0,
Pkts: 50, Bytes: 5797,
  Out: 203.0.113.2/22 --> 192.0.2.18/20691;tcp, Conn Tag: 0x0, If: lt-1/0/0.1,
Pkts: 33, Bytes: 5697,

Session ID: 134218807, Policy name: my_ce/4, Timeout: 1800, Valid
  In: 2001:db8:12:3400:c0:2:1200:3400/1 --> 2001:db8::a/1;ipip, Conn Tag: 0x0,
If: lt-1/0/0.2, Pkts: 50, Bytes: 7797,
  Out: 2001:db8::a/1 --> 2001:db8:12:3400:c0:2:1200:3400/1;ipip, Conn Tag: 0x0,
```

```
If: ge-1/0/2.0, Pkts: 33, Bytes: 7017,
Total sessions: 2
```

- Verify whether the IPv4 and IPv6 addresses are configured correctly:

```
user@host> show security softwires map-e domain mapce1
```

```
Role                : CE
Version             : 3
Domain Name         : mapce1
BR Address           : 2001:db8::a/128
End User Ipv6 prefix : 2001:db8:12:3400::/56
BMR Mapping Rule :
  Rule Name          : bmr
  Rule Ipv4 Prefix    : 192.0.2.0/24
  Rule Ipv6 Prefix    : 2001:db8::/40
  PSID offset         : 6
  PSID length         : 8
  EA bit length       : 16
  Port SetID          : 0x34
  MAP-E Ipv4 address  : 192.0.2.18/32
  MAP-E Ipv6 address  : 2001:db8:12:3400:c0:2:1200:3400
```

- Verify the map rule statistics:

```
user@host> show security softwires map-e domain mapce1 statistics rule bmr
```

```
BMR Rule Name       : bmr
Encapsulated packets : 289
Decapsulated packets : 269
Encapsulation errors : 0
Decapsulation errors : 0
Encapsulated fragmentation : 0
Decapsulated fragmentation : 0
Invalid port set     : 0
IPv6 address mismatch : 0
```

- View the details of the NAT source rule:

```
user@host> show security nat source rule all
```

```

Total rules: 1
Total referenced IPv4/IPv6 ip-prefixes: 5/0
source NAT rule: r1                      Rule-set: mape
  Rule-Id                               : 1
  Rule position                         : 1
  From zone                             : v4zone
  To interface                          : lt-1/0/0.1
                                         : ge-1/0/1.0

  Match
    Source addresses                    : 10.10.10.0      - 10.10.10.255
    Destination addresses                : 10.10.10.0      - 10.10.10.255
                                         198.51.100.0     - 198.51.100.255
                                         203.0.113.0      - 203.0.113.255
                                         192.0.2.0        - 192.0.2.255

  Action                               : my_mape
    Persistent NAT type                  : any-remote-host
    Persistent NAT mapping type          : address-port-mapping
    Inactivity timeout                   : 300
    Max session number                   : 30
  Translation hits                      : 1
    Successful sessions                  : 1
    Failed sessions                      : 0
  Number of sessions                    : 1

```

- View the details of the NAT source pool:

```
user@host> show security nat source pool all
```

```

Total pools: 1
Pool name       : my_mape
Pool id        : 4
Routing instance : default
Host address base : 0.0.0.0
Map-e domain name : mapcel
Map-e rule name  : bmr
PSID offset     : 6
PSID length     : 8
PSID            : 0x34
Port overloading : 1
Address assignment : no-paired
Total addresses  : 1
Translation hits  : 1
Address range          Single Ports  Twin Ports

```

|                         |   |   |
|-------------------------|---|---|
| 192.0.2.18 - 192.0.2.18 | 1 | 0 |
| Total used ports :      | 1 | 0 |

- View the NAT source summary:

user@host> **show security nat source summary**

```
show security nat source summary
Total port number usage for port translation pool: 252
Maximum port number for port translation pool: 33554432
Total pools: 1
Pool          Address          Routing          PAT  Total
Name          Range            Instance         Address
my_mape       192.0.2.18-192.0.2.18 default          yes  1

Total rules: 1
Rule name      Rule set      From          To          Action
r1             mape         v4zone        lt-1/0/0.1  my_mape
r1             mape         v4zone        ge-1/0/1.0
```

- View the persistent NAT table:

user@host> **show security nat source persistent-nat-table all**

| Internal        | Reflective     |          |            | Source   |         | Type     |
|-----------------|----------------|----------|------------|----------|---------|----------|
| Left_time/      | Curr_Sess_Num/ | Source   |            |          |         |          |
| In_IP           | In_Port        | I_Proto  | Ref_IP     | Ref_Port | R_Proto | NAT Pool |
| Conf_time       | Max_Sess_Num   | NAT Rule |            |          |         |          |
| 10.10.10.2      | 57630          | tcp      | 192.0.2.18 | 20691    | tcp     | my_mape  |
| any-remote-host | -/300          | 1/30     | r1         |          |         |          |

- View the software statistics on the MX Series device:

user@host> **show services inline software statistics mape**

|   |               |
|---|---------------|
| Service PIC Name                                      | si-1/0/0      |
| Control Plane Statistics                              |               |
| MAPE ICMPv6 echo requests to software concentrator    | 0             |
| MAPE ICMPv6 echo responses from software concentrator | 0             |
| MAPE Dropped ICMPv6 packets to software concentrator  | 0             |
| Data Plane Statistics (v6-to-v4)                      | Packets Bytes |

|                                  |         |           |
|----------------------------------|---------|-----------|
| MAPE decaps                      | 15034   | 1388760   |
| MAPE ICMP decap errors           | 0       | 0         |
| MAPE decap spoof errors          | 0       | 0         |
| MAPE v6 reassembled              | 0       | 0         |
| MAPE dropped v6 fragments        | 0       | 0         |
| MAPE v6 unsupp protocol drops    | 0       | 0         |
|                                  |         |           |
| Data Plane Statistics (v4-to-v6) | Packets | Bytes     |
| MAPE encaps                      | 149544  | 223527457 |
| MAPE ICMP encap errors           | 0       | 0         |
| MAPE v6 mtu errors               | 0       | 0         |
| MAPE v4 reassembled              | 0       | 0         |
| MAPE dropped v4 fragments        | 0       | 0         |

### Meaning

This section describes the output fields for the MAP-E configuration on NFX Series devices.

**Role**—MAP-E is deployed on a CE device. Currently, only the CE role is supported.

**Version**—MAP-E version: MAP-E draft-3.

**BR address**—Border router address to be used as the destination address in the absence of a matching FMR rule.

**Rule name**—Name of the BMR or FMR rule configured.

**Rule IPv4 prefix**—IPv4 prefix in the BMR or FMR rule.

**Rule IPv6 prefix**—IPv6 prefix in the BMR or FMR rule.

**Port set ID**—Port set identifier, used to algorithmically identify a set of ports exclusively assigned to a CE device.

**PSID offset**—Port set identifier offset, used to specify the range of excluded ports.

**PSID length**—Port set identifier length, used to specify the sharing ratio.

**EA bit length**—Embedded address bit length, used to specify part of the IPv4 address or the PSID.

# 7

CHAPTER

## Configuring Service Chaining

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---





# Example: Configuring Service Chaining Using VLANs on NFX250 NextGen Devices

## IN THIS SECTION

- [Requirements | 119](#)
- [Overview | 119](#)
- [Configuration | 120](#)

This example shows how to configure service chaining using VLANs on the host bridge.

## Requirements

This example uses an NFX250 NextGen device running Junos OS Release 19.1R1.

Before you configure service chaining, ensure that you have installed and instantiated the relevant virtual network functions (VNFs), assigned the corresponding interfaces, and configured the resources.

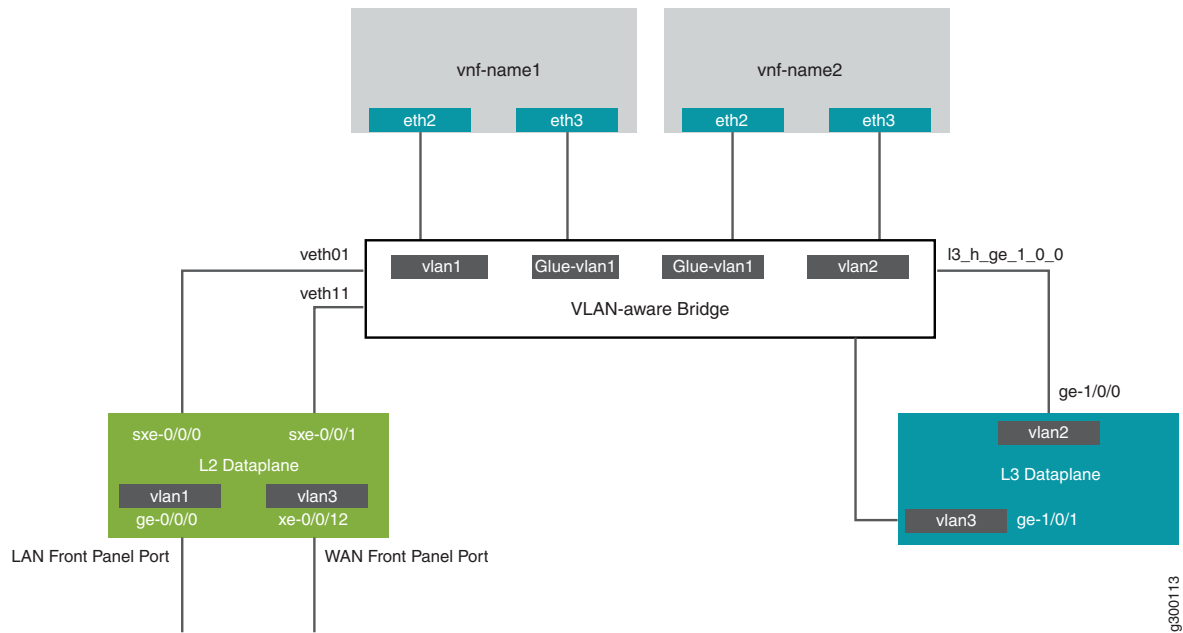
## Overview

Service chaining on a device enables multiple services or VNFs on the traffic that flows through the device. This example explains how to configure the various layers of the device to enable traffic to enter the device, flow through two service VNFs, and exit the device.

## Topology

This example uses a single NFX250 NextGen device running Junos OS, as shown in [Figure 10 on page 120](#).

Figure 10: Configuring Service Chaining Using VLANs



This example is configured using the Junos Control Plane (JCP). The key configuration elements include:

- Front panel ports
- Internal-facing ports
- VNF interfaces, which use the naming format `eth#` (where `#` ranges from 0 through 9)
- VLANs to provide bridging between the static interfaces (`sxe`) and VNF interfaces

## Configuration

### IN THIS SECTION

- [Configuring the JCP Interfaces | 120](#)
- [Configuring the VNF Interfaces and Creating the Service Chain | 124](#)

### Configuring the JCP Interfaces

#### Step-by-Step Procedure

To configure the interfaces:

1. Connect to the JCP.

```
user@host:~ # cli
user@host>
user@host> configure
[edit]
user@host#
```

2. Map the Layer 3 interface to the Open vSwitch (OVS).

```
user@host# set vmhost virtualization-options interfaces ge-1/0/1
```

3. Configure a VLAN for the LAN-side interfaces.

```
user@host# set vlans vlan1 vlan-id 77
```

4. Configure the LAN-side front panel port and add it to the LAN-side VLAN.

The LAN-side port is typically an access port, but can be a trunk port if required.

```
user@host# set interfaces ge-0/0/0.0 family ethernet-switching vlan members vlan1
```

5. Configure the LAN-side internal-facing interface as a trunk port and add it to the LAN-side VLAN.

The internal-facing interfaces are typically trunk ports as they must support traffic from multiple front panel ports and VLANs.

```
user@host# set interfaces sxe-0/0/0.0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/0.0 family ethernet-switching vlan members vlan1
```

6. Configure the WAN-side internal-facing interface as a trunk port and add it to the WAN-side VLAN.

```
user@host# set interfaces sxe-0/0/1.0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/1.0 family ethernet-switching vlan members vlan3
```

7. Configure the WAN-side front panel port and add it to the WAN-side VLAN.

```
user@host# set interfaces xe-0/0/12.0 family ethernet-switching interface-mode access
user@host# set interfaces xe-0/0/12.0 family ethernet-switching vlan members vlan3
```

8. Configure a VLAN for the WAN-side interface.

```
user@host# set interfaces xe-0/0/12.0 family ethernet-switching interface-mode access
user@host# set interfaces xe-0/0/12.0 family ethernet-switching vlan members vlan3
```

9. Configure VLAN tagging on the WAN-side front panel port and assign an IP address.

```
user@host# set vlans vlan3 vlan-id 1178
```

10. Configure the WAN-side internal-facing interface as a VLAN-tagged interface and assign an IP address to it.

```
user@host# set interfaces ge-1/0/0 vlan-tagging
```

```
user@host# set interfaces ge-1/0/0.0 vlan-id 1177
```

```
user@host# set interfaces ge-1/0/0.0 family inet address 203.0.113.2/24
```

11. Commit the configuration.

```
user@host# commit
```

## Results

From configuration mode, check the results of your configuration by entering the following **show** commands:

[edit]

```
user@host# show interfaces ge-0/0/0
```

```
mtu 9192;
unit 0 {
  family ethernet-switching {
    vlan {
      members [ vlan1 ];
    }
  }
}
```

[edit]

```
user@host# show interfaces ge-1/0/0
```

```
vlan-tagging;
unit 0 {
  vlan-id 1177;
  family inet {
    address 203.0.113.2/24;
  }
}
```

```
    }
}
```

[edit]

user@host# **show interfaces ge-1/0/1**

```
vlan-tagging;
unit 0 {
    vlan-id 1178;
    family inet {
        address 192.0.2.1/24;
    }
}
```

[edit]

user@host# **show interfaces sxe-0/0/0**

```
mtu 9192;
unit 0 {
    family ethernet-switching {
        interface-mode trunk;
        vlan {
            members [ default vlan1 ];
        }
    }
}
```

[edit]

user@host# **show interfaces sxe-0/0/1**

```
mtu 9192;
unit 0 {
    family ethernet-switching {
        interface-mode trunk;
        vlan {
            members [ vlan3 ];
        }
    }
}
```

```
}
}
```

[edit]

user@host# **show interfaces xe-0/0/12**

```
mtu 9192;
unit 0 {
  family ethernet-switching {
    vlan {
      members [ vlan3 ];
    }
  }
}
```

[edit]

user@host# **show vlans**

```
default {
  vlan-id 1;
}
vlan1 {
  vlan-id 77;
}
Vlan3 {
  vlan-id 1178;
}
```

## Configuring the VNF Interfaces and Creating the Service Chain

### Step-by-Step Procedure

Configure the VNF interfaces.

1. Configure the vmhost instance with the LAN, WAN, or the glue VLANs to be used for service chaining:

```
user@host# set vmhost vlans vlan1 vlan-id 77
user@host# set vmhost vlans vlan2 vlan-id 1177
user@host# set vmhost vlans glue-vlan1 vlan-id 123
```

2. Instantiate the VNF (vnf-name1) with one virtio interface mapped to the VLAN vlan1 and the other virtio interface mapped to the VLAN glue-vlan1.

```
user@host# set virtual-network-functions vnf-name1 interfaces eth2 mapping vlan members vlan1
user@host# set virtual-network-functions vnf-name1 interfaces eth3 mapping vlan members
glue-vlan1
```

3. Instantiate the second VNF (vnf-name2) with one interface mapped to the VLAN vlan2 and the second interface mapped to the same glue-vlan1.

```
user@host# set virtual-network-functions vnf-name2 interfaces eth2 mapping vlan members
glue-vlan1
user@host# set virtual-network-functions vnf-name2 interfaces eth3 mapping vlan members vlan2
```

4. Configure the IP addresses and static routes for each interface of the VNFs as shown in [Figure 10 on page 120](#).

## Example: Configuring Service Chaining Using SR-IOV on NFX250 NextGen Devices

### IN THIS SECTION

- [Requirements | 126](#)
- [Overview | 126](#)
- [Configuration | 128](#)

This example shows how to configure service chaining using single-root I/O virtualization (SR-IOV). For information about SR-IOV, see *Understanding SR-IOV Usage*.



## Requirements

This example uses an NFX250 NextGen device running Junos OS Release 19.1R1.

Before you configure service chaining, ensure that you have installed and started the relevant VNFs.

## Overview

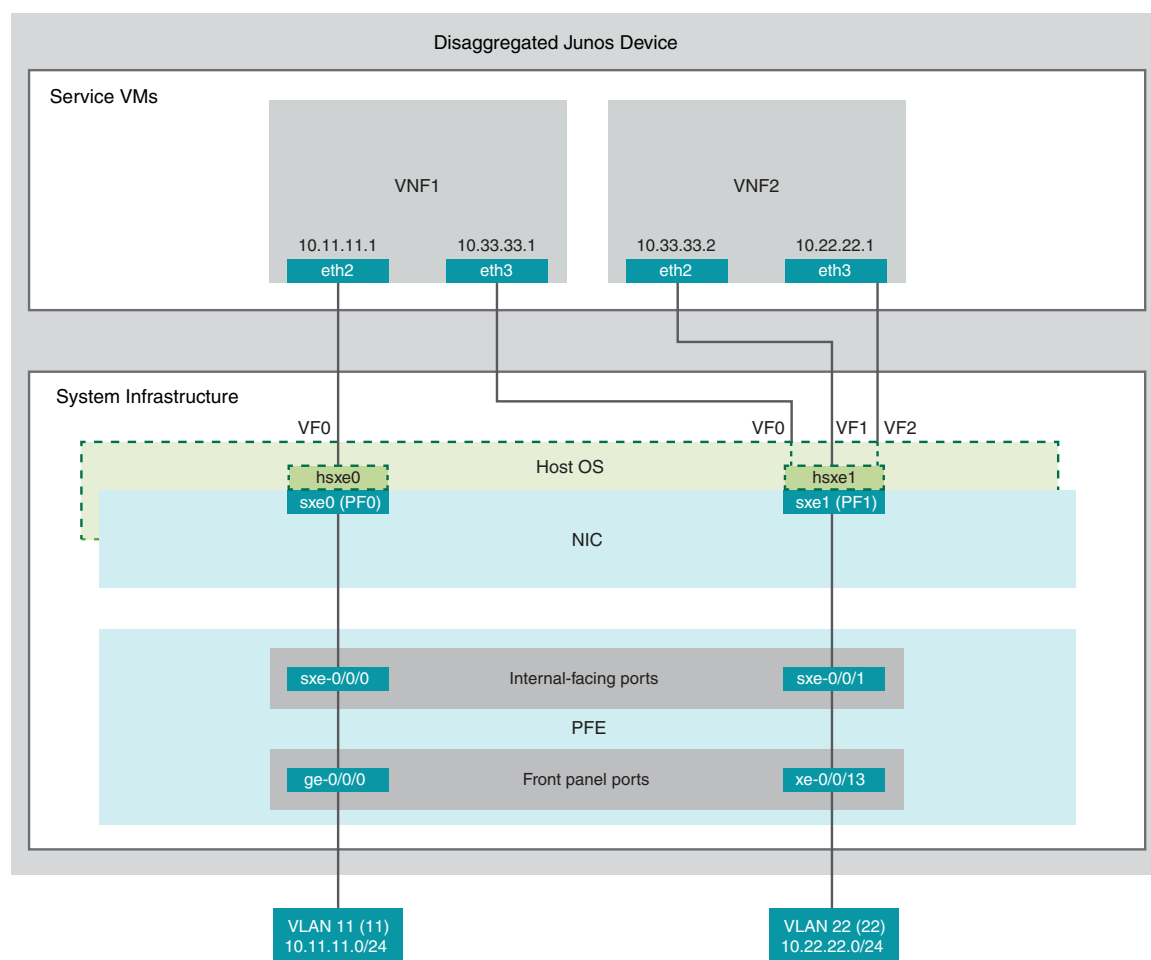
This example uses the front panel ports ge-0/0/0 and xe-0/0/13 associated with the PFE, and its internal-facing ports, sxe-0/0/0 and sxe-0/0/1. The internal NIC ports, sxe0 and sxe1, are not configured directly; instead, they are abstracted at the host OS layer and configured as interfaces hsxe0 and hsxe1. The VNFs use two interfaces, eth2 and eth3. These elements are generally separated into a LAN side and a WAN side.

As this example uses SR-IOV, the virtual functions (VFs) of the NIC ports are used to bypass the host OS and provide direct NIC-to-VM connectivity.

## Topology

[Figure 11 on page 127](#) shows the topology for this example.

Figure 11: Service Chaining Using SR-IOV



This example is configured using the Junos Control Plane (JCP). The key configuration elements include:

- Front panel ports associated with the Packet Forwarding Engine
- Internal-facing ports associated with the Packet Forwarding Engine
- NIC ports

**NOTE:** You must use the host OS interface (hsxe) for these ports because the NIC interfaces (sxe ports) cannot be configured directly.

- VNF interfaces, which use the format eth# (where # ranges from 2 to 9)
- Virtual function settings, which indicate that SR-IOV is being used to provide direct access between the hsxe and VNF interfaces

## Configuration

### IN THIS SECTION

- [Configuring the Packet Forwarding Engine Interfaces | 128](#)
- [Configuring the VNF Interfaces and Creating the Service Chain | 131](#)

This example describes:

### Configuring the Packet Forwarding Engine Interfaces

#### CLI Quick Configuration

To quickly configure the Packet Forwarding Engine interfaces, enter the following configuration statements from the JCP:

```
[edit]
```

```
user@host#
```

```
set vlans Vlan11 vlan-id 11
```

```
set interfaces ge-0/0/0.0 family ethernet-switching vlan member Vlan11
```

```
set interfaces sxe-0/0/0.0 family ethernet-switching interface-mode trunk
```

```
set interfaces sxe-0/0/0.0 family ethernet-switching vlan member Vlan11
```

```
set vlans Vlan22 vlan-id 22
```

```
set interfaces xe-0/0/13.0 family ethernet-switching interface-mode trunk
```

```
set interfaces xe-0/0/13.0 family ethernet-switching vlan member Vlan22
```

```
set interfaces sxe-0/0/1.0 family ethernet-switching interface-mode trunk
```

```
set interfaces sxe-0/0/1.0 family ethernet-switching vlan member Vlan22
```

## Step-by-Step Procedure

To configure the Packet Forwarding Engine interfaces:

1. Configure a VLAN for the LAN-side interfaces.

```
user@host# set vlans Vlan11 vlan-id 11
```

2. Configure the PFE LAN-side front panel port and add it to the LAN-side VLAN.

The LAN-side port is typically an access port, but can be a trunk port if required.

```
user@host# set interfaces ge-0/0/0.0 family ethernet-switching vlan members Vlan11
```

3. Configure the PFE LAN-side internal-facing interface as a trunk port and add it to the LAN-side VLAN.

The internal-facing interfaces are typically trunk ports as they must support traffic from multiple front panel ports and VLANs.

```
user@host# set interfaces sxe-0/0/0.0 family ethernet-switching interface-mode trunk
```

```
user@host# set interfaces sxe-0/0/0.0 family ethernet-switching vlan member Vlan11
```

4. Configure a VLAN for the WAN-side interfaces.

```
user@host# set vlans Vlan22 vlan-id 22
```

5. Configure the PFE WAN-side front panel port as a trunk port and add it to the WAN-side VLAN.

The WAN-side front panel port is typically a trunk port as it might be required to support multiple VLANs.

```
user@host# set interfaces xe-0/0/13.0 family ethernet-switching interface-mode trunk
```

```
user@host# set interfaces xe-0/0/13.0 family ethernet-switching vlan members Vlan22
```

6. Configure the PFE WAN-side internal-facing interface as a trunk port and add it to the WAN-side VLAN.

```
user@host# set interfaces sxe-0/0/1.0 family ethernet-switching interface-mode trunk
```

```
user@host# set interfaces sxe-0/0/1.0 family ethernet-switching vlan members Vlan22
```

7. Commit the configuration.

```
user@host# commit
```

## Results

From configuration mode, check the results of your configuration by entering the following **show** commands:

```
user@host> show interfaces ge-0/0/0
```

```
unit 0 {  
  family ethernet-switching {  
    vlan {  
      members Vlan11;  
    }  
  }  
}
```

```
user@host> show interfaces xe-0/0/13
```

```
unit 0 {  
  family ethernet-switching {  
    interface-mode trunk;  
    vlan {  
      members Vlan22;  
    }  
  }  
}
```

```
user@host> show interfaces sxe-0/0/0
```

```
unit 0 {  
  family ethernet-switching {  
    interface-mode trunk;  
    vlan {  
      members Vlan11;  
    }  
  }  
}
```

```
user@host> show interfaces sxe-0/0/1
```

```
unit 0 {  
  family ethernet-switching {  
    interface-mode trunk;  
    vlan {  
      members Vlan22;  
    }  
  }  
}
```

```
user@host> show vlans
```

```
Vlan11 {  
  vlan-id 11;  
}  
Vlan22 {
```

```
vlan-id 22;
}
```

## Configuring the VNF Interfaces and Creating the Service Chain

### Step-by-Step Procedure

To configure the VNF interfaces and create the service chain:

1. Configure VNF1's LAN-side interface as a Layer 3 interface, and map it to the LAN-side NIC interface. Include the virtual function (VF) setting to specify direct NIC-to-VM connectivity. VNFs must use the interfaces from eth2 through eth9.

The hsxe interface is the configurable representation of the related NIC (sxe) interface.

```
user@host> configure
[edit]
user@host# set virtual-network-functions vm1 interfaces eth2 mapping hsxe0 virtual-function
```

2. Configure VNF1's WAN-side interface from sxe1.

```
user@host# set virtual-network-functions vm1 interfaces eth3 mapping hsxe1 virtual-function
```

3. Instantiate VNF2 with the interfaces eth2 and eth3 on sxe1.

```
user@host# set virtual-network-functions vm2 interfaces eth2 mapping hsxe1 virtual-function
user@host# set virtual-network-functions vm2 interfaces eth3 mapping hsxe1 virtual-function
```

4. Configure the IP addresses and static routes for each interface of the VNFs, and add routes to achieve a complete bidirectional path for the service chain.

### RELATED DOCUMENTATION

*Understanding Service Chaining on Disaggregated Junos OS Platforms*

*Disaggregated Junos OS VMs*

*Understanding SR-IOV Usage*

# Example: Configuring Service Chaining Using a Custom Bridge on NFX250 NextGen Devices

## IN THIS SECTION

- [Requirements | 132](#)
- [Overview | 132](#)
- [Configuration | 133](#)
- [Verifying the Configuration | 136](#)

This example shows how to configure service chaining using a custom bridge.

## Requirements

This example uses an NFX250 NextGen device running Junos OS Release 19.1R1.

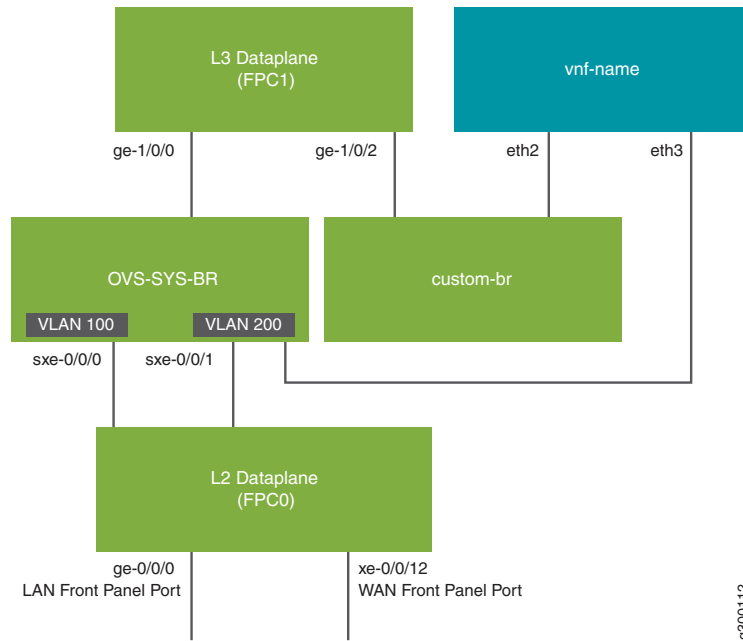
## Overview

The default system bridge is Open vSwitch (OVS). The OVS bridge is a VLAN-aware system bridge, which acts as the Network Functions Virtualization (NFV) backplane to which the VNFs and FPCs connect. However, you can choose to create a custom bridge based on your requirement. This example explains how to configure service chaining using a custom bridge.

## Topology

This example uses the topology shown in [Figure 12 on page 133](#).

Figure 12: Service Chaining Using a Custom Bridge



## Configuration

### IN THIS SECTION

- [Configuring VLANs and Creating the Custom Bridge | 133](#)
- [Configuring the Layer 2 Datapath | 134](#)
- [Configuring the Layer 3 Datapath | 134](#)
- [Configuring the VNF | 135](#)

### Configuring VLANs and Creating the Custom Bridge

#### Step-by-Step Procedure

1. Configure VLANs for the LAN-side interfaces:

```
user@host# set vlans vlan100 vlan-id 100
user@host# set vlans vlan200 vlan-id 200
```



2. Create a custom bridge:

```
user@host# set vmhost vlans custom-br vlan-id none
```

3. Map the Layer 3 interface to the custom bridge:

```
user@host# set vmhost virtualization-options interfaces ge-1/0/2 mapping vlan custom-br
```

## Configuring the Layer 2 Datapath

### Step-by-Step Procedure

1. Configure the LAN-side front panel ports and add them to the LAN-side VLAN.

```
user@host# set interfaces ge-0/0/0 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces ge-0/0/0 unit 0 family ethernet-switching vlan members vlan100
user@host# set interfaces xe-0/0/12 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces xe-0/0/12 unit 0 family ethernet-switching vlan members vlan200
```

2. Configure the internal-facing interfaces as trunk ports and add them to the LAN-side VLAN. The internal-facing interfaces are typically trunk ports as they must support traffic from multiple front panel ports and VLANs.

```
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan100
user@host# set interfaces sxe-0/0/1 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/1 unit 0 family ethernet-switching vlan members vlan200
```

## Configuring the Layer 3 Datapath

### Step-by-Step Procedure

1. Configure VLAN tagging on ge-1/0/0:

```
user@host# set interfaces ge-1/0/0 vlan-tagging
user@host# set interfaces ge-1/0/0 unit 0 vlan-id 100
user@host# set interfaces ge-1/0/0 unit 0 family inet address 192.0.2.1/24
```

2. Configure VLAN tagging on ge-1/0/2:

```
user@host# set interfaces ge-1/0/2 vlan-tagging
user@host# set interfaces ge-1/0/2 unit 0 vlan-id 200
user@host# set interfaces ge-1/0/2 unit 0 family inet address 203.0.113.2/24
```

## Configuring the VNF

### Step-by-Step Procedure

**NOTE:** This example uses a Layer 2 VNF.

1. Launch the VNF:

```
user@host# set virtual-network-functions vnf-name image /var/public/centos-updated1.img
user@host# set virtual-network-functions vnf-name image image-type raw
```

2. Specify the number of CPUs required for the VNF:

```
user@host# set virtual-network-functions vnf-name virtual-cpu count 1
```

3. Pin a virtual CPU to a physical CPU:

```
user@host# set virtual-network-functions vnf-name virtual-cpu 0 physical-cpu 2
```

4. Configure the vmhost instance:

```
user@host# set vmhost vlans vlan200 vlan-id 200
```

5. Create a VNF interface on the custom OVS bridge:

```
user@host# set virtual-network-functions vnf-name interfaces eth2 mapping vlan members
custom-br
```

6. Create a VNF interface on the OVS bridge:

```
user@host# set virtual-network-functions vnf-name interfaces eth3 mapping vlan members vlan200
```

7. Specify the memory allocation for the VNF:

```
user@host# set virtual-network-functions vnf-name memory size 1048576
```

## Verifying the Configuration

### IN THIS SECTION

- [Verify the Control Plane Configuration | 136](#)
- [Verifying the Data Plane Configuration | 137](#)

### Verify the Control Plane Configuration

#### Purpose

Verify the control plane configuration:

#### Action

- Verify that the VLANs are configured:

```
user@host > show vlans
```

| Routing instance | VLAN name | Tag | Interfaces                   |
|------------------|-----------|-----|------------------------------|
| default-switch   | default   | 1   |                              |
| default-switch   | vlan100   | 100 | ge-0/0/0.0*<br>sxe-0/0/0.0*  |
| default-switch   | vlan200   | 200 | sxe-0/0/1.0*<br>xe-0/0/12.0* |

- Verify the vmhost VLANs:

```
user@host> show vmhost vlans
```

| Routing instance | VLAN name | Tag | Interfaces      |
|------------------|-----------|-----|-----------------|
| vmhost           | custom-br |     | vnf-name_eth2.0 |
| vmhost           | vlan200   | 200 | vnf-name_eth3.0 |

- Verify that the VNF is operational. The **State** field shows **Running** for VNFs that are up.

```
user@host> show virtual-network-functions
```

| ID    | Name     | State   | Liveliness |
|-------|----------|---------|------------|
| ----- |          |         |            |
| 4     | vnf-name | Running | alive      |
| 1     | vjunos0  | Running | alive      |

The **Liveliness** field of the VNF indicates whether the internal management IP address of the VNF is reachable from the Junos Control Plane (JCP).

To view more details of the VNF:

```
user@host> show virtual-network-functions vnf-name detail
```

```
Virtual Network Function Information
-----
```

```
Id:          4
Name:        vnf-name
State:       Running
Liveliness:  alive
IP Address:  192.0.2.100
VCPUs:      1
Maximum Memory: 1048576 KiB
Used Memory: 1048576 KiB
Used 1G Hugepages: 0
Used 2M Hugepages: 0
Error:      None
```

## Verifying the Data Plane Configuration

### Purpose

Verify the data plane configuration.

### Action

- Verify the status of the Layer 2 (ge-0/0/x) and Layer 3 (ge-1/0/x) interfaces.

```
user@host > show interfaces interface-name statistics
```

For example:

```
user@host > show interfaces ge-0/0/0 statistics
```

```
Physical interface: ge-0/0/0, Enabled, Physical link is Up
Interface index: 149, SNMP ifIndex: 517
```

```

Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Link-mode: Full-duplex,
Speed: 1000mbps, Duplex: Full-Duplex, BPDU Error: None,
Loop Detect PDU Error: None, Ethernet-Switching Error: None, MAC-REWRITE Error:
None, Loopback: Disabled, Source filtering: Disabled,
Flow control: Enabled, Auto-negotiation: Enabled, Remote fault: Online, IEEE
802.3az Energy Efficient Ethernet: Disabled, Auto-MDIX: Enabled
Device flags      : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Link flags        : None
CoS queues        : 12 supported, 12 maximum usable queues
Current address: 30:7c:5e:4c:78:03, Hardware address: 30:7c:5e:4c:78:03
Last flapped      : 2018-11-26 11:03:32 UTC (04:25:39 ago)
Input rate        : 0 bps (0 pps)
Output rate       : 0 bps (0 pps)
Active alarms     : None
Active defects    : None
PCS statistics
Bit errors        Seconds
0
Errored blocks    0
Ethernet FEC statistics
FEC Corrected Errors      Errors
0
FEC Uncorrected Errors    0
FEC Corrected Errors Rate 0
FEC Uncorrected Errors Rate 0
PRBS Statistics : Disabled
Interface transmit statistics: Disabled

Logical interface ge-0/0/0.0 (Index 330) (SNMP ifIndex 519)
Flags: Up SNMP-Traps 0x24024000 Encapsulation: Ethernet-Bridge
Input packets : 0
Output packets: 0
Protocol eth-switch, MTU: 1514
Flags: Trunk-Mode

```

- Verify the status of the interfaces on the OVS and the custom bridge:

```
user@host > show vmhost network nf-v-back-plane
```

```

Network Name : custom-br

Interface : custom-br
Type : internal, Link type : Full-Duplex, MAC : 2e:8e:a3:e3:e5:40
MTU : [], Link State :down, Admin State : down
IPV4 : None, Netmask : None

```

IPV6 : None, IPV6 netmask : None

```
Rx-packets :      0
Rx-drops   :      0
Rx-errors  :      0
Tx-packets :      0
Tx-drops   :      0
Tx-errors  :      0
```

Interface : vnf-name\_eth2

Type : dpdkvhostuser, Link type : Full-Duplex, MAC : 00:00:00:00:00:00

MTU : 1500, Link State :down, Admin State : up

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

```
Rx-packets :      0
Rx-drops   :      0
Rx-errors  :      0
Tx-packets :      0
Tx-drops   :      0
Tx-errors  :      0
```

Network Name : ovs-sys-br

Interface : ovs-sys-br

Type : internal, Link type : Full-Duplex, MAC : 66:9c:3f:25:04:40

MTU : [], Link State :down, Admin State : down

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

```
Rx-packets :      0
Rx-drops   :      0
Rx-errors  :      0
Tx-packets :      0
Tx-drops   :      0
Tx-errors  :      0
```

Interface : dpdk0

Type : dpdk, Link type : Full-Duplex, MAC : 02:09:c0:1a:c6:ee

MTU : [], Link State :up, Admin State : up

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

```
Rx-packets :      0
Rx-drops   :      0
Rx-errors  :      0
Tx-packets :      0
```

```

Tx-drops      :      0
Tx-errors     :      0

```

Interface : dpdk1

Type : dpdk, Link type : Full-Duplex, MAC : 02:09:c0:7b:6c:47

MTU : [], Link State :up, Admin State : up

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

```

Rx-packets    :      0
Rx-drops      :      0
Rx-errors     :      0
Tx-packets    :      0
Tx-drops      :      0
Tx-errors     :      0

```

Interface : l3\_h\_ge\_1\_0\_0

Type : dpdkvhostuser, Link type : Full-Duplex, MAC : 00:00:00:00:00:00

MTU : [], Link State :down, Admin State : up

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

```

Rx-packets    :      0
Rx-drops      :      0
Rx-errors     :      0
Tx-packets    :      0
Tx-drops      :      0
Tx-errors     :      0

```

Interface : l3\_h\_ge\_1\_0\_1

Type : dpdkvhostuser, Link type : Full-Duplex, MAC : 00:00:00:00:00:00

MTU : [], Link State :down, Admin State : up

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

```

Rx-packets    :      0
Rx-drops      :      0
Rx-errors     :      0
Tx-packets    :      0
Tx-drops      :      0
Tx-errors     :      0

```

Interface : l3\_h\_ge\_1\_0\_2

Type : dpdkvhostuser, Link type : Full-Duplex, MAC : 00:00:00:00:00:00

MTU : [], Link State :down, Admin State : up

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

```
Rx-packets :      0
Rx-drops   :      0
Rx-errors  :      0
Tx-packets :      0
Tx-drops   :      0
Tx-errors  :      0

Interface : vnf-name_eth3
Type : dpdkvhostuser, Link type : Full-Duplex, MAC : 00:00:00:00:00:00
MTU : 1500, Link State :down, Admin State : up
IPv4 : None, Netmask : None
IPv6 : None, IPv6 netmask : None
Rx-packets :      0
Rx-drops   :      0
Rx-errors  :      0
Tx-packets :      0
Tx-drops   :      0
Tx-errors  :      0
```

## Example: Configuring Cross-Connect on NFX250 NextGen Devices

### IN THIS SECTION

- [Requirements | 142](#)
- [Overview | 142](#)
- [Configuration | 143](#)
- [Verifying the Configuration | 146](#)

This example shows how to configure the cross-connect feature on NFX250 NextGen devices.



## Requirements

This example uses an NFX250 NextGen device running Junos OS Release 19.1R1.

## Overview

The cross-connect feature enables traffic switching between any two VNF interfaces. You can bidirectionally switch either all traffic or traffic belonging to a particular VLAN between any two VNF interfaces.

**NOTE:** This feature does not support unidirectional traffic flow.

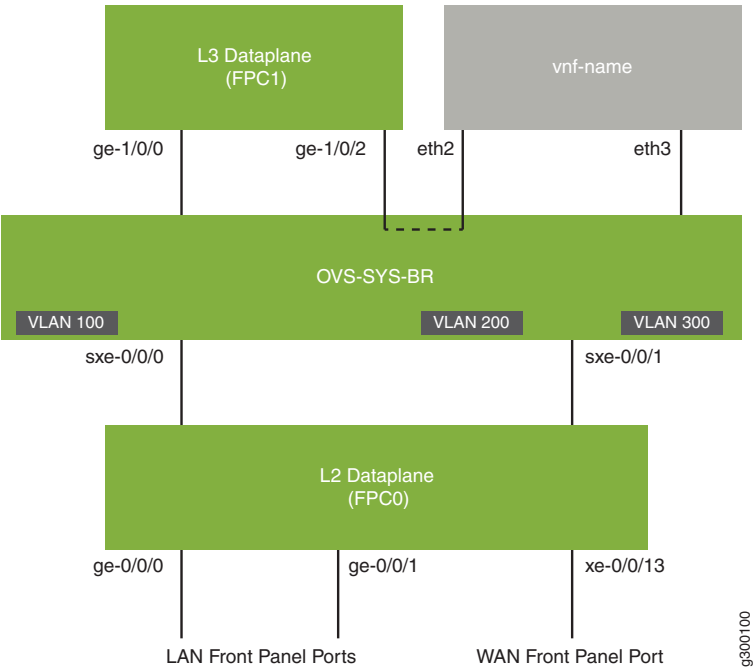
The cross-connect feature supports the following:

- Port cross-connect between two VNF interfaces for all network traffic.
- VLAN-based traffic forwarding between VNF interfaces that support the following functions:
  - Provides an option to switch traffic based on a VLAN ID.
  - Supports VLAN PUSH, POP, and SWAP operations.
  - Supports network traffic flow from trunk to access port through the POP operation.
  - Supports network traffic flow from access to trunk ports through the PUSH operation.

## Topology

This example uses the topology shown in [Figure 13 on page 143](#).

Figure 13: Configuring Cross-Connect



## Configuration

### IN THIS SECTION

- [Configuring VLANs | 143](#)
- [Configure the Layer 2 Datapath | 144](#)
- [Configuring the Layer 3 Datapath | 144](#)
- [Configuring the VNF | 145](#)
- [Configuring Cross-Connect | 145](#)

### Configuring VLANs

#### Step-by-Step Procedure

1. Configure VLANs for the LAN-side interfaces.

```
user@host# set vlans vlan100 vlan-id 100
```

2. Configure a VLAN for the WAN-side interface.

```
user@host# set vlans vlan300 vlan-id 300
```

## Configure the Layer 2 Datapath

### Step-by-Step Procedure

1. Configure the LAN-side front panel ports and add them to the LAN-side VLAN.

```
user@host# set interfaces ge-0/0/0 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces ge-0/0/0 unit 0 family ethernet-switching vlan members vlan100
user@host# set interfaces ge-0/0/1 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces ge-0/0/1 unit 0 family ethernet-switching vlan members vlan100
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan100
```

2. Configure the internal-facing interfaces as trunk ports and add them to the WAN-side VLAN. The internal-facing interfaces are typically trunk ports as they must support traffic from multiple front panel ports and VLANs.

```
user@host# set interfaces xe-0/0/13 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces xe-0/0/13 unit 0 family ethernet-switching vlan members vlan300
user@host# set interfaces sxe-0/0/1 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/1 unit 0 family ethernet-switching vlan members vlan300
```

## Configuring the Layer 3 Datapath

### Step-by-Step Procedure

1. Configure VLAN tagging on ge-1/0/0:

```
user@host# set interfaces ge-1/0/0 vlan-tagging
user@host# set interfaces ge-1/0/0 unit 0 vlan-id 100
user@host# set interfaces ge-1/0/0 unit 0 family inet address 192.0.2.1/24
```

2. Configure VLAN tagging on ge-1/0/2:

```
user@host# set interfaces ge-1/0/2 vlan-tagging
user@host# set interfaces ge-1/0/2 unit 0 vlan-id 200
```

```
user@host# set interfaces ge-1/0/2 unit 0 family inet address 203.0.113.2/24
```

## Configuring the VNF

### Step-by-Step Procedure

1. Launch the VNF:

```
user@host# set virtual-network-functions vnf-name image /var/public/centos-updated_1.img
user@host# set virtual-network-functions vnf-name image image-type raw
```

2. Specify the number of CPUs required for the VNF:

```
user@host# set virtual-network-functions vnf-name virtual-cpu count 1
```

3. Pin a virtual CPU to a physical CPU:

```
user@host# set virtual-network-functions vnf-name virtual-cpu 0 physical-cpu 2
```

4. Create host VLANs:

```
user@host# set vmhost vlans vlan200 vlan-id 200
user@host# set vmhost vlans vlan300 vlan-id 300
```

5. Configure the VNF interfaces as trunk ports and add them to the LAN-side VLAN:

```
user@host# set virtual-network-functions vnf-name interfaces eth2 mapping vlan mode trunk
user@host# set virtual-network-functions vnf-name interfaces eth2 mapping vlan members vlan200
user@host# set virtual-network-functions vnf-name interfaces eth3 mapping vlan members vlan300
```

6. Specify the memory allocation for the VNF:

```
user@host# set virtual-network-functions vnf-name memory size 1048576
```

## Configuring Cross-Connect

### Step-by-Step Procedure

1. Configure cross-connect:

```
user@host# set vmhost cross-connect c1 virtual-interface ge-1/0/2
user@host# set vmhost cross-connect c1 virtual-network-function vnf-name interface eth2
```

## Verifying the Configuration

IN THIS SECTION

- [Verifying the Control Plane Configuration | 146](#)
- [Verifying the Data Plane Configuration | 147](#)

### Verifying the Control Plane Configuration

**Purpose**

Verify the control plane configuration:

**Action**

- Verify the VLANs configured.

```
user@host > show vlans
```

| Routing instance | VLAN name | Tag | Interfaces                                 |
|------------------|-----------|-----|--|
| default-switch   | default   | 1   |  |
| default-switch   | vlan100   | 100 | ge-0/0/0.0*<br>ge-0/0/1.0*<br>sxe-0/0/0.0* |
| default-switch   | vlan200   | 200 | sxe-0/0/1.0*<br>xe-0/0/12.0*               |
| default-switch   | vlan300   | 300 | sxe-0/0/1.0*<br>xe-0/0/13.0*               |

- Verify that the VLANs and VLAN memberships are correct by using the **show vmhost vlans** command.

```
user@host> show vmhost vlans
```

| Routing instance | VLAN name | Tag | Interfaces      |
|------------------|-----------|-----|-----------------|
| vmhost           | vlan200   | 200 | vnf-name_eth2.0 |
| vmhost           | vlan300   | 300 | vnf-name_eth3.0 |

- Verify that the VNF is operational. The **State** field shows **Running** for VNFs that are up.

```
user@host> show virtual-network-functions vnf-name
```

| ID | Name     | State   | Liveliness |
|----|----------|---------|------------|
| 3  | vnf-name | Running | alive      |

The **Liveliness** field of the VNF indicates whether the internal management IP address of the VNF is accessible from the Junos Control Plane (JCP).

To view more details of the VNF:

```
user@host> show virtual-network-functions vnf-name detail
```

| Virtual Network Function Information |             |
|--------------------------------------|-------------|
| -----                                |             |
| Id:                                  | 3           |
| Name:                                | vnf-name    |
| State:                               | Running     |
| Liveliness:                          | alive       |
| IP Address:                          | 192.0.2.100 |
| VCPUs:                               | 1           |
| Maximum Memory:                      | 1048576 KiB |
| Used Memory:                         | 1048576 KiB |
| Used 1G Hugepages:                   | 0           |
| Used 2M Hugepages:                   | 0           |
| Error:                               | None        |

## Verifying the Data Plane Configuration

### Purpose

Verify the data plane configuration.

### Action

- Verify the status of the Layer 2 (ge-0/0/x) and Layer 3 (ge-1/0/x) interfaces.

```
user@host> show interfaces interface-name statistics
```

For example:

```
user@host> show interfaces ge-0/0/0 statistics
```

```
Physical interface: ge-0/0/0, Enabled, Physical link is Up
  Interface index: 149, SNMP ifIndex: 517
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Link-mode: Full-duplex,
  Speed: 1000mbps, Duplex: Full-Duplex, BPDU Error: None,
  Loop Detect PDU Error: None, Ethernet-Switching Error: None, MAC-REWRITE Error:
  None, Loopback: Disabled, Source filtering: Disabled,
  Flow control: Enabled, Auto-negotiation: Enabled, Remote fault: Online, IEEE
  802.3az Energy Efficient Ethernet: Disabled, Auto-MDIX: Enabled
  Device flags      : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags        : None
  CoS queues        : 12 supported, 12 maximum usable queues
  Current address: 30:7c:5e:4c:78:03, Hardware address: 30:7c:5e:4c:78:03
  Last flapped      : 2018-11-26 11:03:32 UTC (04:15:32 ago)
  Input rate         : 0 bps (0 pps)
  Output rate        : 0 bps (0 pps)
  Active alarms      : None
  Active defects     : None
  PCS statistics
    Bit errors                Seconds
    Errored blocks            0
  Ethernet FEC statistics
    Errors
    FEC Corrected Errors      0
    FEC Uncorrected Errors    0
    FEC Corrected Errors Rate 0
    FEC Uncorrected Errors Rate 0
  PRBS Statistics : Disabled
  Interface transmit statistics: Disabled

Logical interface ge-0/0/0.0 (Index 330) (SNMP ifIndex 519)
  Flags: Up SNMP-Traps 0x24024000 Encapsulation: Ethernet-Bridge
  Input packets : 0
  Output packets: 0
  Protocol eth-switch, MTU: 1514
  Flags: Trunk-Mode
```

```
user@host> show interfaces ge-1/0/2 statistics
```

```

Physical interface: ge-1/0/2, Enabled, Physical link is Up
  Interface index: 167, SNMP ifIndex: 547
  Link-level type: Ethernet, MTU: 1518, LAN-PHY mode, Link-mode: Half-duplex,
Speed: 1000mbps, BPDU Error: None, Loop Detect PDU Error: None,
  Ethernet-Switching Error: None, MAC-REWRITE Error: None, Loopback: Disabled,
Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags      : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  CoS queues       : 8 supported, 8 maximum usable queues
  Current address: 30:7c:5e:4c:78:1d, Hardware address: 30:7c:5e:4c:78:1d
  Last flapped    : 2018-11-26 11:03:45 UTC (04:19:57 ago)
  Input rate      : 0 bps (0 pps)
  Output rate     : 0 bps (0 pps)
  Active alarms   : None
  Active defects  : None
  PCS statistics
    Bit errors          Seconds
    Errored blocks      0
  Ethernet FEC statistics
    Errors
    FEC Corrected Errors      0
    FEC Uncorrected Errors    0
    FEC Corrected Errors Rate 0
    FEC Uncorrected Errors Rate 0
  PRBS Statistics : Disabled
  Interface transmit statistics: Disabled

Logical interface ge-1/0/2.0 (Index 334) (SNMP ifIndex 550)
  Flags: Up SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.200 ] Encapsulation: ENET2
  Input packets : 0
  Output packets: 0
  Security: Zone: Null
  Protocol inet, MTU: 1500
  Max nh cache: 75000, New hold nh limit: 75000, Curr nh cnt: 0, Curr new hold
cnt: 0, NH drop cnt: 0
  Flags: Sendbcst-pkt-to-re
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 203.0.113/24, Local: 203.0.113.2, Broadcast: 203.0.113.255

Logical interface ge-1/0/2.32767 (Index 335) (SNMP ifIndex 551)
  Flags: Up SNMP-Traps 0x4004000 VLAN-Tag [ 0x0000.0 ] Encapsulation: ENET2
  Input packets : 0
  Output packets: 0
  Security: Zone: Null

```



- Verify the status of the OVS interfaces.

```
user@host> show vmhost network nfv-back-plane
```

```
Network Name : ovs-sys-br
```

```
Interface : ovs-sys-br
```

```
Type : internal, Link type : Full-Duplex, MAC : 52:86:3c:df:9c:44
```

```
MTU : [], Link State :down, Admin State : down
```

```
IPV4 : None, Netmask : None
```

```
IPV6 : None, IPV6 netmask : None
```

```
Rx-packets : 0
```

```
Rx-drops : 0
```

```
Rx-errors : 0
```

```
Tx-packets : 1
```

```
Tx-drops : 1
```

```
Tx-errors : 0
```

```
Interface : dpdk0
```

```
Type : dpdk, Link type : Full-Duplex, MAC : 02:09:c0:e2:b9:08
```

```
MTU : [], Link State :up, Admin State : up
```

```
IPV4 : None, Netmask : None
```

```
IPV6 : None, IPV6 netmask : None
```

```
Rx-packets : 0
```

```
Rx-drops : 0
```

```
Rx-errors : 0
```

```
Tx-packets : 1
```

```
Tx-drops : 0
```

```
Tx-errors : 0
```

```
Interface : dpdk1
```

```
Type : dpdk, Link type : Full-Duplex, MAC : 02:09:c0:83:39:72
```

```
MTU : [], Link State :up, Admin State : up
```

```
IPV4 : None, Netmask : None
```

```
IPV6 : None, IPV6 netmask : None
```

```
Rx-packets : 0
```

```
Rx-drops : 0
```

```
Rx-errors : 0
```

```
Tx-packets : 0
```

```
Tx-drops : 0
```

```
Tx-errors : 0
```

```
Interface : l3_h_ge_1_0_0
```

```
Type : dpdkvhostuser, Link type : Full-Duplex, MAC : 00:00:00:00:00:00
```

```
MTU : [], Link State :up, Admin State : up
```

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

Rx-packets : 0

Rx-drops : 0

Rx-errors : 0

Tx-packets : 0

Tx-drops : 0

Tx-errors : 0

Interface : l3\_h\_ge\_1\_0\_2

Type : dpdkvhostuser, Link type : Full-Duplex, MAC : 00:00:00:00:00:00

MTU : [], Link State :down, Admin State : up

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

Rx-packets : 0

Rx-drops : 0

Rx-errors : 0

Tx-packets : 0

Tx-drops : 0

Tx-errors : 0

Interface : vnf-name\_eth2

Type : dpdkvhostuser, Link type : Full-Duplex, MAC : 00:00:00:00:00:00

MTU : 1500, Link State :down, Admin State : up

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

Rx-packets : 0

Rx-drops : 0

Rx-errors : 0

Tx-packets : 0

Tx-drops : 0

Tx-errors : 0

Interface : vnf-name\_eth3

Type : dpdkvhostuser, Link type : Full-Duplex, MAC : 00:00:00:00:00:00

MTU : 1500, Link State :down, Admin State : up

IPV4 : None, Netmask : None

IPV6 : None, IPV6 netmask : None

Rx-packets : 0

Rx-drops : 0

Rx-errors : 0

Tx-packets : 0

Tx-drops : 0

Tx-errors : 0

## RELATED DOCUMENTATION

| *Example: Configuring Cross-Connect Using a Custom Bridge on NFX150 Devices*

# Example: Configuring Service Chaining for LAN Routing on NFX250 NextGen Devices

## IN THIS SECTION

- [Requirements | 152](#)
- [Overview | 152](#)
- [Configuration | 153](#)

This example shows how to configure service chaining for LAN routing.

## Requirements

This example uses an NFX250 NextGen device running Junos OS Release 19.1R1.

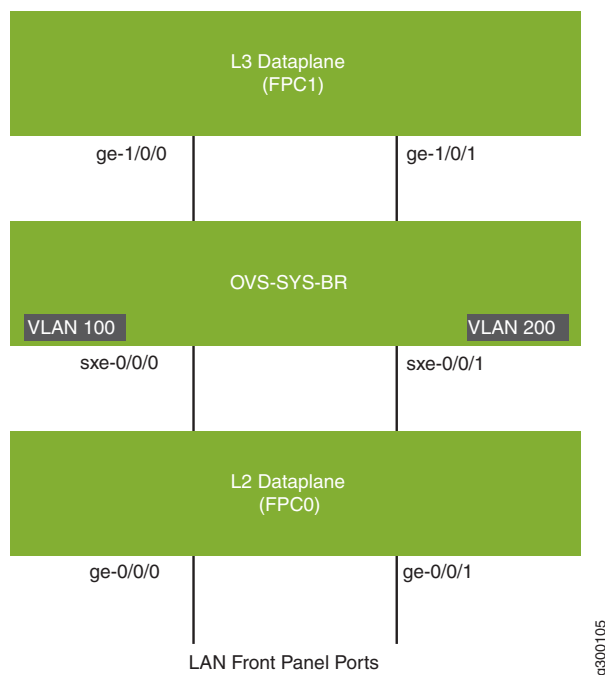
## Overview

This example explains how to configure the various layers of the device to enable traffic flow within a LAN network.

## Topology

This example uses the topology shown in [Figure 14 on page 153](#).

Figure 14: Service Chaining for LAN Routing



## Configuration

### IN THIS SECTION

- [Configuring the Layer 2 Datapath | 153](#)
- [Configuring the Layer 3 Datapath | 154](#)

### Configuring the Layer 2 Datapath

#### Step-by-Step Procedure

1. Configure VLANs for the LAN-side interfaces.

```
user@host# set vlans vlan100 vlan-id 100
```

```
user@host# set vlans vlan200 vlan-id 200
```

2. Configure the LAN-side front panel ports and add them to the LAN-side VLAN.

```

user@host# set interfaces ge-0/0/0 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces ge-0/0/0 unit 0 family ethernet-switching vlan members vlan100
user@jcp# set interfaces ge-0/0/1 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces ge-0/0/1 unit 0 family ethernet-switching vlan members vlan200

```

3. Configure the internal-facing interfaces as trunk ports and add them to the LAN-side VLAN. The internal-facing interfaces are typically trunk ports as they must support traffic from multiple front panel ports and VLANs.

```

user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan100
user@host# set interfaces sxe-0/0/1 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/1 unit 0 family ethernet-switching vlan members vlan200

```

## Configuring the Layer 3 Datapath

### Step-by-Step Procedure

1. Configure VLAN tagging on ge-1/0/0:

```

user@host# set interfaces ge-1/0/0 vlan-tagging
user@host# set interfaces ge-1/0/0 unit 0 vlan-id 100
user@host# set interfaces ge-1/0/0 unit 0 family inet address 192.0.2.1/24

```

2. Configure VLAN tagging on ge-1/0/1:

```

user@host# set interfaces ge-1/0/1 vlan-tagging
user@host# set interfaces ge-1/0/1 unit 0 vlan-id 200
user@host# set interfaces ge-1/0/1 unit 0 family inet address 203.0.113.2/24

```

## RELATED DOCUMENTATION

| *Example: Configuring Service Chaining for LAN-WAN Routing*

# Example: Configuring Service Chaining for LAN to WAN Routing on NFX250 NextGen Devices

## IN THIS SECTION

- [Requirements | 155](#)
- [Overview | 155](#)
- [Configuration | 156](#)
- [Verification | 157](#)

This example shows how to configure service chaining for LAN to WAN routing.

## Requirements

This example uses an NFX250 NextGen device running Junos OS Release 19.1R1.

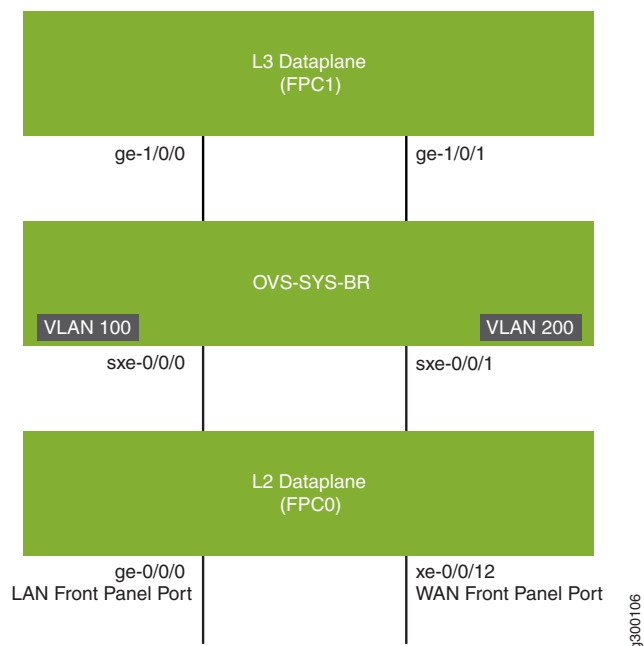
## Overview

This example explains how to configure the various layers of the device to enable traffic from the LAN network to enter the device, flow through the OVS, exit the device, and enter the WAN network.

## Topology

This example uses the topology shown in [Figure 15 on page 156](#).

Figure 15: Service Chaining for LAN to WAN Routing



## Configuration

### IN THIS SECTION

- [Configuring the Layer 2 Datapath | 156](#)
- [Configuring the Layer 3 Datapath | 157](#)

### Configuring the Layer 2 Datapath

#### Step-by-Step Procedure

1. Configure VLANs for the LAN-side interfaces.

```
user@host# set vlans vlan100 vlan-id 100
user@host# set vlans vlan200 vlan-id 200
```

2. Configure the LAN-side front panel ports and add them to the LAN-side and WAN-side VLANs.

```

user@host# set interfaces ge-0/0/0 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces ge-0/0/0 unit 0 family ethernet-switching vlan members vlan100
user@host# set interfaces xe-0/0/12 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces xe-0/0/12 unit 0 family ethernet-switching vlan members vlan200

```

3. Configure the internal-facing interface, sxe-0/0/0, as a trunk port and add it to the LAN-side VLAN. The internal-facing interfaces are typically trunk ports as they must support traffic from multiple front panel ports and VLANs.

```

user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/0 unit 0 family ethernet-switching vlan members vlan100

```

4. Configure the internal-facing interface, sxe-0/0/1, as a trunk port and add it to the WAN-side VLAN.

```

user@host# set interfaces sxe-0/0/1 unit 0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/1 unit 0 family ethernet-switching vlan members vlan200

```

## Configuring the Layer 3 Datapath

### Step-by-Step Procedure

1. Configure VLAN tagging on ge-1/0/0:

```

user@host# set interfaces ge-1/0/0 vlan-tagging
user@host# set interfaces ge-1/0/0 unit 0 vlan-id 100
user@host# set interfaces ge-1/0/0 unit 0 family inet address 192.0.2.1/24

```

2. Configure VLAN tagging on ge-1/0/1:

```

user@host# set interfaces ge-1/0/1 vlan-tagging
user@host# set interfaces ge-1/0/1 unit 0 vlan-id 200
user@host# set interfaces ge-1/0/1 unit 0 family inet address 203.0.113.2/24

```

## Verification

### IN THIS SECTION

- [Verifying the Status of the Interfaces | 158](#)



## Verifying the Status of the Interfaces

### Purpose

Verify the status of the Layer 2 and Layer 3 interfaces.

### Action

- Verify the status of the Layer 2 (ge-0/0/x) and Layer 3 (ge-1/0/x) interfaces.

```
user@host> show interfaces interface-name statistics
```

For example:

```
user@host> show interfaces ge-0/0/0 statistics
```

```
Physical interface: ge-0/0/0, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 518
  Link-level type: Ethernet, MTU: 9192, LAN-PHY mode, Speed: 1000mbps,
  BPDU Error: None, Loop Detect PDU Error: None, Ethernet-Switching Error: None,

  MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled,
  Flow control: Enabled
  Device flags      : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags       : None
  CoS queues       : 8 supported, 8 maximum usable queues
  Current address: 00:00:5e:00:53:43, Hardware address: 00:00:5e:00:53:43
  Last flapped    : 2018-04-18 05:38:22 UTC (2d 10:07 ago)
  Statistics last cleared: Never
Input rate      : 0 bps (0 pps)
Output rate     : 0 bps (0 pps)
  Input errors: 0, Output errors: 0
  Active alarms  : None
  Active defects : None
  PCS statistics                               Seconds
    Bit errors                                0
    Errored blocks                            0
  Ethernet FEC statistics                       Errors
    FEC Corrected Errors                      0
    FEC Uncorrected Errors                    0
    FEC Corrected Errors Rate                  0
    FEC Uncorrected Errors Rate                0
  PRBS Statistics : Disabled
  Interface transmit statistics: Disabled
```

```
Logical interface ge-0/0/0.0 (Index 333) (SNMP ifIndex 524)
  Flags: Up SNMP-Traps 0x24024000 Encapsulation: Ethernet-Bridge
Input packets : 147888
Output packets: 22
  Protocol eth-switch, MTU: 9192
    Flags: Is-Primary
```

## Example: Configuring Service Chaining for LAN to WAN Routing through Third-party VNFs on NFX250 NextGen Devices

### IN THIS SECTION

- [Requirements | 159](#)
- [Overview | 160](#)
- [Configuration | 160](#)
- [Verification | 163](#)

This example shows how to configure service chaining for LAN to WAN routing through third-party VNFs on NFX250 NextGen devices.

## Requirements

This example uses an NFX250 NextGen device running Junos OS Release 19.1R1.

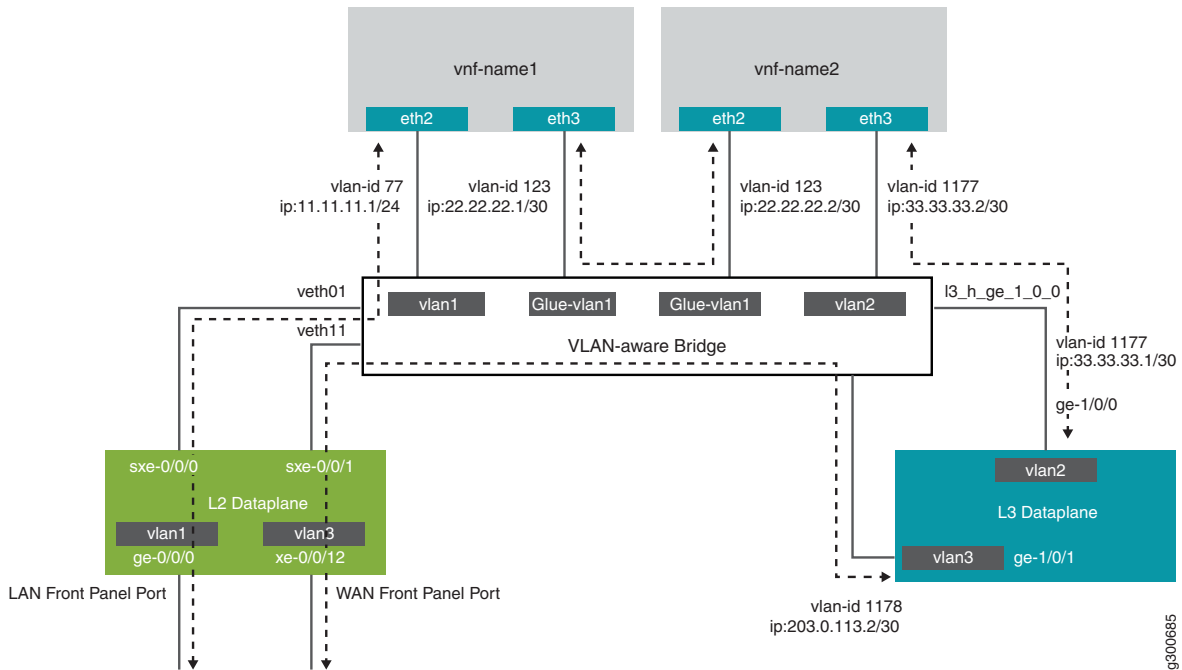
## Overview

This example explains how to configure the various layers of the device to enable traffic from the LAN network to enter the device, flow through the OVS bridge and third-party VNFs, exit the device, and enter the WAN network.

## Topology

This example uses the topology shown in [Figure 16 on page 160](#).

**Figure 16: Service Chaining for LAN to WAN Routing through Third-party VNFs**



## Configuration

### IN THIS SECTION

- [Configuring the Layer 2 Datapath \(JCP LAN Interfaces\) | 161](#)
- [Configuring the VNF Interfaces for Creating the Service Chain | 161](#)

- [Configuring the Layer 3 Datapath | 162](#)
- [Configuring the Layer 2 Datapath \(JCP WAN Interfaces\) | 162](#)

## Configuring the Layer 2 Datapath (JCP LAN Interfaces)

### Step-by-Step Procedure

1. Connect to the JCP.

```
user@host:~ # cli
user@host>
user@host> configure
[edit]
user@host#
```

2. Configure VLANs for the LAN-side interfaces.

```
user@host# set vlans vlan1 vlan-id 77
```

3. Configure the LAN-side front panel ports and add them to the LAN-side VLANs. The LAN-side port is typically an access port, and can be a trunk port if required

```
user@host# set interfaces ge-0/0/0.0 family ethernet-switching vlan members vlan1
```

4. Configure the internal-facing interface, sxe-0/0/0, as a trunk port and add it to the LAN-side VLAN. The internal-facing interfaces are typically trunk ports as they must support traffic from multiple front panel ports and VLANs.

```
user@host# set interfaces sxe-0/0/0.0 family ethernet-switching interface-mode trunk
user@host# set interfaces sxe-0/0/0.0 family ethernet-switching vlan members vlan1
```

## Configuring the VNF Interfaces for Creating the Service Chain

### Step-by-Step Procedure

1. Configure the vmhost instance with the vlans for connecting to the OVS bridge for service chaining:

```
user@host# set vmhost vlans vlan1 vlan-id 77
user@host# set vmhost vlans glue-vlan1 vlan-id 123
user@host# set vmhost vlans vlan2 vlan-id 1177
```

2. Instantiate the VNF (vnf-name1) with one virtio interface mapped to the VLAN vlan1 and the other virtio interface mapped to the VLAN glue-vlan1:

```
user@host# set virtual-network-functions vnf-name1 interfaces eth2 mapping vlan members vlan1
user@host# set virtual-network-functions vnf-name1 interfaces eth3 mapping vlan members
glue-vlan1
```

3. Instantiate the second VNF (vnf-name2) with one interface mapped to the VLAN glue-vlan1 and and the second interface mapped to VLAN vlan2:

```
user@host# set virtual-network-functions vnf-name2 interfaces eth2 mapping vlan members
glue-vlan1
user@host# set virtual-network-functions vnf-name2 interfaces eth3 mapping vlan members vlan2
```

## Configuring the Layer 3 Datapath

### Step-by-Step Procedure

1. Configure the internal-facing L3 Dataplane interface as a VLAN-tagged interface and assign an IP address to it:

```
user@host# set interfaces ge-1/0/0 vlan-tagging
user@host# set interfaces ge-1/0/0.0 vlan-id 1177
user@host# set interfaces ge-1/0/0.0 family inet address 33.33.33.1/30
```

2. Map the Layer 3 interface to the Open vSwitch (OVS) and commit the configuration:

```
user@host# set vmhost virtualization-options interfaces ge-1/0/1
user@host# commit
```

3. Configure the external-facing L3 Dataplane interface as a VLAN-tagged interface and assign an IP address to it:

```
user@host# set interfaces ge-1/0/1 vlan-tagging
user@host# set interfaces ge-1/0/1.0 vlan-id 1178
user@host# set interfaces ge-1/0/1.0 family inet address 203.0.113.2/30
```

## Configuring the Layer 2 Datapath (JCP WAN Interfaces)

### Step-by-Step Procedure

1. Configure a VLAN for the WAN-side JCP interfaces:

```
user@host# set vlans vlan3 vlan-id 1178
```

2. Configure the WAN-side internal-facing interface as a trunk port and add it to the WAN-side VLAN:

```
user@host# set interfaces sxe-0/0/1.0 family ethernet-switching interface-mode trunk
```

```
user@host# set interfaces sxe-0/0/1.0 family ethernet-switching vlan members vlan3
```

3. Configure the WAN-side front panel port and add it to the WAN-side VLAN:

```
user@host# set interfaces xe-0/0/12.0 family ethernet-switching interface-mode access
```

```
user@host# set interfaces xe-0/0/12.0 family ethernet-switching vlan members vlan3
```

4. Commit the configuration:

```
user@host# commit
```

## Verification

### IN THIS SECTION

- [Verifying the Status of the Interfaces | 163](#)

### Verifying the Status of the Interfaces

#### Purpose

Verify the status of the Layer 2 and Layer 3 interfaces.

#### Action

- Verify the status of the Layer 2 (ge-0/0/x) and Layer 3 (ge-1/0/x) interfaces.

```
user@host> show interfaces interface-name statistics
```

For example:

```
user@host> show interfaces ge-0/0/0 statistics
```

```

Physical interface: ge-0/0/0, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 518
  Link-level type: Ethernet, MTU: 9192, LAN-PHY mode, Speed: 1000mbps,
  BPDU Error: None, Loop Detect PDU Error: None, Ethernet-Switching Error: None,

  MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled,
  Flow control: Enabled
  Device flags      : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags       : None
  CoS queues       : 8 supported, 8 maximum usable queues
  Current address: 00:00:5e:00:53:43, Hardware address: 00:00:5e:00:53:43
  Last flapped    : 2018-04-18 05:38:22 UTC (2d 10:07 ago)
  Statistics last cleared: Never
Input rate      : 0 bps (0 pps)
Output rate     : 0 bps (0 pps)
  Input errors: 0, Output errors: 0
  Active alarms  : None
  Active defects : None
  PCS statistics
    Bit errors           Seconds
    Errored blocks       0
    Ethernet FEC statistics Errors
    FEC Corrected Errors 0
    FEC Uncorrected Errors 0
    FEC Corrected Errors Rate 0
    FEC Uncorrected Errors Rate 0
  PRBS Statistics : Disabled
  Interface transmit statistics: Disabled

Logical interface ge-0/0/0.0 (Index 333) (SNMP ifIndex 524)
  Flags: Up SNMP-Traps 0x24024000 Encapsulation: Ethernet-Bridge
Input packets : 147888
Output packets: 22
  Protocol eth-switch, MTU: 9192
  Flags: Is-Primary

```

# 8

CHAPTER

## Troubleshooting

---

Recovering the Root Password for NFX150 and NFX250 (NG) Devices | **167**

Troubleshooting Interfaces on NFX Devices | **170**

---





# Recovering the Root Password for NFX150 and NFX250 (NG) Devices

The root password on your Junos OS-enabled device helps to prevent unauthorized users from making changes to your network.

If you forget the root password, you can use the password recovery procedure to reset the root password.

**NOTE:** You need console access to the device to recover the root password.

To recover the root password:

1. Power off the device by switching off the AC power outlet of the device or, if necessary, by pulling the power cords out of the device's power supplies.
2. Turn off the power to the management device, such as a PC or laptop computer, that you want to use to access the CLI.
3. Plug one end of the Ethernet rollover cable supplied with the device into the RJ-45 to DB-9 serial port adapter supplied with the device.
4. Plug the RJ-45 to DB-9 serial port adapter into the serial port on the management device.
5. Connect the other end of the Ethernet rollover cable to the console port on the device.
6. Turn on the power to the management device.
7. On the management device, start any asynchronous terminal emulation application (such as Microsoft Windows HyperTerminal), and select the port to be used.
8. Configure the port settings as follows:
  - Bits per second—9600
  - Data bits—8
  - Parity—None
  - Stop bits—1
  - Flow control—None

9. Power on the device by plugging the power cords into the device's power supply (if necessary), or by turning on the power to the device by switching on the AC power outlet that the device is plugged into.

The terminal emulation screen on your management device displays the device's boot sequence.

```
i2cset -y 5 0x19 0xff 0x05
i2cset -y 5 0x19 0x2d 0x81
i2cset -y 5 0x19 0x15 0x12
i2cset -y 5 0x18 0xff 0x05
i2cset -y 5 0x18 0x2d 0x82
i2cset -y 5 0x18 0x15 0x12
* Stopping virtualization library daemon: libvirtd
```

[This message is truncated...]

```
Checking Prerequisites
jdm docker container is in Exit state, required to cleanup, please wait...
9dba6935234b
[ OK ]
Launching jdm container 'jdm'...
```

10. When the prompt shows **Launching jdm container 'jdm'**, press **Ctrl+C**. The **Main Menu** appears.

```
Main Menu

1. Boot [J]unos volume
2. Boot Junos volume in [S]afe mode
3. [R]eboot
4. [B]oot menu
5. [M]ore options
```

11. From the **Main Menu**, select **5. [M]ore options**. The **Options Menu** appears.

```
Options Menu

1. Recover [J]unos volume
2. Recovery mode - [C]LI
3. Check [F]ile system
4. Enable [V]erbose boot
5. [B]oot prompt
6. [M]ain menu
```

12. From the **Options Menu**, select **2. Recovery mode - [C]LI**. The device reboots into CLI recovery mode.

```
Booting Junos in CLI recovery mode ...

it will boot in recovery mode and will get MGD cli

/packages/sets/active/boot/os-kernel/kernel text=0x444c38 data=0x82348+0x2909a0
syms=[0x8+0x94c50+0x8+0x8165b]
/packages/sets/active/boot/os-kernel/contents.izo size=0x84d200
/packages/sets/active/boot/os-kernel/miibus.ko size 0x40778 at 0x14bc000
loading required module 'netstack'
/packages/sets/active/boot/netstack/netstack.ko size 0x1386b08 at 0x14fd000
loading required module 'crypto'
```

[This message is truncated...]

```
Starting MGD
mgd: error: could not open database: /var/run/db/schema.db: No such file or
directory
mgd: error: could not open database schema: /var/run/db/schema.db
mgd: error: could not open database schema
mgd: error: database schema is out of date, rebuilding it
mgd: error: could not open database: /var/run/db/juniper.data: No such file or
directory
mgd: error: Cannot read configuration: Could not open configuration database
mgd: warning: schema: dbs_remap_daemon_index: could not find daemon name 'isdnd'

Starting CLI ...
```

13. Enter configuration mode in the CLI.

```
root> configure
```

```
Entering configuration mode
```

14. Set the root password.

```
[edit]
root# set system root-authentication plain-text-password
```

15. At the first prompt, enter the new root password:

```
New password:
```

16. At the second prompt, reenter the new root password.

```
Retype new password:
```

17. After you have finished configuring the password, commit the configuration.

```
[edit]  
root# commit  
  
commit complete
```

18. Exit configuration mode in the CLI.

```
[edit]  
root@host# exit  
root@host>
```

19. Exit operational mode in the CLI.

```
root@host> exit  
root@host%
```

20. At the shell prompt, type **exit** to reboot the device.

```
root@host% exit
```

## RELATED DOCUMENTATION

| [Configuring the Root Password](#)

# Troubleshooting Interfaces on NFX Devices

## IN THIS SECTION

- [Monitoring Interface Status and Traffic on NFX Series Devices | 171](#)

## Monitoring Interface Status and Traffic on NFX Series Devices

### Purpose

View the interface status to monitor bandwidth utilization and traffic statistics of an interface.

### Action

To view the status of an interface:

```
user@host> show interfaces interface-name
```

For example:

- To view the status of an interface for an NFX150 device:

```
user@host> show interfaces heth-0-1
```

```
Physical interface: heth-0-1, Enabled, Physical link is Up
  Link-level type: Ethernet, Media type: Copper, MTU: 9192, Speed: 1Gbps, Duplex:
  Full-duplex, Auto-negotiation: Enabled
  Device flags      : Present Running
  Current address: 00:00:5e:00:53:8e, Hardware address: 00:00:5e:00:53:8e
```

- To view the status of the interface for an NFX250 device:

```
user@host> show interfaces xe-0/0/12
```

```
Physical interface: xe-0/0/12, Enabled, Physical link is Up
Interface index: 145, SNMP ifIndex: 509
Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, BPDU Error:
None, Loop Detect PDU Error: None,
Ethernet-Switching Error: None, MAC-REWRITE Error: None, Loopback: Disabled,
Source filtering: Disabled, Flow control: Enabled
Device flags : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Link flags : None
CoS queues : 12 supported, 12 maximum usable queues
Current address: 30:7c:5e:4c:78:0f, Hardware address: 30:7c:5e:4c:78:0f
Last flapped : 2018-12-10 19:53:35 UTC (2d 03:08 ago)
Input rate : 0 bps (0 pps)
Output rate : 0 bps (0 pps)
Active alarms : None
Active defects : None
PCS statistics Seconds
Bit errors 0
```

```
Errorred blocks 0
Ethernet FEC statistics Errors
FEC Corrected Errors 0
FEC Uncorrected Errors 0
FEC Corrected Errors Rate 0
FEC Uncorrected Errors Rate 0
PRBS Statistics : Disabled
Interface transmit statistics: Disabled
```

# 9

CHAPTER

## Operational Commands

---

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---

# request vmhost cleanup

## Syntax

```
request vmhost cleanup
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.

Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Clean up temporary files, crash generated files, and log files located in the **/var/tmp**, **/var/crash**, and **/var/log** directories respectively on the host OS.

## Required Privilege Level

maintenance

## RELATED DOCUMENTATION

| *vmhost*

## Output Fields

When you enter this command, you are provided feedback on the status of your request.

# request vmhost file-copy

## Syntax

```
request vmhost file-copy (crash|log) from-jnode host file-name to-vjunos host file-name
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.

Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Copy crash files or log files from the host OS to Junos OS. You can use these files for analysis and debugging purposes.

## Options

- **crash**—Files in `/var/crash` on the host.
- **from-jnode *filename***—Name of the host file to be copied.
- **log**—Files in `/var/log` on the host.
- **to-vjunos *filename***—Name of the Junos OS file to which the host file is copied.

## Additional Information

You can use the **show vmhost crash** and **show vmhost logs** commands to list or identify the files in the host OS to be copied to Junos OS.

## Required Privilege Level

maintenance

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[request vmhost file-copy on page 176](#)

## Sample Output

**request vmhost file-copy**

```
user@host> request vmhost file-copy log from-jnode daemon.log to-vjunos /var/tmp
```

```
:/var/tmp # ls -lrt daemon.log  
-rw-r--r-- 1 root wheel 1035126 Mar  4 20:33 daemon.log
```

# request vmhost halt

## Syntax

```
request vmhost halt
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.

Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Stop the host OS and Junos OS running on the device.

## Required Privilege Level

maintenance

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[request vmhost halt on page 178](#)

## Sample Output

### request vmhost halt

```
user@host> request vmhost halt
```

```
Halt the vmhost ? [yes,no] (no) yes

Initiating vmhost halt... ok
Initiating Junos shutdown...  shutdown: [pid 8782]
Shutdown NOW!
ok
Junos shutdown is in progress...

*** FINAL System shutdown message from root@ ***

System going down IMMEDIATELY
```

...

...

Operating System halted

Please press any key to reboot

# request vmhost mode

## Syntax

```
request vmhost mode [compute | hybrid | throughput]
```

## Release Information

Command introduced in Junos OS Release 19.1R1 for NFX150 and NFX250 (NG) devices.

## Description

Select the operational mode of the device.

### NOTE:

- Starting from Junos OS Release 19.3R1, if the same physical CPU is used for both VNFs and the Junos OS or device components, the request to change the mode fails and an error message is displayed. For example:

```
root> request vmhost mode throughput
```

```
error: Mode cannot be changed; Reason: Reserved CPUs conflict with VNF  
cpu pinnings: 3
```

- When you upgrade the software image that has a VNF CPU conflict to Junos OS Release 19.3R1 by using the CLI upgrade option, the upgrade succeeds and the VNF configuration is applied. The VNF CPU conflict is reported by JDM only if you issue a **commit** command. You must modify the VNF configurations accordingly.

## Required Privilege Level

maintenance

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[request vmhost mode compute on page 181](#)

## Sample Output

**request vmhost mode compute**

user@host> **request vmhost mode compute**

```
warning: Device will be rebooted to change the mode from hybrid to compute
Do you want to continue? [yes,no] (no)
```



# request vmhost power-off

## Syntax

```
request vmhost power-off
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.

Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

**NOTE:** `request vmhost power-on` is not supported on NFX150 and NFX250 (NG) devices.

## Description

Shut down the Junos OS software and the host OS.

## Required Privilege Level

maintenance

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[request vmhost power-off on page 182](#)

## Sample Output

### request vmhost power-off

```
user@host> request vmhost power-off
```

```
Power-off the vmhost ? [yes,no] (no) yes
```

```
Initiating vmhost shutdown... ok
```

```
Initiating Junos shutdown... shutdown: [pid 3884]
```

```
Shutdown NOW!
```

```
ok
```

```
*** FINAL System shutdown message from root@host ***
```

```
System going down IMMEDIATELY
```

```
...
```

```
...
```

# request vmhost reboot

## Syntax

```
request vmhost reboot
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.

Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Reboot the Junos OS software and the host OS.

## Required Privilege Level

maintenance

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[request vmhost reboot on page 184](#)

## Sample Output

### request vmhost reboot

```
user@host> request vmhost reboot
```

```
Reboot the vmhost ? [yes,no] (no) yes

warning: Rebooting re0
Initiating vmhost reboot... ok
Initiating Junos shutdown... shutdown: [pid 7273]
Shutdown NOW!
ok
Junos shutdown is in progress...

*** FINAL System shutdown message from root@ ***
```

System going down IMMEDIATELY

...

...

# request vmhost software add

## Syntax

```
request vmhost software add package-name <in>| <no-validate>| <reboot>| <set>| <unlink>| <upgrade-to-model  
  model-number>
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.

Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Install or upgrade the Junos OS and host software packages on the device.

## Options

- **in**—(Optional) Number of minutes to delay before the reboot operation.
- **no-validate**—(Optional) When loading a software package or bundle with a different release, suppress the default behavior of the **validate** option.
- **reboot**—(Optional) After adding the software package or bundle, reboot the system.
- **set**—(Optional) List of URLs or pathnames corresponding to the software packages.
- **unlink**—(Optional) Removes the software package after successful installation.
- **upgrade-to-model**—(Optional) *model number*—(Optional) Name of the model to upgrade to.

## Required Privilege Level

maintenance

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[request vmhost software add \(NFX150\) on page 187](#)

[request vmhost software add \(NFX250 \(NG\)\) on page 187](#)

## Sample Output

### request vmhost software add (NFX150)

```
user@host> request vmhost software add
/var/public/jinstall-host-nfx-3-x86-64-18.1R1.8-secure-signed.tgz no-validate reboot
```

```
Verified jinstall-host-nfx-3-x86-64-18.1R1.8-secure-signed signed by
PackageProductionEc_2018 method ECDSA256+SHA256
Pushing Junos image package to the host...
File already present in Host. Skipping pushing the image
Mounting primary partitions to stage upgrade operation
Installing
/mnt/.share/lshare/public/pkginst.7565/install-media-nfx-3-junos-18.1R1.8-secure.tgz
Extracting the package ...
..
..
```

### request vmhost software add (NFX250 (NG))

```
user@host> request vmhost software add
/var/public/jinstall-host-nfx-3-x86-64-18.4R1.8-secure-signed.tgz
```

```
Verified jinstall-host-nfx-3-x86-64-18.4R1.8-secure-signed signed by
PackageProductionEc_2018 method ECDSA256+SHA256
Pushing Junos image package to the host...
File already present in Host. Skipping pushing the image
Mounting alternate partitions to stage upgrade operation
Installing
/mnt/.share/lshare/public/pkginst.39634/install-media-nfx-3-junos-18.4R1.8-secure.tgz
Extracting the package ...
=====
Host OS upgrade is FORCED
Current Host kernel version : 4.1.27-rt30-WR8.0.0.25_ovp
Package Host kernel version : 4.1.27-rt30-WR8.0.0.25_ovp
Current Host version       : 3.0.3
Package Host version       : 3.0.3
Min host version required for applications: 3.0.2
=====
Validate linux image...
upgrade_platform: -----
upgrade_platform: Parameters passed:
upgrade_platform: silent=0
upgrade_platform:
```

```

package=/var/tmp/tmp.rV7S1sxWedjunos_cli_upg/jinstall-nfx-3-junos-18.4R1.8-secure-linux.tgz
upgrade_platform: clean install=0
upgrade_platform: on primary    =0
upgrade_platform: clean upgrade=0
upgrade_platform: Need reboot after staging=1
upgrade_platform: -----
upgrade_platform:
upgrade_platform: Checking input
/var/tmp/tmp.rV7S1sxWedjunos_cli_upg/jinstall-nfx-3-junos-18.4R1.8-secure-linux.tgz
...
upgrade_platform: Input package
/var/tmp/tmp.rV7S1sxWedjunos_cli_upg/jinstall-nfx-3-junos-18.4R1.8-secure-linux.tgz
is valid.
Secure Boot is enforced.
ALLOW:usr/secureboot/grub/BOOTX64.EFI
ALLOW:boot/bzImage-intel-x86-64.bin
ALLOW:boot/initramfs.cpio.gz
Setting up Junos host applications for installation ...
Current junos instance is 0
Installing Host OS ...
upgrade_platform: -----
upgrade_platform: Parameters passed:
upgrade_platform: silent=0
upgrade_platform: package=/var/tmp/jinstall-nfx-3-junos-18.4R1.8-secure-linux.tgz
upgrade_platform: clean install=0
upgrade_platform: on primary    =0
upgrade_platform: clean upgrade=0
upgrade_platform: Need reboot after staging=0
upgrade_platform: -----
upgrade_platform:
upgrade_platform: Checking input
/var/tmp/jinstall-nfx-3-junos-18.4R1.8-secure-linux.tgz ...
upgrade_platform: Input package
/var/tmp/jinstall-nfx-3-junos-18.4R1.8-secure-linux.tgz is valid.
Secure Boot is enforced.
ALLOW:usr/secureboot/grub/BOOTX64.EFI
ALLOW:boot/bzImage-intel-x86-64.bin
ALLOW:boot/initramfs.cpio.gz
upgrade_platform: Backing up boot assets..
upgrade_platform: Staging the upgrade package -
/var/tmp/jinstall-nfx-3-junos-18.4R1.8-secure-linux.tgz..
upgrade_platform: Checksum verified and OK...
upgrade_platform: Staging of /var/tmp/jinstall-nfx-3-junos-18.4R1.8-secure-linux.tgz
completed

```

```
upgrade_platform: System needs *REBOOT* to complete the upgrade  
Host OS upgrade staged. Reboot the system to complete installation!
```



# show system visibility cpu

## Syntax

```
show system visibility cpu
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.  
 Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Display details such as per CPU statistics, per CPU usage, and CPU pinning for a Junos OS platform.

## Required Privilege Level

view

## RELATED DOCUMENTATION

|  |
|--|
| <a href="#">show system visibility host   194</a>    |
| <a href="#">show system visibility memory   205</a>  |
| <a href="#">show system visibility network   208</a> |
| <a href="#">show system visibility vnf   214</a>     |

## List of Sample Output

[show system visibility cpu \(NFX150\) on page 191](#)  
[show system visibility cpu \(NFX250 \(NG\)\) on page 192](#)

## Output Fields

[Table 14 on page 190](#) lists the output fields for the **show system visibility cpu** command. Output fields are listed in the approximate order in which they appear.

Table 14: show system visibility cpu Output Fields

| Field Name                       | Field Description                      |
|----------------------------------|--|
| <b>Fields for CPU Statistics</b> |  |
| CPU ID                           | The CPU ID                             |
| User Time                        | The amount of user time, in seconds.   |
| System Time                      | The amount of system time, in seconds. |

Table 14: show system visibility cpu Output Fields (*continued*)

| Field Name                                | Field Description   |
|---|---|
| Idle Time                                 | The amount of time spent in idle mode, in seconds.                              |
| Nice Time                                 | The amount of spent nice time, in seconds.                                      |
| I/O Wait Time                             | The amount of time spent waiting for input/output (I/O) operations, in seconds. |
| Interrupt Service Time                    | The amount of interrupt service time, in seconds.                               |
| Service Time                              | The amount of service time, in seconds.   |
| <b>Fields for CPU Usages</b>              |   |
| CPU ID                                    | The CPU ID  |
| CPU Usage                                 | The percentage of CPU used.   |
| <b>Fields for CPU Pinning Information</b> |   |
| Virtual Machine                           | The name of the virtual machine.  |
| vCPU                                      | The ID of virtual CPUs used by the virtual machine.                             |
| CPU                                       | The ID of CPUs used by the virtual machine.                                     |
| System Component                          | The name of the system component.   |
| CPUs                                      | The ID of CPUs used by the system component.                                    |

## Sample Output

**show system visibility cpu (NFX150)**

user@host> **show system visibility cpu**

```

CPU Statistics (Time in sec)
-----
CPU Id User Time System Time Idle Time Nice Time IOWait Time Intr. Service Time
-----
0      26583    40107      105816    0         102         0

```

|   |       |       |        |   |   |   |
|---|-------|-------|--------|---|---|---|
| 1 | 53183 | 64078 | 56959  | 0 | 0 | 0 |
| 2 | 72    | 67    | 171189 | 0 | 1 | 0 |
| 3 | 0     | 96    | 171241 | 0 | 0 | 0 |

#### CPU Usages

-----

CPU Id CPU Usage

-----

|   |                    |
|---|--------------------|
| 0 | 36.399999999999999 |
| 1 | 66.700000000000003 |
| 2 | 0.0                |
| 3 | 0.0                |

#### CPU Pinning Information

-----

| Virtual Machine | vCPU | CPU |
|-----------------|------|-----|
|-----------------|------|-----|

-----

|         |   |   |
|---------|---|---|
| vjunos0 | 0 | 0 |
|---------|---|---|

| System Component | CPUs |
|------------------|------|
|------------------|------|

-----

|              |   |
|--------------|---|
| ovs-vswitchd | 1 |
|--------------|---|

### show system visibility cpu (NFX250 (NG))

user@host> show system visibility cpu

#### CPU Statistics (Time in sec)

-----

| CPU Id | User Time | System Time | Idle Time | Nice Time | IOWait Time | Intr. Service Time |
|--------|-----------|-------------|-----------|-----------|-------------|--------------------|
|--------|-----------|-------------|-----------|-----------|-------------|--------------------|

-----

|    |        |      |        |   |     |   |
|----|--------|------|--------|---|-----|---|
| 0  | 28568  | 4549 | 236916 | 0 | 205 | 0 |
| 1  | 272502 | 0    | 48     | 0 | 0   | 0 |
| 2  | 165    | 45   | 272268 | 0 | 11  | 0 |
| 3  | 40     | 9    | 272470 | 0 | 0   | 0 |
| 4  | 0      | 0    | 272494 | 0 | 0   | 0 |
| 5  | 0      | 0    | 272550 | 0 | 0   | 0 |
| 6  | 0      | 0    | 272552 | 0 | 0   | 0 |
| 7  | 272507 | 0    | 47     | 0 | 0   | 0 |
| 8  | 0      | 0    | 272552 | 0 | 0   | 0 |
| 9  | 0      | 0    | 272553 | 0 | 0   | 0 |
| 10 | 0      | 0    | 272553 | 0 | 0   | 0 |
| 11 | 0      | 0    | 272547 | 0 | 0   | 0 |

| CPU Usages |           |
|------------|-----------|
| -----      |           |
| CPU Id     | CPU Usage |
| -----      | -----     |
| 0          | 11.9      |
| 1          | 100.0     |
| 2          | 0.0       |
| 3          | 0.0       |
| 4          | 0.0       |
| 5          | 0.0       |
| 6          | 0.0       |
| 7          | 100.0     |
| 8          | 0.0       |
| 9          | 0.0       |
| 10         | 0.0       |
| 11         | 0.0       |

| CPU Pinning Information |       |       |
|-------------------------|-------|-------|
| -----                   |       |       |
| Virtual Machine         | vCPU  | CPU   |
| -----                   | ----- | ----- |
| vjunos0                 | 0     | 0     |

| System Component | CPUs    |
|------------------|---------|
| -----            | -----   |
| ovs-vswitchd     | 0, 1, 7 |

# show system visibility host

## Syntax

```
show system visibility host
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.  
 Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Displays details such as the host uptime, number of tasks, CPU statistics, list of disk partitions, disk usage, disk I/O statistics, list of network interfaces, and per port statistics for a Junos OS platform.

## Required Privilege Level

view

## RELATED DOCUMENTATION

|  |                       |
|--|-----------------------|
| <a href="#">show system visibility cpu</a>     | <a href="#">  190</a> |
| <a href="#">show system visibility memory</a>  | <a href="#">  205</a> |
| <a href="#">show system visibility network</a> | <a href="#">  208</a> |
| <a href="#">show system visibility vnf</a>     | <a href="#">  214</a> |

## List of Sample Output

[show system visibility host \(NFX150\) on page 197](#)  
[show system visibility host \(NFX250 \(NG\)\) on page 201](#)

## Output Fields

[Table 15 on page 194](#) lists the output fields for the **show system visibility host** command. Output fields are listed in the approximate order in which they appear.

Table 15: show system visibility host Output Fields

| Field Name                   | Field Description                       |
|------------------------------|---|
| <b>Field for Host Uptime</b> |   |
| Uptime                       | The time the host has been operational. |
| <b>Fields for Host Tasks</b> |   |

Table 15: show system visibility host Output Fields (*continued*)

| Field Name                                    | Field Description   |
|---|---|
| <b>Total</b>                                  | The total number of tasks.  |
| <b>Running</b>                                | The total number of tasks running.  |
| <b>Sleeping</b>                               | The total number of tasks in sleeping state.                                    |
| <b>Stopped</b>                                | The total number of tasks that are stopped.                                     |
| <b>Zombie</b>                                 | The total number of zombie processes.   |
| <b>Fields for Host CPU Information</b>        |   |
| <b>User Time</b>                              | The amount of user time, in seconds.  |
| <b>System Time</b>                            | The amount of system time, in seconds.  |
| <b>Idle Time</b>                              | The amount of time spent in idle mode, in seconds.                              |
| <b>Nice Time</b>                              | The amount of spent nice time, in seconds.                                      |
| <b>I/O Wait Time</b>                          | The amount of time spent waiting for input/output (I/O) operations, in seconds. |
| <b>Interrupt Service Time</b>                 | The amount of interrupt service time, in seconds.                               |
| <b>Fields for Host Disk Partitions</b>        |   |
| <b>Device</b>                                 | The device path.  |
| <b>Mount Point</b>                            | The mount point of the device path.   |
| <b>File System</b>                            | The file system type.   |
| <b>Options</b>                                | Options available for the device path.  |
| <b>Fields for Host Disk Usage Information</b> |   |
| <b>Total</b>                                  | The total amount of disk usage space, in mebibytes (MiB).                       |
| <b>Used</b>                                   | The amount of used disk usage space, in mebibytes (MiB).                        |
| <b>Free</b>                                   | The amount of free disk usage space, in mebibytes (MiB).                        |

Table 15: show system visibility host Output Fields (*continued*)

| Field Name                                     | Field Description   |
|--|---|
| Percentage Used                                | The percentage of used disk space.  |
| <b>Fields for Host Disk I/O Information</b>    |   |
| Read Count                                     | The number of times the disk has been read.   |
| Write Count                                    | The number of times a write operation has happened on the disk.                       |
| Read Bytes                                     | The number of bytes used in read operations on the disk.                              |
| Write Bytes                                    | The number of bytes used in write operations on the disk.                             |
| Read Time                                      | The amount of time the disk has been read, in milliseconds.                           |
| Write Time                                     | The amount of time write operations have been performed on the disk, in milliseconds. |
| <b>Fields for List of Host Interfaces</b>      |   |
| Interfaces                                     | The name of the interface.  |
| State  | The state of the Host Interface.  |
| MAC  | The MAC address of the interface.   |
| <b>Fields for List of Host Port Statistics</b> |   |
| Interface                                      | The name of the interface.  |
| Bytes Sent                                     | The number of bytes sent.   |
| Bytes Received                                 | The number of bytes received.   |
| Packets Sent                                   | The number of packets sent.   |
| Packets Received                               | The number of packets received.   |
| Errors In                                      | The number of errors in.  |
| Errors Out                                     | The number of errors out.   |
| Drops In                                       | The number of drops in.   |

Table 15: show system visibility host Output Fields (*continued*)

| Field Name | Field Description        |
|------------|--------------------------|
| Drops Out  | The number of drops out. |

## Sample Output

### show system visibility host (NFX150)

user@host> show system visibility host

```

Host Uptime
-----
Uptime: 1 day 23:19:41.21000

Host Tasks
-----
Total:      187
Running:    3
Sleeping:   179
Stopped:    0
Zombie:     5

Host CPU Information (Time in sec)
-----
User Time:      79359
System Time:    0
Idle Time:      502215
I/O Wait Time:  103
Nice Time:      103724
Interrupt Service Time: 0

Host Disk Partitions
-----
Device                                Mount Point      File System  Options
-----
/dev/sda2                             /                 ext4
rw,relatime,i_version,data=ordered
/dev/sda1                             /boot/efi        vfat
rw,noatime,fmask=0022,dmask=0022,codepage=437,iocharset=iso8859-1,shortname=mixed,errors=remount-ro
/dev/sda7                             /config          ext4

```



```
rw,noatime,data=ordered
/dev/sda8                /var/log                ext4
rw,noatime,data=ordered
/dev/sda9                /mnt/.share             ext4
rw,noatime,discard,data=ordered
/dev/sda5                /junos                  ext4
rw,noatime,discard,data=ordered
/dev/loop0               /var/tmp                ext4
rw,relatime,data=ordered
/dev/loop1               /mnt/.share/lshare/jnpr/jlog ext4
rw,relatime,data=ordered
/dev/loop0               /mnt/.share/lshare/jnpr/jtmp ext4
rw,relatime,data=ordered
```

Host Disk Usage Information

```
-----
Total (MiB):      1469
Used  (MiB):      948
Free  (MiB):      429
Percentage Used:  64.5
```

Host Disk I/O Information

```
-----
Read Count: 187083
Write Count: 256206
Read Bytes: 2290787328
Write Bytes: 3331667456
Read Time: 33977
Write Time: 258864
```

Host Interfaces

| Interface | State    | MAC               |
|-----------|----------|-------------------|
| heth-0-1  | active   | 00:00:5e:00:53:8e |
| heth-0-0  | active   | 00:00:5e:00:53:8d |
| heth-0-3  | active   | 00:00:5e:00:53:90 |
| heth-0-2  | active   | 00:00:5e:00:53:8f |
| heth-0-5  | inactive | 00:00:5e:00:53:92 |
| heth-0-4  | inactive | 00:00:5e:00:53:91 |
| ctrlbr0   | active   | 00:00:5e:00:53:10 |
| docker0   | inactive | 00:00:5e:00:53:8c |
| eth0br    | active   | 00:00:5e:00:53:00 |
| eth1br    | inactive | 00:00:5e:00:53:67 |

```

13_h_ge_1_0_0      active  00:00:5e:00:53:6d
13_h_ltectrl        active  00:00:5e:00:53:f1
13_h_ltedata         active  00:00:5e:00:53:91
lo                   inactive 00:00:00:00:00:00
lte_crt10            active  00:00:5e:00:53:91
lte_data0            active  00:00:5e:00:53:fc
ovs-sys-br           inactive 00:00:5e:00:53:4f
ovs-system           inactive 00:00:5e:00:53:1b
sit0                 inactive 00:00:00:00
veth00               active  00:00:5e:00:53:79
veth01               active  00:00:5e:00:53:87
veth10               active  00:00:5e:00:53:40
veth11               active  00:00:5e:00:53:65
virbr0               active  00:00:5e:00:53:83
virbr1               active  00:00:5e:00:53:6f

```

#### Host Port Statistics

```

-----
Interface Bytes Sent   Bytes Rcvd   Packets Sent Packets Rcvd Errors In Errors Out
Drops In Drops Out
-----
-----
13_h_ge_1_0_0 11025    648          74           8           0           0
0             0
veth10      0        11673        0            82          0           0
12           0
veth11     11673      0            82           0           0           0
0             0
ovs-system  0          0            0            0           0           0
0             0
ovs-sys-br  0          0            0            0           0           0
82           0
vnet0      31080352   10698402    153074       136451      0           0
0             0
vnet1      858553596  712231555   9325949      10546588    0           0
0             0
vnet2      735033102  50689829    4956943      180168      0           0
0             0
vnet3      4428680    602          85168        13          0           0
0             0
eth0       50689829   1077880063  180168       5551593     0           0
6146        0
eth1br     0          0            0            0           0           0
0             0

```

|              |           |           |         |         |   |   |
|--------------|-----------|-----------|---------|---------|---|---|
| lte_data0    | 0         | 1648      | 0       | 14      | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| lo           | 96584     | 96584     | 1219    | 1219    | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| lte_crt10    | 749623    | 12570778  | 22710   | 22762   | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| virbr0-nic   | 0         | 0         | 0       | 0       | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| docker0      | 0         | 0         | 0       | 0       | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| veth01       | 4558      | 4743808   | 53      | 89402   | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| veth00       | 4743808   | 4558      | 89402   | 53      | 0 | 0 |
| 8            | 0         |           |         |         |   |   |
| dcapi-tap    | 0         | 0         | 0       | 0       | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| l3_h_ltedata | 1648      | 648       | 14      | 8       | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| sit0         | 0         | 0         | 0       | 0       | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| flowd_h_mgmt | 391536979 | 448871585 | 5975703 | 5507199 | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| virbr1       | 29553905  | 8096581   | 137792  | 128808  | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| virbr0       | 46365     | 48232     | 467     | 540     | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| l3_h_ltectrl | 12570778  | 818395    | 22762   | 22718   | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| jdm-hbme1    | 4474379   | 55866     | 85622   | 537     | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| jdm-hbme2    | 813479    | 1526643   | 7992    | 15288   | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| eth0br       | 0         | 595875398 | 0       | 4835907 | 0 | 0 |
| 222          | 0         |           |         |         |   |   |
| ctrlbr0      | 408483097 | 256713674 | 3800585 | 4571275 | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| heth-0-1     | 0         | 5368334   | 0       | 89330   | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| heth-0-0     | 0         | 5366462   | 0       | 89349   | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| heth-0-3     | 0         | 5367002   | 0       | 89358   | 0 | 0 |
| 0            | 0         |           |         |         |   |   |
| heth-0-2     | 0         | 5365262   | 0       | 89329   | 0 | 0 |
| 0            | 0         |           |         |         |   |   |

|          |   |   |   |   |   |   |
|----------|---|---|---|---|---|---|
| heth-0-5 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0        | 0 |   |   |   |   |   |
| heth-0-4 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0        | 0 |   |   |   |   |   |

show system visibility host (NFX250 (NG))

user@host> show system visibility host

```
Host Uptime
-----
Uptime: 3 days 3:47:05.09000

Host Tasks
-----
Total:      198
Running:    1
Sleeping:   194
Stopped:    0
Zombie:     3

Host CPU Information (Time in sec)
-----
User Time:      574351
System Time:    0
Idle Time:      2692218
I/O Wait Time:  216
Nice Time:      4609
Interrupt Service Time: 0

Host Disk Partitions
-----
Device                                Mount Point      File System  Options
-----
/dev/sda2                             /                 ext4
rw,relatime,i_version,data=ordered
/dev/sda1                             /boot/efi        vfat
rw,noatime,fmask=0022,dmask=0022,codepage=437,iocharset=iso8859-1,shortname=mixed,errors=remount-ro
/dev/sda7                             /config          ext4
rw,noatime,data=ordered
/dev/sda8                             /var/log         ext4
rw,noatime,data=ordered
/dev/sda9                             /mnt/.share      ext4
```

```

rw,noatime,discard,data=ordered
/dev/sda5                      /junos          ext4
rw,noatime,discard,data=ordered
/dev/loop0                    /var/tmp        ext4
rw,relatime,data=ordered

```

#### Host Disk Usage Information

-----

```

Total (MiB):      1469
Used  (MiB):      906
Free  (MiB):      470
Percentage Used:  61.7

```

#### Host Disk I/O Information

-----

```

Read Count: 245805
Write Count: 333782
Read Bytes: 2967304704
Write Bytes: 6147921408
Read Time: 34906
Write Time: 448918

```

#### Host Interfaces

-----

| Interface     | State    | MAC               |
|---------------|----------|-------------------|
| hsxe0         | active   | 30:7c:5e:4c:78:44 |
| hsxe1         | active   | 30:7c:5e:4c:78:45 |
| ctrlbr0       | active   | 02:00:00:00:00:10 |
| docker0       | inactive | 02:42:f9:e7:08:5f |
| eth0br        | active   | 4c:96:14:00:00:00 |
| eth1br        | inactive | 66:7e:98:6c:9d:a7 |
| l3_h_ge_1_0_0 | active   | ca:6b:5a:fe:39:2c |
| lo            | inactive | 00:00:00:00:00:00 |
| sit0          | inactive | 00:00:00:00       |
| virbr0        | active   | 30:7c:5e:4c:78:43 |
| virbr1        | active   | be:51:f7:ac:03:1b |

#### Host Port Statistics

-----

| Interface | Bytes Sent | Bytes Rcvd | Packets Sent | Packets Rcvd | Errors In | Errors Out |
|-----------|------------|------------|--------------|--------------|-----------|------------|
| Drops In  | Drops Out  |            |              |              |           |            |

-----

-----

|               |            |           |         |         |   |   |
|---------------|------------|-----------|---------|---------|---|---|
| 13_h_ge_1_0_0 | 0          | 648       | 0       | 8       | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| ovs-sys-br    | 0          | 0         | 0       | 0       | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| vnet0         | 2573491477 | 117345734 | 2448205 | 1790887 | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| vnet1         | 670930985  | 585788796 | 7585078 | 8400542 | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| vnet2         | 454043208  | 224389433 | 2873376 | 416585  | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| vnet3         | 7129616    | 9814      | 137213  | 231     | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| eth0          | 224389433  | 464747548 | 416585  | 2889060 | 0 | 0 |
| 9829          | 0          |           |         |         |   |   |
| lo            | 61305      | 61305     | 920     | 920     | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| virbr1        | 2475291351 | 90762062  | 1008399 | 1774468 | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| irb           | 0          | 0         | 0       | 0       | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| hsxe1         | 0          | 0         | 0       | 0       | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| hsxe0         | 0          | 0         | 0       | 0       | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| docker0       | 0          | 0         | 0       | 0       | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| dcapi-tap     | 0          | 0         | 0       | 0       | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| sit0          | 0          | 0         | 0       | 0       | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| flowd_h_mgmt  | 387545386  | 426690199 | 5662328 | 5294853 | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| virbr0-nic    | 0          | 0         | 0       | 0       | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| virbr0        | 3021873    | 1067179   | 4573    | 6153    | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| jdm-hbme1     | 1785562    | 33378     | 34145   | 404     | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| jdm-hbme2     | 41904      | 72344     | 321     | 323     | 0 | 0 |
| 0             | 0          |           |         |         |   |   |
| eth0br        | 0          | 401858893 | 0       | 2755416 | 0 | 0 |
| 226           | 0          |           |         |         |   |   |
| ctrlbr0       | 243770080  | 159923150 | 2283092 | 2738720 | 0 | 0 |
| 0             | 0          |           |         |         |   |   |

|            |   |   |   |   |   |   |
|------------|---|---|---|---|---|---|
| eth1br     | 0 | 0 | 0 | 0 | 0 | 0 |
| 0          | 0 |   |   |   |   |   |
| ovs-netdev | 0 | 0 | 0 | 0 | 0 | 0 |
| 0          | 0 |   |   |   |   |   |

# show system visibility memory

## Syntax

```
show system visibility memory
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.  
Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Display the details about virtual memory and shared memory for a Junos OS platform.

## Required Privilege Level

view

## RELATED DOCUMENTATION

- [show system visibility cpu | 190](#)
- [show system visibility host | 194](#)
- [show system visibility network | 208](#)
- [show system visibility vnf | 214](#)

## List of Sample Output

- [show system visibility memory \(NFX150\) on page 206](#)
- [show system visibility memory \(NFX250 \(NG\)\) on page 206](#)

## Output Fields

Table 16 on page 205 lists the output fields for the **show system visibility memory** command. Output fields are listed in the approximate order in which they appear.

Table 16: show system visibility memory Output Fields

| Field Name                                   | Field Description  |
|--|--|
| Fields for Memory Information—Virtual Memory |  |
| Total  | The total amount of available virtual memory, in kibibytes (KiBs). |
| Used   | The total amount of used virtual memory, in kibibytes (KiBs).      |
| Available                                    | The total amount of available virtual memory, in kibibytes (KiBs). |



Table 16: show system visibility memory Output Fields (*continued*)

| Field Name                                       | Field Description   |
|--|---|
| <b>Free</b>                                      | The total amount of free virtual memory, in kibibytes (KiBs).   |
| <b>Percent Used</b>                              | The percentage of buffer virtual memory used.                   |
| <b>Fields for Memory Information—Swap Memory</b> |   |
| <b>Total</b>                                     | The total amount of available swap memory, in kibibytes (KiBs). |
| <b>Used</b>                                      | The total amount of used swap memory, in kibibytes (KiBs).      |
| <b>Free</b>                                      | The total amount of free swap memory, in kibibytes (KiBs).      |
| <b>Percent Used</b>                              | The percentage of buffer swap memory used.                      |

## Sample Output

**show system visibility memory (NFX150)**

user@host> **show system visibility memory**

```
Memory Information
-----
Virtual Memory:
-----
Total      (KiB): 7946732
Used       (KiB): 3292908
Available  (KiB): 5844376
Free       (KiB): 4653824
Percent Used    : 26.50
```

**show system visibility memory (NFX250 (NG))**

user@host> **show system visibility memory**

```
Memory Information
-----
```

```
Virtual Memory:
-----
Total      (KiB): 15914412
Used       (KiB): 6723092
Available  (KiB): 10250492
Free       (KiB): 9191320
Percent Used    : 35.60

Huge Pages:
-----
Total 1GiB Huge Pages:      2
Free 1GiB Huge Pages:      0
Configured 1GiB Huge Pages: 0
Total 2MiB Huge Pages:    401
Free 2MiB Huge Pages:      1
Configured 2MiB Huge Pages: 0

Hugepages Usage:
-----
```

| Name                        | Type          | Used 1G |
|-----------------------------|---------------|---------|
| Hugepages Used 2M Hugepages |               |         |
| -----                       |               |         |
| -----                       |               |         |
| srxpfe<br>400               | other process | 1       |
| ovs-vswitchd<br>0           | other process | 2       |

# show system visibility network

## Syntax

```
show system visibility network
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.  
 Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Displays details such as the list of MAC addresses assigned to VNF interfaces, the list of internal IP addresses for VNFs, the list of virtual functions used by VNFs, and the list of VNF interfaces for a Junos OS platform.

## Required Privilege Level

view

## RELATED DOCUMENTATION

|   |                       |
|---|-----------------------|
| <a href="#">show system visibility cpu</a>    | <a href="#">  190</a> |
| <a href="#">show system visibility host</a>   | <a href="#">  194</a> |
| <a href="#">show system visibility memory</a> | <a href="#">  205</a> |
| <a href="#">show system visibility vnf</a>    | <a href="#">  214</a> |

## List of Sample Output

[show system visibility network \(NFX150\) on page 209](#)  
[show system visibility network \(NFX250 \(NG\)\) on page 212](#)

## Output Fields

[Table 17 on page 208](#) lists the output fields for the **show system visibility network** command. Output fields are listed in the approximate order in which they appear.

Table 17: show system visibility network Output Fields

| Field Name                                  | Field Description           |
|---|-----------------------------|
| <b>Fields for List of VNF MAC Addresses</b> |                             |
| VNF   | The name of the VNF.        |
| MAC   | The MAC address of the VNF. |

Table 17: show system visibility network Output Fields (*continued*)

| Field Name  | Field Description  |
|---|--|
| <b>Fields for List of VNF Internal IP Addresses</b> |  |
| VNF   | The name of the VNF.   |
| IP  | The IP address of the VNF.   |
| <b>Fields for List of VNF Virtual Functions</b>     |  |
| VNF   | The name of the VNF.   |
| PF  | The names of the Physical Functions available.                           |
| VF  | The names of the Virtual Functions available for each Physical Function. |
| <b>Fields for List of Free Virtual Functions</b>    |  |
| PF  | The names of the Physical Functions available.                           |
| VF  | The names of the Virtual Functions available for each Physical Function. |
| <b>Fields for List of VNF Interfaces</b>            |  |
| VNF   | The name of the VNF.   |
| Interface   | The name of the interface.   |
| Type  | The type of interface.   |
| Source  | The connectivity source.   |
| Model   | The connectivity model.  |
| MAC   | The MAC address of the VNF.  |

## Sample Output

show system visibility network (NFX150)

```
user@host> show system visibility network
```

## VNF MAC Addresses

| VNF             | MAC               |
|-----------------|-------------------|
| centos1_ethdef0 | 00:00:5E:00:53:9E |
| centos1_ethdef1 | 00:00:5E:00:53:9F |
| centos1_eth2    | 00:00:5E:00:53:A0 |
| centos1_eth3    | 00:00:5E:00:53:A1 |
| centos2_ethdef0 | 00:00:5E:00:53:A2 |
| centos2_ethdef1 | 00:00:5E:00:53:A3 |
| centos2_eth2    | 00:00:5E:00:53:A4 |
| centos2_eth3    | 00:00:5E:00:53:A5 |

## VNF Internal IP Addresses

| VNF     | IP          |
|---------|-------------|
| centos1 | 192.0.2.103 |
| centos2 | 192.0.2.102 |

## VNF Virtual Functions

| VNF                | PF       | VF           |
|--------------------|----------|--------------|
| 13_ge_1_0_4_vfdef0 | heth-0-1 | 0000:04:10:0 |
| 12_ge_0_0_0_vfdef0 | heth-0-0 | 0000:04:10:1 |
| 12_ge_0_0_0_vfdef1 | heth-0-0 | 0000:04:10:5 |
| 12_ge_0_0_0_vfdef2 | heth-0-0 | 0000:04:11:1 |
| 12_ge_0_0_0_vfdef3 | heth-0-0 | 0000:04:11:5 |
| 13_ge_1_0_2_vfdef0 | heth-0-5 | 0000:07:10:0 |
| 12_ge_0_0_2_vfdef0 | heth-0-2 | 0000:04:10:3 |
| 12_ge_0_0_2_vfdef1 | heth-0-2 | 0000:04:10:7 |
| 12_ge_0_0_2_vfdef2 | heth-0-2 | 0000:04:11:3 |
| 12_ge_0_0_2_vfdef3 | heth-0-2 | 0000:04:11:7 |
| 13_ge_1_0_1_vfdef0 | heth-0-4 | 0000:07:10:1 |
| 12_ge_0_0_3_vfdef0 | heth-0-3 | 0000:04:10:2 |
| 12_ge_0_0_3_vfdef1 | heth-0-3 | 0000:04:10:6 |
| 12_ge_0_0_3_vfdef2 | heth-0-3 | 0000:04:11:2 |
| 12_ge_0_0_3_vfdef3 | heth-0-3 | 0000:04:11:6 |

## Free Virtual Functions

| PF | VF |
|----|----|
|----|----|

```

heth-0-1 0000:04:10:4
heth-0-1 0000:04:11:0
heth-0-1 0000:04:11:4
heth-0-5 0000:07:10:2
heth-0-5 0000:07:10:4
heth-0-5 0000:07:10:6
heth-0-4 0000:07:10:3
heth-0-4 0000:07:10:5
heth-0-4 0000:07:10:7

```

#### VNF Interfaces

| VNF<br>VLAN-ID | Interface Type | Source            | Model  | MAC               |
|----------------|----------------|-------------------|--------|-------------------|
| centos2        | centos2_vnet6  | network default   | virtio | 00:00:5e:00:53:a2 |
| --             |                |                   |        |                   |
| centos2        | centos2_vnet7  | bridge eth0br     | virtio | 00:00:5e:00:53:a3 |
| --             |                |                   |        |                   |
| centos2        | centos2_eth2   | bridge ovs-sys-br | virtio | 00:00:5e:00:53:a4 |
| 199            |                |                   |        |                   |
| centos2        | centos2_eth3   | bridge custom1    | virtio | 00:00:5e:00:53:a5 |
| --             |                |                   |        |                   |
| centos1        | centos1_vnet4  | network default   | virtio | 00:00:5e:00:53:9e |
| --             |                |                   |        |                   |
| centos1        | centos1_vnet5  | bridge eth0br     | virtio | 00:00:5e:00:53:9f |
| --             |                |                   |        |                   |
| centos1        | centos1_eth2   | bridge ovs-sys-br | virtio | 00:00:5e:00:53:a0 |
| 100            |                |                   |        |                   |
| centos1        | centos1_eth3   | bridge custom1    | virtio | 00:00:5e:00:53:a1 |
| --             |                |                   |        |                   |

#### OVS Interfaces

| NAME          | MTU  |
|---------------|------|
| custom1       | 1500 |
| centos2_eth3  | 1500 |
| centos1_eth3  | 1500 |
| veth11        | 9200 |
| l3_h_ge_1_0_0 | 9200 |
| veth01        | 9200 |
| ovs-sys-br    | 1500 |

```
centos1_eth2      1500
centos2_eth2      1500
```

**show system visibility network (NFX250 (NG))**

user@host> **show system visibility network**

```
VNF Virtual Functions
-----
VNF                                PF      VF
-----
System_vfdef0                     hsxe0   0000:03:13:6
System_vfdef0                     hsxe1   0000:03:13:7

Free Virtual Functions
-----
PF      VF
-----
hsxe0   0000:03:10:0
hsxe0   0000:03:10:2
hsxe0   0000:03:10:4
hsxe0   0000:03:10:6
hsxe0   0000:03:11:0
hsxe0   0000:03:11:2
hsxe0   0000:03:11:4
hsxe0   0000:03:11:6
hsxe0   0000:03:12:0
hsxe0   0000:03:12:2
hsxe0   0000:03:12:4
hsxe0   0000:03:12:6
hsxe0   0000:03:13:0
hsxe0   0000:03:13:2
hsxe0   0000:03:13:4
hsxe1   0000:03:10:1
hsxe1   0000:03:10:3
hsxe1   0000:03:10:5
hsxe1   0000:03:10:7
hsxe1   0000:03:11:1
hsxe1   0000:03:11:3
hsxe1   0000:03:11:5
hsxe1   0000:03:11:7
hsxe1   0000:03:12:1
hsxe1   0000:03:12:3
hsxe1   0000:03:12:5
```

|                |              |
|----------------|--------------|
| hsxe1          | 0000:03:12:7 |
| hsxe1          | 0000:03:13:1 |
| hsxe1          | 0000:03:13:3 |
| hsxe1          | 0000:03:13:5 |
| OVS Interfaces |              |
| -----          |              |
| NAME           | MTU          |
| -----          | -----        |
| dpdk1          | 1500         |
| ovs-sys-br     | 1500         |
| 13_h_ge_1_0_0  | 1500         |
| dpdk0          | 1500         |



# show system visibility vnf

## Syntax

```
show system visibility vnf vnf name
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.  
Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

If a VNF name is not specified, this command displays the details of all VNFs present in the system. Details include VNF memory usage, CPU statistics, the list of network interfaces, the list of disk files, per disk usage, per port I/O statistics, and media information, which includes details about CD-ROM and USB storage devices.

If a VNF name is specified, this command displays the details of that particular VNF. Details include VNF memory usage, CPU statistics, the list of network interfaces, the list of disk files, per disk usage, per port I/O statistics, and media information, which includes details about CD-ROM and USB storage devices.

## Required Privilege Level

view

## RELATED DOCUMENTATION

|  |                       |
|--|-----------------------|
| <a href="#">show system visibility cpu</a>     | <a href="#">  190</a> |
| <a href="#">show system visibility host</a>    | <a href="#">  194</a> |
| <a href="#">show system visibility memory</a>  | <a href="#">  205</a> |
| <a href="#">show system visibility network</a> | <a href="#">  208</a> |

## List of Sample Output

[show system visibility vnf on page 217](#)

## Output Fields

[Table 18 on page 215](#) lists the output fields for the **show system visibility vnf** command. Output fields are listed in the approximate order in which they appear.

Table 18: show system visibility vnf Output Fields

| Field Name  | Field Description                                     |
|---|---|
| <b>Fields for List of VNFs</b>                      |   |
| <b>ID</b>   | ID of the VNF.  |
| <b>Name</b>   | Name of the VNF.                                      |
| <b>State</b>  | State of the VNF.                                     |
| <b>Fields for VNF Memory Usage</b>                  |   |
| <b>Name</b>   | Name of the VNF.                                      |
| <b>Maximum Memory</b>                               | The maximum amount of memory, in kibibytes (KiBs).    |
| <b>Used Memory</b>                                  | The total amount of used memory, in kibibytes (KiBs). |
| <b>Used 1G Hugepages</b>                            | The total number of 1G hugepages used.                |
| <b>Used 2M Hugepages</b>                            | The total number of 2M hugepages used.                |
| <b>Fields for VNF CPU Stats</b>                     |   |
| <b>Name</b>   | Name of the VNF.                                      |
| <b>CPU Time</b>                                     | The total CPU time, in seconds.                       |
| <b>System Time</b>                                  | The amount of system CPU time, in seconds.            |
| <b>User Time</b>                                    | The amount of user CPU time, in seconds.              |
| <b>Fields for List of VNF MAC Addresses</b>         |   |
| <b>VNF</b>  | Names of the VNFs.                                    |
| <b>MAC</b>  | MAC addresses of the VNFs.                            |
| <b>Fields for List of VNF Internal IP Addresses</b> |   |
| <b>VNF</b>  | Names of the VNFs.                                    |
| <b>IP</b>   | Internal IP addresses of the VNFs.                    |

Table 18: show system visibility vnf Output Fields (*continued*)

| Field Name  | Field Description  |
|---|--|
| <b>Fields for List of Virtual Functions per VNF</b> |  |
| VNF   | Names of the VNFs.   |
| PF  | The names of the Physical Functions available.                           |
| VF  | The names of the Virtual Functions available for each Physical Function. |
| <b>Fields for the VNF Interfaces</b>                |  |
| VNF   | The name of the VNF.   |
| Interface   | The name of the interface.   |
| Type  | The type of interface.   |
| Source  | The connectivity source.   |
| Model   | The connectivity model.  |
| MAC   | The MAC address of the VNF.  |
| <b>Fields for List of VNF Disk Information</b>      |  |
| VNF   | The name of the VNF.   |
| Disk  | The name of the disk.  |
| File  | The path to the disk.  |
| <b>Fields for List of VNF Disk Usage</b>            |  |
| VNF   | The name of the VNF.   |
| Disk  | The name of the disk.  |
| Read Requests                                       | The number of times a read operation has happened on the disk.           |
| Bytes Read  | The number of read bytes on the disk.                                    |
| Write Requests                                      | The number of times a write operation has happened on the disk.          |

Table 18: show system visibility vnf Output Fields (*continued*)

| Field Name                                    | Field Description                        |
|---|--|
| Bytes Written                                 | The number of bytes written on the disk. |
| <b>Fields for List of VNF Port Statistics</b> |  |
| VNF   | The name of the VNF.                     |
| Port  | The name of the port.                    |
| Rcvd Bytes                                    | The number of bytes received.            |
| Rcvd Packets                                  | The number of packets received.          |
| Rcvd Error                                    | The number of errors received.           |
| Rcvd Drop                                     | The number of drops received.            |
| Trxd Bytes                                    | The number of bytes transferred.         |
| Trxd Packets                                  | The number of packets transferred.       |
| Trxd Error                                    | The number of errors transferred.        |
| Trxd Drop                                     | The number of drops transferred.         |

## Sample Output

**show system visibility vnf**

user@host> **show system visibility vnf**

List of VNFs

```

-----
ID   Name                               State
-----
5    centos                             Running

```

VNF Memory Usage

```

-----
Name                               Maximum Memory (KiB)  Used Memory (KiB)

```

Used 1G Hugepages    Used 2M Hugepages

```
-----
centos                                2097152                260741                0
                                0
```

VNF CPU Statistics (Time in ms)

```
-----
Name                                CPU Time                System Time   User Time
-----
centos                                14029                  3650          1540
```

VNF MAC Addresses

```
-----
VNF                                MAC
-----
centos_ethdef0                    E8:B6:C2:CC:66:9B
centos_ethdef1                    E8:B6:C2:CC:66:9C
```

VNF Internal IP Addresses

```
-----
VNF                                IP
-----
centos                            192.0.2.100
```

VNF Virtual Functions

```
-----
VNF                                PF                VF
-----
12_ge_0_0_0_vfdef0                heth-0-0          0000:02:10:1
12_ge_0_0_0_vfdef1                heth-0-0          0000:02:10:5
12_ge_0_0_0_vfdef2                heth-0-0          0000:02:11:1
12_ge_0_0_0_vfdef3                heth-0-0          0000:02:11:5
12_ge_0_0_2_vfdef0                heth-0-2          0000:02:10:3
12_ge_0_0_2_vfdef1                heth-0-2          0000:02:10:7
12_ge_0_0_2_vfdef2                heth-0-2          0000:02:11:3
12_ge_0_0_2_vfdef3                heth-0-2          0000:02:11:7
13_ge_1_0_2_vfdef0                heth-0-5          0000:05:10:0
12_ge_0_0_1_vfdef0                heth-0-1          0000:02:10:0
12_ge_0_0_1_vfdef1                heth-0-1          0000:02:10:4
12_ge_0_0_1_vfdef2                heth-0-1          0000:02:11:0
12_ge_0_0_1_vfdef3                heth-0-1          0000:02:11:4
12_ge_0_0_3_vfdef0                heth-0-4          0000:05:10:1
12_ge_0_0_3_vfdef1                heth-0-4          0000:05:10:3
12_ge_0_0_3_vfdef2                heth-0-4          0000:05:10:5
```

```
12_ge_0_0_3_vfdef3          heth-0-4  0000:05:10:7
```

```
13_ge_1_0_1_vfdef0          heth-0-3  0000:02:10:2
```

#### VNF Interfaces

| VNF                  | Interface    | Type    | Source  | Model  | MAC               |
|----------------------|--------------|---------|---------|--------|-------------------|
| IPv4-address         |              |         |         |        |                   |
| centos               | centos_vnet4 | network | default | virtio | e8:b6:c2:cc:66:9b |
| centos               | centos_vnet5 | bridge  | eth0br  | virtio |                   |
| e8:b6:c2:cc:66:9c -- |              |         |         |        |                   |

#### VNF Disk Information

| VNF    | Disk | File                             |
|--------|------|----------------------------------|
| centos | vda  | /var/public/centos-linux-1.img   |
| centos | hda  | /var/public/vnf_config_data_vnf0 |

#### VNF Disk Usage

| VNF    | Disk | Read Req | Read Bytes | Write Req | Write Bytes |
|--------|------|----------|------------|-----------|-------------|
| centos | vda  | 5382     | 84654592   | 2068      | 4372480     |
| centos | hda  | 15       | 37068      | 0         | 0           |

#### VNF Port Statistics

| VNF    | Port         | Rcvd Bytes | Rcvd Packets | Rcvd Error | Rcvd Drop | Trxd |
|--------|--------------|------------|--------------|------------|-----------|------|
| Bytes  | Trxd Packets | Trxd Error | Trxd Drop    |            |           |      |
| centos | centos_vnet4 | 572        | 11           | 0          | 0         | 850  |
| centos | centos_vnet5 | 21729      | 258          | 0          | 395       | 0    |

#### VNF Media Information

| VNF | Media | Disk | File |
|-----|-------|------|------|
|     |       |      |      |

|      |           |                                  |
|------|-----------|----------------------------------|
| vnf0 | CDROM hda | /var/public/vnf_config_data_vnf0 |
|------|-----------|----------------------------------|

# show vmhost connections

## Syntax

```
show vmhost connections
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.  
 Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Display the details for the cross-connect connections. The NFX150 and NFX250 (NG) supports VLAN PUSH, POP, and SWAP operations.

## Options

- name**—Display the details of a specific connection.
- down**—Display the details of connections that are not operational.
- up**—Display the details of connections that are operational.
- up-down**—Display the details of both operational and non-operational connections.

## Required Privilege Level

view

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[show vmhost connections on page 222](#)

## Output Fields

[Table 19 on page 221](#) lists the output fields for the **show vmhost connections** command. Output fields are listed in the approximate order in which they appear.

Table 19: show vmhost connections Output Fields

| Field Name | Field Description                                  |
|------------|--|
| Connection | Displays the type of the cross-connect.            |
| Function   | Displays the name of the virtual network function. |



Table 19: show vmhost connections Output Fields (continued)

| Field Name | Field Description  |
|------------|--|
| Interface  | Specifies an interface on which the connection is established. |
| Status     | Displays the status of the connection.                         |

## Sample Output

show vmhost connections

user@host> show vmhost connections

| Connection  | Function | Interface | Vlan | Status |
|-------------|----------|-----------|------|--------|
| -----       |          |           |      |        |
| phy_cc      | system   | sxe0      | 200  | up     |
|             | centos1  | eth2      | 500  |        |
| push_pop_cc | centos1  | eth2      | none | down   |
|             | centos2  | eth3      | none |        |
| swap_cc     | centos1  | eth2      | 300  | up     |
|             | centos2  | eth2      | 400  |        |
| vlan_cc     | centos1  | eth2      | 100  | up     |
|             | centos2  | eth2      | 100  |        |

# show vmhost control-plane

## Syntax

```
show vmhost control-plane
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.  
Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Display the status of the JCP, JDM, Layer 2 dataplane, Layer 3 dataplane, and LTE.

## Required Privilege Level

view

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[show vmhost control-plane on page 223](#)

## Sample Output

show vmhost control-plane

user@host> show vmhost control-plane

|                                  |         |        |
|----------------------------------|---------|--------|
| Vmhost Control Plane Information |         |        |
| -----                            |         |        |
| Name                             | State   | Status |
| -----                            |         |        |
| Junos Control Plane              | RUNNING | OK     |
| Juniper Device Manager           | RUNNING | OK     |
| Layer 2 Infrastructure           | RUNNING | OK     |
| Layer 3 Infrastructure           | RUNNING | OK     |
| LTE                              | RUNNING | OK     |

# show vmhost crash

## Syntax

```
show vmhost crash
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.

Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Display host OS crash information.

## Required Privilege Level

view

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[show vmhost crash on page 224](#)

## Sample Output

**show vmhost crash**

user@host> **show vmhost crash**

```
-rw-r--r-- 1 root root 306773 Mar 22 10:41
local-node.srxpfe.7439.1521715280.core.tgz
-rw-r--r-- 1 root root 307058 Mar 22 10:42
local-node.srxpfe.8184.1521715324.core.tgz
-rw-r--r-- 1 root root 306999 Mar 22 10:42
local-node.srxpfe.8918.1521715357.core.tgz
-rw-r--r-- 1 root root 315121 Apr 18 05:35
localhost.dummy_flowdapp.3037.1524029709.core.tgz
-rw-r--r-- 1 root root 315033 Apr 18 05:17
localhost.dummy_flowdapp.3432.1524028674.core.tgz
```

```
-rw-r--r-- 1 root root 315088 Apr 13 18:11  
localhost.dummy_flowdapp.3435.1523643106.core.tgz
```

# show vmhost forwarding-options analyzer

Syntax

```
show vmhost forwarding-options analyzer analyzer-name
```

Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.  
Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

Description

Displays information about the VNF analyzers that are configured for port mirroring on a Junos OS platform.

Options

***analyzer-name***—Displays the details of a specific analyzer on the device.

Required Privilege Level

view

RELATED DOCUMENTATION

| [vmhost](#)

List of Sample Output

[show vmhost forwarding-options analyzer on page 227](#)

Output Fields

[Table 20 on page 226](#) lists the output fields for the **show vmhost forwarding-options analyzer** command. Output fields are listed in the approximate order in which they appear.

Table 20: show vmhost forwarding-options analyzer Output Fields

| Field Name                   | Field Description  |
|------------------------------|--|
| Analyzer name                | Displays the name of the analyzer instance.                                    |
| Egress monitored interfaces  | Displays interfaces for which the traffic leaving the interfaces is mirrored.  |
| Output interface             | Specifies an interface to which mirrored packets are sent.                     |
| Ingress monitored interfaces | Displays interfaces for which the traffic entering the interfaces is mirrored. |

## Sample Output

**show vmhost forwarding-options analyzer**

user@host> **show vmhost forwarding-options analyzer**

```
Analyzer name           : mon1
Egress monitored interfaces : vnf-name1:eth2
Output interface        : analyzer1:eth2

Analyzer name           : mon2
Ingress monitored interfaces : vnf-name2:eth2
Output interface        : analyzer1:eth3
```

# show vmhost memory

## Syntax

```
show vmhost memory
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.

Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Display the memory information for the host OS.

## Required Privilege Level

view

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[show vmhost memory on page 228](#)

## Output Fields

## Sample Output

```
show vmhost memory
```

```
user@host> show vmhost memory
```

```
Memory Controller Information
-----

Id :MC0
correctable-error           :0
uncorrectable-error        :0
```

# show vmhost mode

## Syntax

```
show vmhost mode
```

## Release Information

Command introduced in Junos OS Release 19.1R1 for NFX150 and NFX250 (NG) devices.

## Description

Display the CPU and memory allocations for various components.

## Required Privilege Level

view

## RELATED DOCUMENTATION

[vmhost](#)

## List of Sample Output

[show vmhost mode \(Throuput mode\) on page 229](#)

[show vmhost mode \(Hybrid mode\) on page 230](#)

[show vmhost mode \(Compute mode\) on page 232](#)

## Sample Output

**show vmhost mode (Throuput mode)**

```
user@host> show vmhost mode
```

```
Mode:
-----
Current Mode: throughput

CPU Allocations:
Name                                Configured                                Used
-----
Junos Control Plane                 0                                           0
Juniper Device Manager              0                                           0
```



|                            |            |       |
|----------------------------|------------|-------|
| LTE                        | 0          | -     |
| NFV Backplane Control Path | 0          | 0     |
| NFV Backplane Data Path    | 1,2        | 1,2   |
| Layer 2 Control Path       | 0          | 0     |
| Layer 2 Data Path          | 3,4        | 3,4   |
| Layer 3 Control Path       | 0          | 0     |
| Layer 3 Data Path          | 5,6,7      | 5,6,7 |
| Memory Allocations:        |            |       |
| Name                       | Configured | Used  |
| -----                      |            |       |
| Junos Control Plane (mB)   | 2048       | 1548  |
| NFV Backplane 1G hugepages | 1          | 1     |
| NFV Backplane 2M hugepages | -          | 0     |
| Layer 2 1G hugepages       | 1          | 1     |
| Layer 2 2M hugepages       | -          | 0     |
| Layer 3 1G hugepages       | 1          | 1     |
| Layer 3 2M hugepages       | 651        | 650   |

## Sample Output

```
show vmhost mode (Hybrid mode)
user@host> show vmhost mode
```

|       |
|-------|
| Mode: |
| ----- |

Current Mode: hybrid

CPU Allocations:

| Name                       | Configured | Used |
|----------------------------|------------|------|
| Junos Control Plane        | 0          | 0    |
| Juniper Device Manager     | 0          | 0    |
| LTE                        | 0          | -    |
| NFV Backplane Control Path | 0          | 0    |
| NFV Backplane Data Path    | 1,2        | 1,2  |
| Layer 2 Control Path       | 0          | 0    |
| Layer 2 Data Path          | 3          | 3    |
| Layer 3 Control Path       | 0          | 0    |
| Layer 3 Data Path          | 4,5        | 4,5  |

Memory Allocations:

| Name                       | Configured | Used |
|----------------------------|------------|------|
| Junos Control Plane (mB)   | 2048       | 1548 |
| NFV Backplane 1G hugepages | 1          | 1    |
| NFV Backplane 2M hugepages | -          | 0    |
| Layer 2 1G hugepages       | 1          | 1    |
| Layer 2 2M hugepages       | -          | 0    |
| Layer 3 1G hugepages       | 1          | 1    |
| Layer 3 2M hugepages       | 651        | 650  |

## Sample Output

**show vmhost mode (Compute mode)**

user@host> **show vmhost mode**

```

Mode:
-----
Current Mode: compute

CPU Allocations:
Name                                     Configured                               Used
-----
Junos Control Plane                     0                                         0
Juniper Device Manager                  0                                         0
LTE                                     0                                         -
NFV Backplane Control Path              0                                         0
NFV Backplane Data Path                 1                                         1
Layer 2 Control Path                   0                                         0
Layer 2 Data Path                       2                                         2
Layer 3 Control Path                   0                                         0
Layer 3 Data Path                       3                                         3

Memory Allocations:
Name                                     Configured                               Used
-----
Junos Control Plane (mB                 2048                                     1548
NFV Backplane 1G hugepages              1                                         1
NFV Backplane 2M hugepages              -                                         0
Layer 2 1G hugepages                    1                                         1
Layer 2 2M hugepages                    -                                         0

```

|                      |     |     |
|----------------------|-----|-----|
| Layer 3 1G hugepages | 1   | 1   |
| Layer 3 2M hugepages | 651 | 650 |

| CPU                      | %usr | %nice | %sys  | %iowait | %irq | %soft | %steal | %guest | %gnice |
|--------------------------|------|-------|-------|---------|------|-------|--------|--------|--------|
| %idle                    |      |       |       |         |      |       |        |        |        |
| Load Avg : 4.04<br>90.90 | 0.00 |       | 4.74  | 0.01    | 0.00 | 0.01  | 0.00   | 0.30   | 0.00   |
| cpu0 : 8.26<br>73.23     | 0.00 |       | 15.91 | 0.06    | 0.00 | 0.06  | 0.00   | 2.47   | 0.00   |

|         |      |           |      |           |      |         |      |          |      |      |
|---------|------|-----------|------|-----------|------|---------|------|----------|------|------|
| cpu1    | :    | 24.73     | 0.00 | 22.95     | 0.00 | 0.00    | 0.00 | 0.00     | 0.00 | 0.00 |
| 52.32   |      |           |      |           |      |         |      |          |      |      |
| cpu2    | :    | 0.00      | 0.00 | 0.01      | 0.00 | 0.00    | 0.00 | 0.00     | 0.02 | 0.00 |
| 99.97   |      |           |      |           |      |         |      |          |      |      |
| cpu3    | :    | 0.00      | 0.00 | 0.00      | 0.00 | 0.00    | 0.00 | 0.00     | 0.00 | 0.00 |
| 100.00  |      |           |      |           |      |         |      |          |      |      |
| cpu4    | :    | 0.00      | 0.00 | 0.00      | 0.00 | 0.00    | 0.02 | 0.00     | 0.00 | 0.00 |
| 99.98   |      |           |      |           |      |         |      |          |      |      |
| cpu5    | :    | 0.00      | 0.00 | 0.00      | 0.00 | 0.00    | 0.00 | 0.00     | 0.00 | 0.00 |
| 100.00  |      |           |      |           |      |         |      |          |      |      |
| cpu6    | :    | 0.00      | 0.00 | 0.00      | 0.00 | 0.00    | 0.00 | 0.00     | 0.00 | 0.00 |
| 100.00  |      |           |      |           |      |         |      |          |      |      |
| cpu7    | :    | 0.00      | 0.00 | 0.00      | 0.00 | 0.00    | 0.00 | 0.00     | 0.00 | 0.00 |
| 100.00  |      |           |      |           |      |         |      |          |      |      |
|         |      |           |      |           |      |         |      |          |      |      |
| Device: | tps  | kB_read/s |      | kB_wrtn/s |      | kB_read |      | kB_wrtn  |      |      |
| -----   |      |           |      |           |      |         |      |          |      |      |
| sda     | 2.15 | 7.60      |      | 30.04     |      | 4057951 |      | 16046703 |      |      |

# show vmhost storage

## Syntax

```
show vmhost storage
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.  
Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Display the vmhost storage information.

## Required Privilege Level

view

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[show vmhost storage on page 236](#)

## Sample Output

**show vmhost storage**

user@host> **show vmhost storage**

|                            |                             |           |
|----------------------------|-----------------------------|-----------|
| Vmhost Storage Information |                             |           |
| -----                      |                             |           |
| Storage Name :sda          |                             |           |
| ID                         | Storage S.M.A.R.T attribute | Raw value |
| 1                          | Raw_Read_Error_Rate         | 0         |
| 5                          | Reallocated_Sector_Ct       | 0         |
| 9                          | Power_On_Hours              | 6562      |
| 12                         | Power_Cycle_Count           | 72        |

|     |                                   |            |
|-----|-----------------------------------|------------|
| 160 | Uncorrectable_Sector_Count        | 0          |
| 161 | Spare_Blocks                      | 555        |
| 163 | Number_of_Initial_Invalid_Blocks  | 31         |
| 164 | Total_Erase_Count                 | 72780      |
| 165 | Maximum_Erase_Count               | 56         |
| 166 | Minimum_Erase_Count               | 0          |
| 167 | Average_Erase_Count               | 35         |
| 168 | Maximum_Specified_Erase_Count     | 3000       |
| 169 | Power-On_UECC_Count               | 56         |
| 192 | Power-Off_Retract_Count           | 555        |
| 193 | Dynamic_Remaps                    | 0          |
| 194 | Temperature_Celsius               | 37         |
| 195 | Hardware_ECC_Recovered            | 646747     |
| 196 | Reallocated_Event_Count           | 0          |
| 198 | Offline_Uncorrectable             | 0          |
| 199 | UDMA_CRC_Error_Count              | 0          |
| 215 | TRIM_Count                        | 80433      |
| 235 | Total_Flash_LBAs_Written          | 103297788  |
| 237 | Total_Flash_LBAs_Written_Expanded | 0          |
| 241 | Total_LBAs_Written                | 4262373185 |
| 242 | Total_LBAs_Read                   | 2322062690 |
| 243 | Total_Host_LBAs_Written_Expanded  | 0          |
| 244 | Total_Host_LBAs_Read_Expanded     | 0          |
| 248 | SSD_Remaining_Life                | 99         |
| 249 | Spare_Blocks_Remaining_Life       | 100        |



# show vmhost uptime

## Syntax

```
show vmhost uptime
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.

Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Display the current time and information such as how long the host OS has been running, number of users, and average load.

## Required Privilege Level

view

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[show vmhost uptime on page 238](#)

## Sample Output

**show vmhost uptime**

user@host> **show vmhost uptime**

```
Vmhost Current time: 2018-04-09 09:15:28+00:00
Vmhost Uptime:
    09:15:28 up 6 days, 4:42, 0 users, load average: 0.38, 0.48, 0.45
```

# show vmhost version

## Syntax

```
show vmhost version
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 devices.

Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Display host version information including Linux host kernel version and host software version.

## Required Privilege Level

view

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[show vmhost connections \(NFX150\) on page 239](#)

[show vmhost connections \(NFX250 \(NG\)\) on page 240](#)

## Sample Output

### show vmhost connections (NFX150)

```
user@host> show vmhost version
```

```
Partition set      : primary
Software version   : 18.2-20180402_18.2T_x_tvp.0
                   Host kernel release  : 4.1.27-rt30-WR8.0.0.23_ovp
                   Host kernel version  : #1 SMP Sat Mar 24 02:04:51 PDT 2018
```

## Sample Output

**show vmhost connections (NFX250 (NG))**

user@host> **show vmhost version**

```
Partition set : primary
Software version : 18.4R1.6
Host kernel release : 4.1.27-rt30-WR8.0.0.25_ovp
Host kernel version : #1 SMP Mon Nov 19 20:24:06 PST 2018
```

# show vmhost vlans

## Syntax

```
show vmhost vlans
```

## Release Information

Command introduced in Junos OS Release 18.1R1 for NFX150 Network Services Platform.  
Command introduced in Junos OS Release 18.4R1 for NFX250 (NG) devices.

## Description

Display details about the vmhost VLANs.

## Options

- vlan-name**—Display information for a specified VLAN.
- brief | detail | extensive** —Display the specified level of output.
- instance**—Display information for a specified instance.
- interface**—Name of interface for which the table is displayed.
- logical-system**—Name of logical system.

## Required Privilege Level

view

## RELATED DOCUMENTATION

| [vmhost](#)

## List of Sample Output

[show vmhost vlans on page 242](#)

## Output Fields

[Table 21 on page 241](#) describes the output fields for the [show vmhost forwarding-options analyzershow vmhost vlans show vmhost vlans](#) command. Output fields are listed in the approximate order in which they appear.

Table 21: show vmhost vlans Output Fields

| Field Name | Field Description                        |
|------------|--|
| vlan-name  | Display information for a specified VLAN |

Table 21: show vmhost vlans Output Fields (*continued*)

| Field Name     | Field Description                            |
|----------------|--|
| brief          | Display brief output                         |
| detail         | Display detailed output                      |
| extensive      | Display extensive output                     |
| instance       | Display information for a specified instance |
| interface      | Name of interface for which to display table |
| logical-system | Name of logical system                       |

## Sample Output

### show vmhost vlans

```

root@host> show vmhost vlans

Routing instance      VLAN name      Tag      Interfaces
vmhost                test-1         56       centos1_eth2.0
-----
```