How to Configure the NFX250 (NextGen)

Modified: 2019-06-26

Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

How to Configure the NFX250 (NextGen)

The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

END USER LICENSE AGREEMENT

The Juniper Networks product that is the subject of this technical documentation consists of (or is intended for use with) Juniper Networks software. Use of such software is subject to the terms and conditions of the End User License Agreement ("EULA") posted at https://support.juniper.net/support/eula/. By downloading, installing or using such software, you agree to the terms and conditions of that EULA.

Table of Contents

List of Figures

List of Tables

About the Documentation

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.

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at https://www.juniper.net/books.

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.xsl; }
   ```

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 xiii 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 xiv defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the **configure** command: user@host> **configure**
`Fixed-width text like this`	Represents output that appears on the terminal screen.	`user@host>` **show chassis alarms** `No alarms currently active`
Italic text like this	• Introduces or emphasizes important new terms. • Identifies guide names. • Identifies RFC and Internet draft titles.	• A policy *term* is a named structure that defines match conditions and actions. • *Junos OS CLI User Guide* • RFC 1997, *BGP Communities Attribute*
Italic text like this	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# **set system domain-name** *domain-name*
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	• To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level. • The console port is labeled **CONSOLE**.
< > (angle brackets)	Encloses optional keywords or variables.	**stub <default-metric** *metric***>;**
| (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.	**broadcast | multicast** **(***string1* **|** *string2* **|** *string3***)**
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	**rsvp { # Required for dynamic MPLS only**
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	**community name members [** *community-ids* **]**

Indention and braces ({ })	Identifies a level in the configuration hierarchy.	[edit]
		routing-options {
		  static {
		  route default {
		  nexthop *address*;
		  retain;
		  }
		  }
		}

; (semicolon)	Identifies a leaf statement at a configuration hierarchy level.	

GUI Conventions

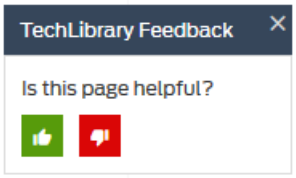
Table 2: Text and Syntax Conventions (continued)

Convention	Description	Examples
Bold text like this	Represents graphical user interface (GUI) items you click or select.	• In the Logical Interfaces box, select **All Interfaces**. • To cancel the configuration, click **Cancel**.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select **Protocols>Ospf**.

Documentation Feedback

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

- Online feedback system—Click TechLibrary Feedback, on the lower right of any page on the Juniper Networks TechLibrary site, and do one of the following:



  - Click the thumbs-up icon if the information on the page was helpful to you.
  - 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**. Include the document or topic name, URL or page number, and software version (if applicable).

Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active Juniper Care or Partner Support Services support contract, or are covered under warranty, and need post-sales technical support, you can access our tools and resources online or open a case with JTAC.

- 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.

Self-Help Online Tools and Resources

For quick and easy problem resolution, Juniper Networks has designed an online self-service portal called the Customer Support Center (CSC) that provides you with the following features:

- Find CSC offerings: https://www.juniper.net/customers/support/
- 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/.

CHAPTER 1

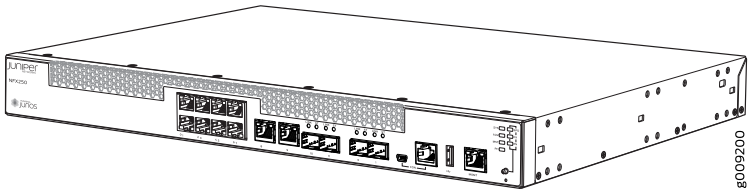
Overview

NFX250 NextGen Overview

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 17 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 Feature Guide for Security Devices)
- NAT (see NAT Feature Guide)
- ALG (see Application Layer Gateways Feature Guide)
- Application Security (see AppSecure Feature Guide)
- UTM features including Enhanced Web Filtering and Anti-Virus (see UTM Feature Guide)

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

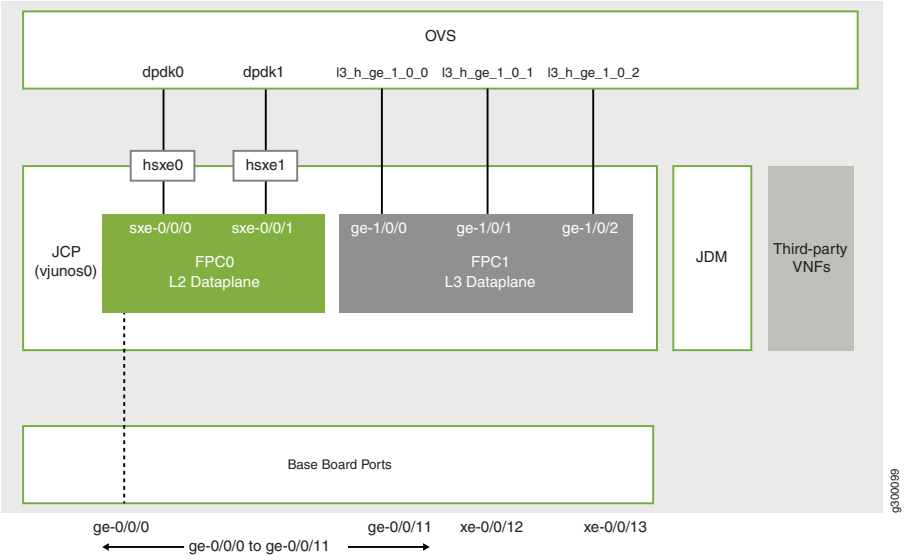
Junos OS Release 19.1R1 introduces a reoptimized architecture for NFX250 devices. This architecture enables you to use JCP as the single point of management to manage all the NFX250 components.

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

Software Architecture

Figure 2 on page 18 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 19 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 21 provides details of Junos OS software releases supported on the NFX Series devices.

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 jinstall-host-nfx-3-x86-64-<*release-number*>-secure-signed.tgz install-media-host-usb-nfx-3-x86-64-<*release-number*>-secure.img	NFX150 Software Download Page

Table 4: Supported Junos OS Releases on NFX Series Devices (continued)

NFX Series Platform	Supported Junos OS Release	Software Package	Software Downloads Page
NFX250	15.1X53-D45, 15.1X53-D47, 15.1X53-D470, and 15.1X53-D471	nfx-2 jinstall-host-nfx-2-flex-x86-64-<*release-number*>-secure-signed.tgz install-media-host-usb-nfx-2-flex-x86-64-<*release-number*>-secure.img	NFX250 Software Download Page
	17.2R1 through 19.1R1		
	19.1 R1 or later	nfx-3 jinstall-host-nfx-3-x86-64-<*release-number*>-secure-signed.tgz install-media-host-usb-nfx-3-x86-64-<*release-number*>-secure.img	NFX250 Software Download Page

NFX Product Compatibility

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 23.

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
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

CHAPTER 2

Initial Configuration

Initial Configuration on NFX250 NextGen Devices

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 ge-0/0/11	trust	server	192.168.2.1/24
0/12 to 0/13	xe-0/0/12 to 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 25.

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

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.

  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

Pre-staging 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. Pre-staging 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 pre-stage resources are copied and the configuration is applied on the device.

The pre-stage workflow proceeds as follows:

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

   To add the pre-stage 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 pre-staged, 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 25.
5. The device applies the pre-stage 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 pre-stage 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 pre-stage configuration and certificates, run:

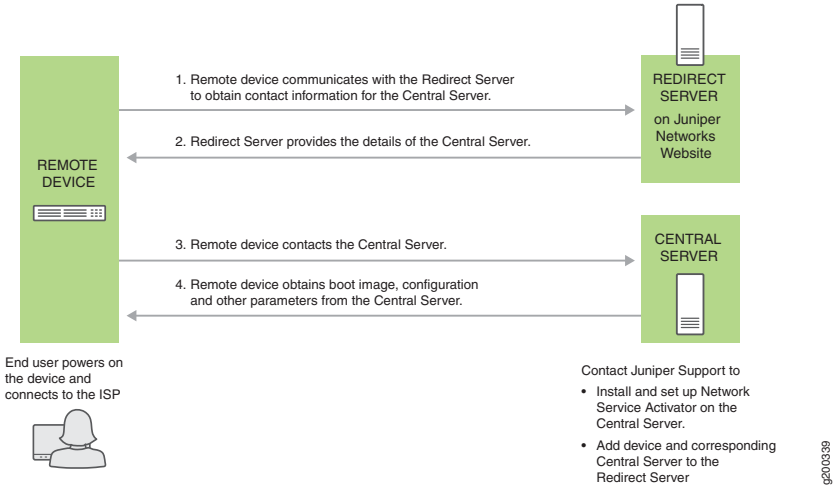
```
user@host>show system phone-home pre-stage configuration
user@host>show system phone-home pre-stage certificate
user@host>show system phone-home pre-stage
```

The pre-stage 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 3 on page 29 illustrates the workflow of the initial provisioning of NFX Series devices.

Figure 3: 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 3 on page 29 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.

CHAPTER 3

Configuring Interfaces

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

ADSL Interface Overview

Asymmetric digital subscriber line (ADSL) technology is part of the *x*DSL 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 32.

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:

- LLCSNAP 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

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 encap 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 hugeages:

```
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 encap
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

- VDSL Interface Overview on page 36
- VDSL2 Network Deployment Topology on page 36

VDSL Interface Overview

Very-high-bit-rate digital subscriber line (VDSL) technology is part of the *x*DSL 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 4 on page 37.

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 5 on page 37.

   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 4 on page 37 shows a typical VDSL2 network topology.

Figure 4: Typical VDSL2 End-to-End Connectivity and Topology Diagram

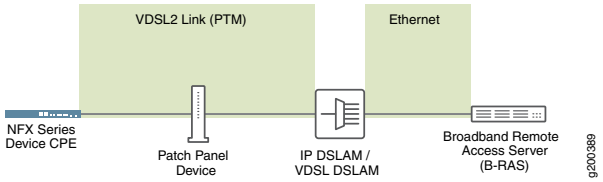
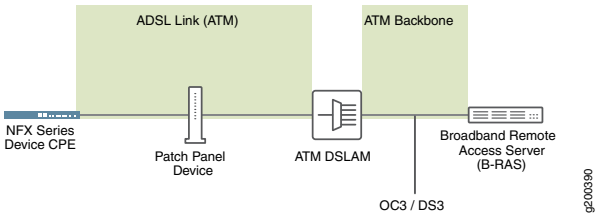


Figure 5 on page 37 shows a backward-compatible ADSL topology using ATM DSLAM.

Figure 5: 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 38. (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 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) 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 39 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

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                      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 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

CHAPTER 4

Configuring Security

IP Security on NFX Devices

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 44 lists the IPsec features supported on NFX150 devices.

Table 11: IPsec Features Supported on NFX150

Features	Reference
AutoVPN Spoke	Understanding Spoke Authentication in AutoVPN Deployments
Auto Discovery VPN (ADVPN) Partner NOTE: On NFX150 devices, you cannot configure ADVPN Suggester.	Understanding Auto Discovery VPN
Site-to-Site VPN and Dynamic Endpoints	Understanding IPsec VPNs with Dynamic Endpoints
Route-based VPN NOTE: NFX150 devices do not support policy-based VPNs.	Understanding Route-Based IPsec VPNs

Table 11: IPsec Features Supported on NFX150 (continued)

Features	Reference
NAT-T	Understanding NAT-T
Dead Peer Detection	Understanding VPN Monitoring

Configuring Security

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

- Configuring Interfaces on page 45
- Configuring Routing Options on page 46
- Configuring Security IKE on page 46
- Configuring Security IPsec on page 48
- Configuring Security Policies on page 50
- Configuring Security Zones on page 51

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

- Intrusion Detection and Prevention on NFX Devices on page 53
- Integrated User Firewall Support on NFX Devices on page 53

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 for NFX Devices*.
- 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*.
- 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

- Integrated User Firewall Support on NFX Devices on page 53

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 Feature Guide*.

Related Documentation

- UTM on NFX Devices on page 51

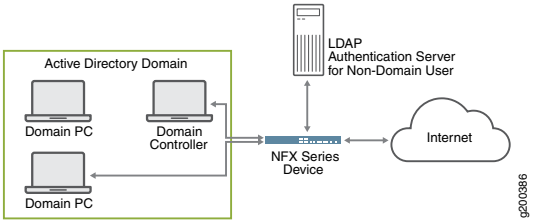
Integrated User Firewall Support on NFX Devices

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 6 on page 54 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 6: 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 *Integrated User Firewall Feature Guide for NFX Devices*.

Related Documentation

- UTM on NFX Devices on page 51

CHAPTER 5

Configuring Virtual Network Functions

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 55.

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

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.

To configure a VNF, log in to the JCP and perform the following tasks:

Load a VNF Image

To load a VNF image on the device from a remote location, use the **file-copy** command. Alternatively, you can load a VNF image by using the NETCONF command, **file-put**.

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

Prepare the Bootstrap Configuration

You can bootstrap a VNF using an attached config drive that contains a bootstrap-config 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 59.

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 58 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
```

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 59 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 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 nfv-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 hd*x*, sd*x*, or vd*x*—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 vnf*n*—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

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 can be configured in the system is limited to 20.

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.

CHAPTER 6

Configuring Service Chaining

Example: Configuring Service Chaining Using VLANs on NFX250 NextGen Devices

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.

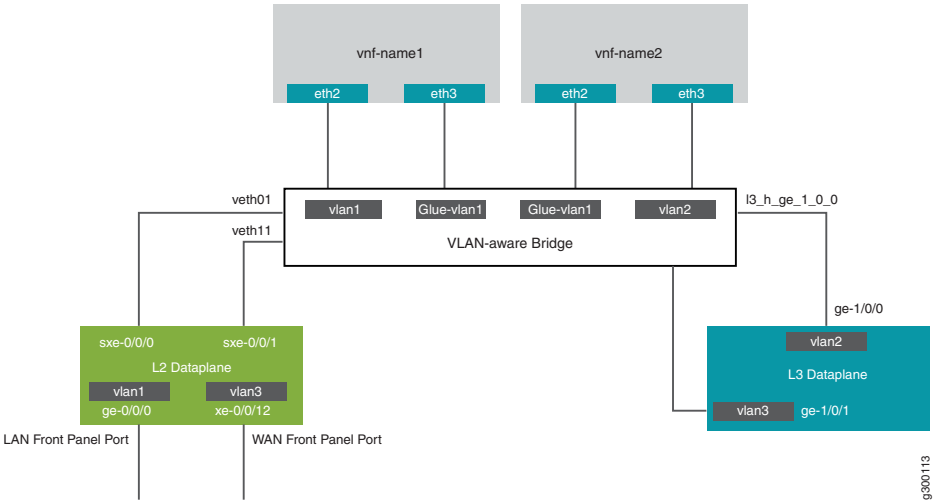
Overview

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 7 on page 72.

Figure 7: 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

- Configuring the JCP Interfaces on page 73
- Configuring the VNF Interfaces and Creating the Service Chain on page 76

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 7 on page 72.

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

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

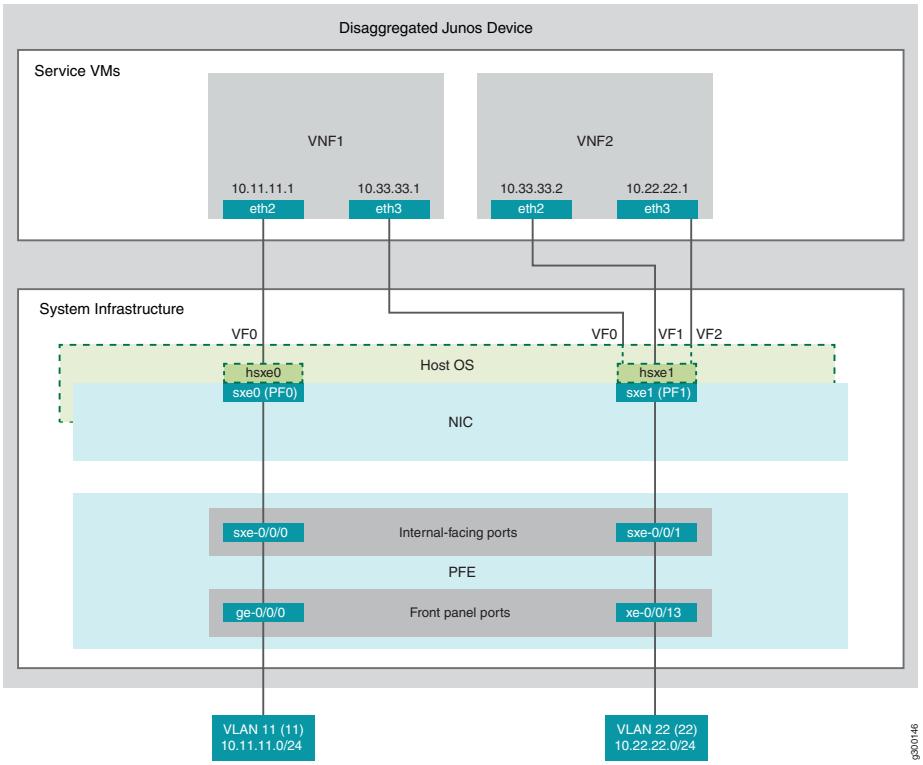
and configured as interfaces hsxe0 and hsxe1. The VNFs use two interfaces, eth2 and eth3. These elements are generally separated into a LAN side and a WAN side.

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 8 on page 77 shows the topology for this example.

Figure 8: 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

This example describes:

- Configuring the Packet Forwarding Engine Interfaces on page 78
- Configuring the VNF Interfaces and Creating the Service Chain on page 80

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

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.

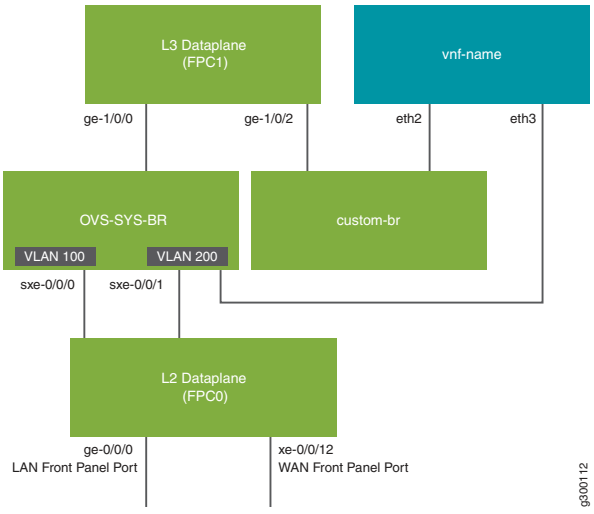
Overview

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 9 on page 81.

Figure 9: Service Chaining Using a Custom Bridge



Configuration

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

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*
                                                           sxe-0/0/0.0*
default-switch          vlan200               200
                                                           sxe-0/0/1.0*
                                                           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                      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 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 nfv-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

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.**

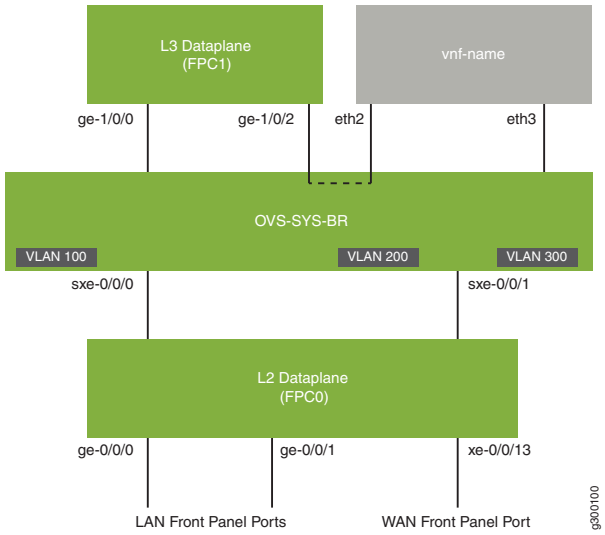
The cross-connect feature supports the following:

- 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 10 on page 89.

Figure 10: Configuring Cross-Connect



Configuration

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

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
                                                           ge-0/0/0.0*
                                                           ge-0/0/1.0*
                                                           sxe-0/0/0.0*
default-switch          vlan100               100
                                                           sxe-0/0/1.0*
                                                           xe-0/0/12.0*
default-switch          vlan200               200
                                                           sxe-0/0/1.0*
                                                           xe-0/0/13.0*
default-switch          vlan300               300
```

- 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                      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 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                      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-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: Sendbcast-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

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.

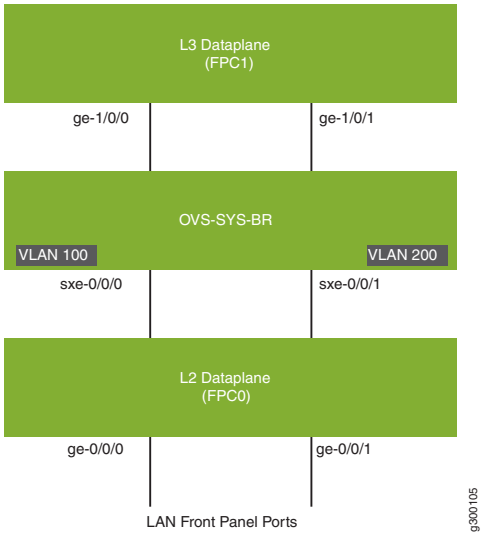
Overview

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 11 on page 96.

Figure 11: Service Chaining for LAN Routing



Configuration

- Configuring the Layer 2 Datapath on page 96
- Configuring the Layer 3 Datapath on page 97

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

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.

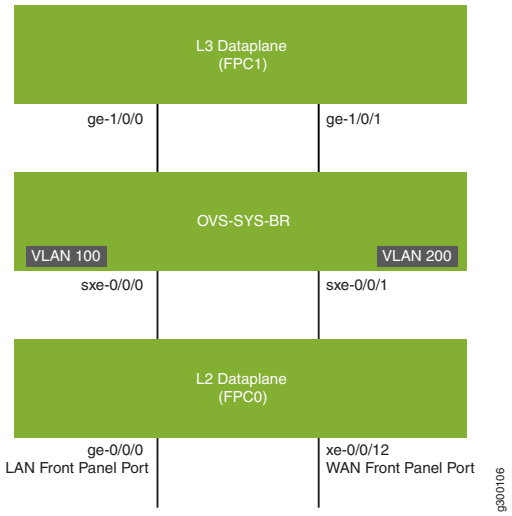
Overview

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 12 on page 98.

Figure 12: Service Chaining for LAN to WAN Routing



Configuration

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

- Verifying the Status of the Interfaces on page 99

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
```

CHAPTER 7

Troubleshooting

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

- Monitoring Interface Status and Traffic on NFX Series Devices on page 104

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
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
```

CHAPTER 8

Operational Commands

- request vmhost cleanup
- request vmhost file-copy
- request vmhost halt
- request vmhost mode
- request vmhost power-off
- request vmhost reboot
- request vmhost software add
- show system visibility cpu
- show system visibility host
- show system visibility memory
- show system visibility network
- show system visibility vnf
- show vmhost connections
- show vmhost control-plane
- show vmhost crash
- show vmhost forwarding-options analyzer
- show vmhost memory
- show vmhost mode
- show vmhost status
- show vmhost storage
- show vmhost uptime
- show vmhost version
- show vmhost vlans

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 109

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 110

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.

Required Privilege Level maintenance

Related Documentation
- *vmhost*

List of Sample Output request vmhost mode compute on page 111

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 112

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 113

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 114
request vmhost software add (NFX250 (NG)) on page 115

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

- show system visibility host on page 120
- show system visibility memory on page 128
- show system visibility network on page 130
- show system visibility vnf on page 135

List of Sample Output

show system visibility cpu (NFX150) on page 118
show system visibility cpu (NFX250 (NG)) on page 119

Output Fields Table 14 on page 117 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
Fields for CPU Statistics	
CPU ID	The CPU ID
User Time	The amount of user time, in seconds.
System Time	The amount of system time, in seconds.
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.

Table 14: show system visibility cpu Output Fields (continued)

Field Name	Field Description
Fields for CPU Usages	
CPU ID	The CPU ID
CPU Usage	The percentage of CPU used.
Fields for CPU Pinning Information	
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

- show system visibility cpu on page 117
- show system visibility memory on page 128
- show system visibility network on page 130
- show system visibility vnf on page 135

List of Sample Output
show system visibility host (NFX150) on page 122
show system visibility host (NFX250 (NG)) on page 125

Output Fields Table 15 on page 120 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
Field for Host Uptime	
Uptime	The time the host has been operational.
Fields for Host Tasks	
Total	The total number of tasks.
Running	The total number of tasks running.
Sleeping	The total number of tasks in sleeping state.
Stopped	The total number of tasks that are stopped.
Zombie	The total number of zombie processes.
Fields for Host CPU Information	

Table 15: show system visibility host Output Fields (continued)

Field Name	Field Description
User Time	The amount of user time, in seconds.
System Time	The amount of system time, in seconds.
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.
Fields for Host Disk Partitions	
Device	The device path.
Mount Point	The mount point of the device path.
File System	The file system type.
Options	Options available for the device path.
Fields for Host Disk Usage Information	
Total	The total amount of disk usage space, in mebibytes (MiB).
Used	The amount of used disk usage space, in mebibytes (MiB).
Free	The amount of free disk usage space, in mebibytes (MiB).
Percentage Used	The percentage of used disk space.
Fields for Host Disk I/O Information	
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.
Fields for List of Host Interfaces	
Interfaces	The name of the interface.

Table 15: show system visibility host Output Fields (continued)

Field Name	Field Description
State	The state of the Host Interface.
MAC	The MAC address of the interface.
Fields for List of Host Port Statistics	
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.
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
l3_h_ge_1_0_0      active    00:00:5e:00:53:6d
l3_h_ltectrl       active    00:00:5e:00:53:f1
l3_h_ltedata       active    00:00:5e:00:53:91
lo                 inactive  00:00:00:00:00:00
lte_crtl0          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
--------- ------------ ------------ ------------ ------------ --------- ----------
 -------- ---------
l3_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_crtl0 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
--------- ------------ ------------ ------------ ------------ --------- ----------
 -------- ---------
l3_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 on page 117
- show system visibility host on page 120
- show system visibility network on page 130
- show system visibility vnf on page 135

List of Sample Output

show system visibility memory (NFX150) on page 129
show system visibility memory (NFX250 (NG)) on page 129

Output Fields Table 16 on page 128 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).
Free	The total amount of free virtual memory, in kibibytes (KiBs).
Percent Used	The percentage of buffer virtual memory used.
Fields for Memory Information—Swap Memory	
Total	The total amount of available swap memory, in kibibytes (KiBs).
Used	The total amount of used swap memory, in kibibytes (KiBs).
Free	The total amount of free swap memory, in kibibytes (KiBs).

Table 16: show system visibility memory Output Fields (continued)

Field Name	Field Description
Percent Used	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                            other process                     1
       400
ovs-vswitchd                      other process                     2
       0
```

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

- show system visibility cpu on page 117
- show system visibility host on page 120
- show system visibility memory on page 128
- show system visibility vnf on page 135

List of Sample Output

show system visibility network (NFX150) on page 131
show system visibility network (NFX250 (NG)) on page 133

Output Fields

Table 17 on page 130 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
Fields for List of VNF MAC Addresses	
VNF	The name of the VNF.
MAC	The MAC address of the VNF.
Fields for List of VNF Internal IP Addresses	
VNF	The name of the VNF.
IP	The IP address of the VNF.
Fields for List of VNF Virtual Functions	
VNF	The name of the VNF.
PF	The names of the Physical Functions available.

Table 17: show system visibility network Output Fields (continued)

Field Name	Field Description
VF	The names of the Virtual Functions available for each Physical Function.
Fields for List of Free Virtual Functions	
PF	The names of the Physical Functions available.
VF	The names of the Virtual Functions available for each Physical Function.
Fields for List of VNF Interfaces	
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
---------------------------------------- --------- ------------
```

```
l3_ge_1_0_4_vfdef0                          heth-0-1  0000:04:10:0
l2_ge_0_0_0_vfdef0                          heth-0-0  0000:04:10:1
l2_ge_0_0_0_vfdef1                          heth-0-0  0000:04:10:5
l2_ge_0_0_0_vfdef2                          heth-0-0  0000:04:11:1
l2_ge_0_0_0_vfdef3                          heth-0-0  0000:04:11:5
l3_ge_1_0_2_vfdef0                          heth-0-5  0000:07:10:0
l2_ge_0_0_2_vfdef0                          heth-0-2  0000:04:10:3
l2_ge_0_0_2_vfdef1                          heth-0-2  0000:04:10:7
l2_ge_0_0_2_vfdef2                          heth-0-2  0000:04:11:3
l2_ge_0_0_2_vfdef3                          heth-0-2  0000:04:11:7
l3_ge_1_0_1_vfdef0                          heth-0-4  0000:07:10:1
l2_ge_0_0_3_vfdef0                          heth-0-3  0000:04:10:2
l2_ge_0_0_3_vfdef1                          heth-0-3  0000:04:10:6
l2_ge_0_0_3_vfdef2                          heth-0-3  0000:04:11:2
l2_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             Interface Type   Source             Model      MAC
    VLAN-ID
--------------  ---------------  -----------------  ---------- ---------------------
 --------
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
```

```
l3_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
- show system visibility cpu on page 117
- show system visibility host on page 120
- show system visibility memory on page 128
- show system visibility network on page 130

List of Sample Output show system visibility vnf on page 138

Output Fields Table 18 on page 135 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
Fields for List of VNFs	
ID	ID of the VNF.
Name	Name of the VNF.
State	State of the VNF.
Fields for VNF Memory Usage	
Name	Name of the VNF.
Maximum Memory	The maximum amount of memory, in kibibytes (KiBs).

Table 18: show system visibility vnf Output Fields (continued)

Field Name	Field Description
Used Memory	The total amount of used memory, in kibibytes (KiBs).
Used 1G Hugepages	The total number of 1G hugepages used.
Used 2M Hugepages	The total number of 2M hugepages used.
Fields for VNF CPU Stats	
Name	Name of the VNF.
CPU Time	The total CPU time, in seconds.
System Time	The amount of system CPU time, in seconds.
User Time	The amount of user CPU time, in seconds.
Fields for List of VNF MAC Addresses	
VNF	Names of the VNFs.
MAC	MAC addresses of the VNFs.
Fields for List of VNF Internal IP Addresses	
VNF	Names of the VNFs.
IP	Internal IP addresses of the VNFs.
Fields for List of Virtual Functions per VNF	
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.
Fields for the VNF Interfaces	
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.

Table 18: show system visibility vnf Output Fields (continued)

Field Name	Field Description
Fields for List of VNF Disk Information	
VNF	The name of the VNF.
Disk	The name of the disk.
File	The path to the disk.
Fields for List of VNF Disk Usage	
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.
Bytes Written	The number of bytes written on the disk.
Fields for List of VNF Port Statistics	
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
---------------------------------------- --------- ------------
l2_ge_0_0_0_vfdef0                       heth-0-0  0000:02:10:1
l2_ge_0_0_0_vfdef1                       heth-0-0  0000:02:10:5
l2_ge_0_0_0_vfdef2                       heth-0-0  0000:02:11:1
l2_ge_0_0_0_vfdef3                       heth-0-0  0000:02:11:5
l2_ge_0_0_2_vfdef0                       heth-0-2  0000:02:10:3
l2_ge_0_0_2_vfdef1                       heth-0-2  0000:02:10:7
l2_ge_0_0_2_vfdef2                       heth-0-2  0000:02:11:3
l2_ge_0_0_2_vfdef3                       heth-0-2  0000:02:11:7
l3_ge_1_0_2_vfdef0                       heth-0-5  0000:05:10:0
l2_ge_0_0_1_vfdef0                       heth-0-1  0000:02:10:0
l2_ge_0_0_1_vfdef1                       heth-0-1  0000:02:10:4
l2_ge_0_0_1_vfdef2                       heth-0-1  0000:02:11:0
l2_ge_0_0_1_vfdef3                       heth-0-1  0000:02:11:4
l2_ge_0_0_3_vfdef0                       heth-0-4  0000:05:10:1
l2_ge_0_0_3_vfdef1                       heth-0-4  0000:05:10:3
l2_ge_0_0_3_vfdef2                       heth-0-4  0000:05:10:5
```

```
l2_ge_0_0_3_vfdef3                          heth-0-4  0000:05:10:7
l3_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
          7            0          0
centos               centos_vnet5 21729     258          0          395       0
           0            0          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 140

Output Fields Table 19 on page 140 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.
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 142

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 143

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 144

Output Fields Table 20 on page 144 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 146

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 147
show vmhost mode (Hybrid mode) on page 148
show vmhost mode (Compute mode) on page 149

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
```

show vmhost status

Syntax show vmhost status

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 virtualization status and status of all the CPUs.

Required Privilege Level view

List of Sample Output show vmhost status on page 150

Sample Output

show vmhost status

```
user@host> show vmhost status
Virtualization status :
------------------------------
kvm_status      : ok
libvirt_status  : ok
qemu_status     : ok

CPU Status [Since Boot Time]:

--------------------------------------------------------------------------------

CPU        %usr   %nice    %sys   %iowait  %irq   %soft  %steal  %guest  %gnice
 %idle

Load Avg  : 4.04   0.00     4.74   0.01     0.00   0.01   0.00    0.30    0.00
  90.90
cpu0      : 8.26   0.00     15.91  0.06     0.00   0.06   0.00    2.47    0.00
  73.23
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 152

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 154

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 155
show vmhost connections (NFX250 (NG)) on page 155

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 157

Output Fields Table 21 on page 156 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
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

----
```