How to Configure the NFX150

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YEAR 2000 NOTICE

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Using the Examples in This Manual

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

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

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

Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

Merging a Snippet

To merge a snippet, follow these steps:

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

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

   ```
   commit {
     file ex-script-snippet.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**.

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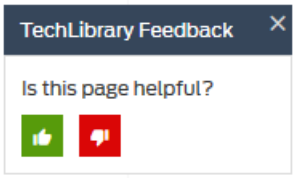
- Online feedback system—Click TechLibrary Feedback, on the lower right of any page on the Juniper Networks TechLibrary site, and do one of the following:



  - Click the thumbs-up icon if the information on the page was helpful to you.
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- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at https://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf.
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To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: https://entitlementsearch.juniper.net/entitlementsearch/

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- 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

NFX150 System Overview

Overview

The Juniper Networks NFX150 Network Services Platform is a secure, automated, software-driven customer premises equipment (CPE) platform that delivers virtualized network and security services on demand. NFX150 is part of the Juniper Cloud CPE solution, which leverages Network Functions Virtualization (NFV). It enables service providers to deploy and chain multiple, secure, high-performance virtualized network functions (VNFs) on a single device.

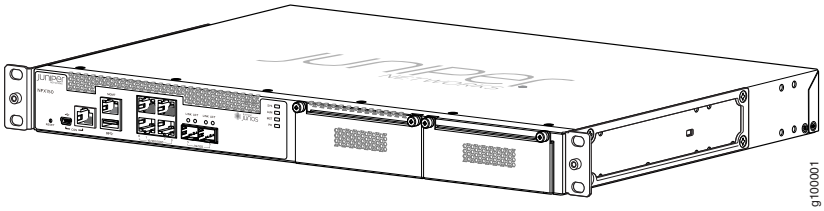
The NFX150 architecture integrates routing, switching, and security functions on a single platform that optimizes the usage of system resources. The architecture enables unified management of all the components through a single CLI. Key components in the NFX150 software include the Junos Control Plane (JCP), Juniper Device Manager (JDM), Layer 2 dataplane, Layer 3 dataplane, and Virtual Network Functions (VNFs).

The NFX150 is suited for small to medium-sized enterprises. With key security features and NFV, the NFX150 can be used in secure SD-WAN and secure router deployments.

The NFX150 portfolio consists of a compact desktop model and a rack-mount model. Both the models are available with or without LTE support. Figure 1 on page 18 shows the compact model without LTE support and Figure 2 on page 18 shows the rack-mount model.

Figure 1: NFX150 Compact Model (Without LTE Support)

Figure 2: NFX150 Rack-Mount Model



For details on the various models, see "NFX150 Models" on page 18.

NFX150 Models

The NFX150 is available in seven models. Table 3 on page 18 lists the NFX150-C models and Table 4 on page 19 lists the NFX150-S1 models.

Table 3: NFX150-C (Compact Models)

	NFX150-C-S1	NFX150-C-S1-AE	NFX150-C-S1-AA	NFX150-C-S1E-AE	NFX150-C-S1E-AA
CPU	2.2-GHz 4-core Intel CPU	2.2-GHz 4-core Intel CPU	2.2-GHz 4-core Intel CPU	2.2-GHz 4-core Intel CPU	2.2-GHz 4-core Intel CPU
RAM	8 GB	8 GB	8 GB	16 GB	16 GB
Storage	100 GB SSD	100 GB SSD	100 GB SSD	100 GB SSD	100 GB SSD
Form Factor	Desktop	Desktop	Desktop	Desktop	Desktop

Table 3: NFX150-C (Compact Models) (continued)

	NFX150-C-S1	NFX150-C-S1-AE	NFX150-C-S1-AA	NFX150-C-S1E-AE	NFX150-C-S1E-AA
Ports	Four 10/100/1000BASE-T RJ-45 ports which can be used as either access ports or uplinks	Four 10/100/1000BASE-T RJ-45 ports which can be used as either access ports or uplinks	Four 10/100/1000BASE-T RJ-45 ports which can be used as either access ports or uplinks	Four 10/100/1000BASE-T RJ-45 ports which can be used as either access ports or uplinks	Four 10/100/1000BASE-T RJ-45 ports which can be used as either access ports or uplinks
	Two 1-Gigabit Ethernet /10-Gigabit Ethernet SFP+ ports	Two 1-Gigabit Ethernet /10-Gigabit Ethernet SFP+ ports	Two 1-Gigabit Ethernet /10-Gigabit Ethernet SFP+ ports	Two 1-Gigabit Ethernet /10-Gigabit Ethernet SFP+ ports	Two 1-Gigabit Ethernet /10-Gigabit Ethernet SFP+ 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	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)	Console ports (RJ-45 and mini-USB)	Console ports (RJ-45 and mini-USB)
	One USB 3.0 port	One USB 3.0 port	One USB 3.0 port	One USB 3.0 port	One USB 3.0 port
Expansion module support	No	No	No	No	No
LTE support	No	Yes (integrated LTE modem for Europe and North America)	Yes (integrated LTE modem for Asia, Australia, and New Zealand)	Yes (integrated LTE modem for Europe and North America)	Yes (integrated LTE modem for Asia, Australia, and New Zealand)

Table 4: NFX150-S1 Models

	NFX150-S1	NFX150-S1E
CPU	2.2 GHz 8-core Intel CPU	2.2 GHz 8-core Intel CPU
RAM	16 GB	32 GB
Storage	200 GB SSD	200 GB SSD
Form Factor	1 RU	1 RU

Table 4: NFX150-S1 Models (continued)

	NFX150-S1	NFX150-S1E
Ports	Four 10/100/ 1000BASE-T RJ-45 ports which can be used as either access ports or uplinks	Four 10/100/ 1000BASE-T RJ-45 ports which can be used as either access ports or uplinks
	Two 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ ports	Two 1-Gigabit Ethernet/10-Gigabit Ethernet SFP+ ports
	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)
	One USB 3.0 port	One USB 3.0 port
LTE support	Yes (LTE expansion module)	Yes (LTE expansion module)
Expansion module support	Yes	Yes
Supported expansion modules NOTE: You can install only one expansion module on the NFX150-S1 devices. The expansion module must be installed in the first slot, which is next to the chassis LEDs.	• NFX-EM-6T2SFP— Expansion module with six 1-Gigabit Ethernet RJ-45 ports and two 1-Gigabit Ethernet SFP ports • NFX-LTE-AE—Expansion module with a LTE modem supporting the frequency bands in Europe and North America. • NFX-LTE-AA—Expansion module with a LTE modem supporting the frequency bands in Asia, Australia, and New Zealand.	• NFX-EM-6T2SFP— Expansion module with six 1-Gigabit Ethernet RJ-45 ports and two 1-Gigabit Ethernet SFP ports • NFX-LTE-AE—Expansion module with a LTE modem supporting the frequency bands in Europe and North America. • NFX-LTE-AA—Expansion module with a LTE modem supporting the frequency bands in Asia, Australia, and New Zealand.

For more information on the NFX150 models and the expansion modules, see the NFX150 Hardware Guide.

Benefits and Uses of NFX150

The NFX150 Network Services Platform provides these benefits:

- Highly scalable, supporting multiple Juniper 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.
- Supports a variety of flexible deployments. A distributed services deployment model ensures high availability, performance, and compliance. The NFX150 provides an open framework that supports industry standards, protocols, and seamless API integration.
- In addition to Ethernet connections, Wireless WAN support through the LTE module provides more flexibility in deployments.
- Supports advanced security features such as IPsec connectivity, applications detection, and filtering for malicious traffic.

- The 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.
- Support of Open vSwitch (OVS) integrated with Data Plane Development Kit (DPDK) on NFX150 device offers better network packet throughput and lower latencies.

Related Documentation

- NFX150 Feature Overview on page 21

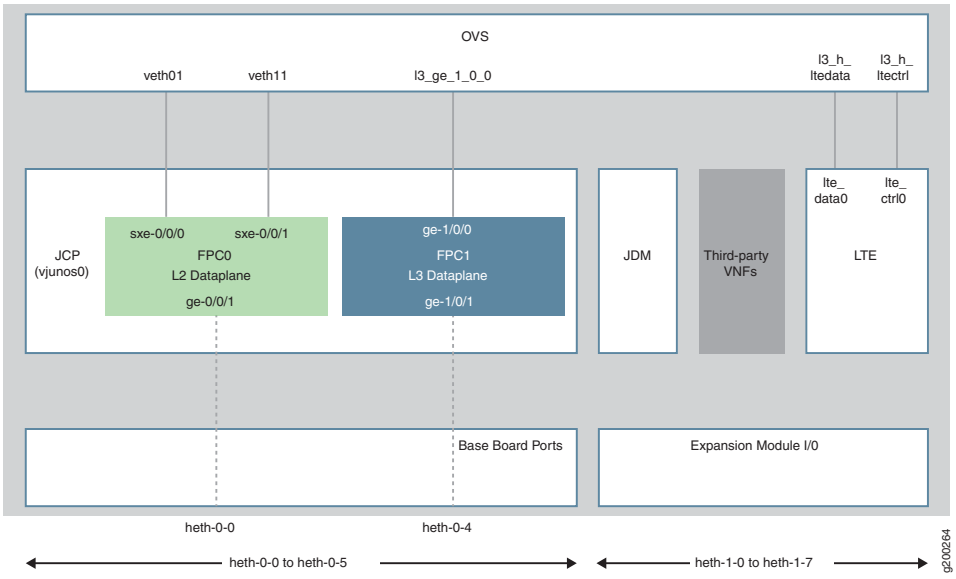
NFX150 Feature Overview

Software Architecture

The software architecture for the NFX150 is designed to provide a unified control plane that functions as a single management point.

Figure 3 on page 21 illustrates the architecture of the NFX150.

Figure 3: NFX150 Architecture



Key components of the system software include:

- VNF—A VNF is a consolidated offering that contains all the components required for supporting a fully virtualized networking environment. You can configure and use third-party VNFs in service chains.
- Junos Control Plane (JCP)—The JCP is the Junos VM running on the host OS, Wind River Linux. The JCP functions as the single point of management for all the components. The JCP controls the Layer 2 dataplane, which provide the Layer 2 services and the Layer 3 dataplane, which provides the Layer 3 to Layer 7 services.

  In addition to chassis management, JCP enables:

  - Configuration of advanced security features.
  - Management of guest virtualized network functions (VNFs) during their life cycle.
  - Installation of third-party VNFs.
  - Creation of VNF service chains.
  - Management of guest VNF images (their binary files).
  - Management of the system inventory and resource usage.
  - Management of the LTE interface.
- Juniper Device Manager (JDM)—An application container that manages VNFs and provides infrastructure services. The JDM functions in the background and users cannot access JDM directly.
- L2 Dataplane—The Layer 2 dataplane that manages the Layer 2 traffic. The Layer 2 dataplane forwards the LAN traffic to the NFV backplane, Open vSwitch (OVS). The Layer 2 dataplane is mapped to the virtual FPC0 on the JCP. By default, all the 1-Gigabit Ethernet physical ports are mapped to the virtual interfaces on the Layer 2 dataplane.
- L3 Dataplane—The Layer 3 dataplane that provides datapath functions for the Layer 3 to Layer 7 services. The Layer 3 dataplane is mapped to the virtual FPC1 on the JCP. By default, the two SFP+ ports on the NFX150 chassis are mapped to the virtual interfaces on the Layer 3 dataplane.
- Linux—The host OS, WindRiver Linux. In Junos OS Release 18.1R1, the WindRiver Linux version is 8.
- Open vSwitch (OVS) bridge—The OVS bridge is a VLAN-aware system bridge, which acts as the NFV backplane to which the VNFs and FPCs connect. Additionally, you can create custom OVS bridges to isolate connectivity between different VNFs.
- LTE—A containerized driver that provides 4G LTE connectivity management. The LTE container is bound to the FPC1 for management.

Interfaces

The interfaces on the NFX150 devices comprise of physical interfaces, virtual interfaces, and the LTE interface.

Physical Interfaces

The physical interfaces represent the physical ports on the NFX150 chassis and expansion module. The physical interfaces comprise of network and management ports:

- Network ports—Four 1-Gigabit Ethernet ports and two 10-Gigabit Ethernet SFP+ ports function as network ports on the NFX150 chassis. The expansion modules consists of six 1-Gigabit Ethernet ports and two 1-Gigabit Ethernet SFP ports.

  The network ports follow the naming convention **heth-*slot number-port number***, where:

  - heth denotes host Ethernet
  - *slot number* is 0 for the chassis ports and 1 for the expansion module ports. The ports on the chassis are named as heth-0-x and the ports on the expansion module are named heth-1-x.
  - *port number* is the number of the port on the chassis or expansion module

  Each physical port has four virtual functions (VFs) enabled by default.

  NOTE: **You cannot map a VF from a port which is mapped to the Layer 2 dataplane.**

- Management port—The NFX150 device has a dedicated management port labeled **MGMT** (fxp0), which functions as the out-of-band management interface. The fxp0 interface is assigned an IP address in the 192.168.1.1/24 network.

Virtual Interfaces

The virtual FPCs running within the JCP, contain the virtual interfaces. The virtual interfaces on the NFX150 devices are categorized as follows:

- Virtual Layer 2 interfaces (FPC0)—Denoted as ge-0/0/x, where the value of x ranges from:
  - 0 to 3 for NFX150 devices without an expansion module
  - 0 to 11 for NFX150 devices with an expansion module

  These interfaces are used to configure the following Ethernet switching features:
  - Layer 2 switching of traffic, including support for both trunk and access ports
  - Link Layer Discovery Protocol (LLDP)
  - IGMP snooping
  - Port Security features (MAC limiting, Persistent MAC learning)
  - MVRP
  - Ethernet OAM, CFM, and LFM

  All the 1-Gigabit Ethernet physical ports (heth ports) are mapped to FPC0, by default.

- Virtual Layer 3 interfaces (FPC1)—Denoted as ge-1/0/x, where value of x ranges from 0 to 9. These interfaces are used to configure Layer 3 features such as routing protocols and QoS.

  In an NFX150 device, you can configure any of the ge-1/0/x interfaces as in-band management interfaces. In in-band management, you configure a network interface as a management interface and connect it to the management device. You can configure any number of interfaces for in-band management by assigning an IPv4 or IPv6 address to each of the ports, and an in-band management VLAN.

  NOTE: **The NFX150 devices do not support integrated routing and bridging (IRB) interfaces. The IRB functionality is provided by ge-1/0/0, which is always mapped to the service chaining backplane (OVS). Note that this mapping cannot be changed.**

- Virtual SXE Interfaces—Two static interfaces, sxe-0/0/0 and sxe-0/0/1, connect the FPC0 (Layer 2 dataplane) to the OVS backplane.

LTE Interface

The NFX150 device models with LTE support can be configured for wireless WAN connectivity over 3G or 4G networks. The LTE physical interface uses the name cl-1/1/0. The dialer interface, dl0, is a logical interface, which is used to trigger calls.

Interface Mapping

Table 5 on page 25 summarizes the interfaces on the NFX150.

Table 5: Interfaces on the NFX150

Interface Name	Description
heth-0-0 to heth-0-5	Physical ports on the front panel of the NFX150 device, which can be mapped to Layer 2 or Layer 3 interfaces, or VNFs. Ports heth-0-0 to heth-0-3 are 10 Mbps/100 Mbps/1 Gbps tri-speed copper ports. Ports heth-0-4 and heth-0-5 are 10 Gbps SFP+ ports **For Junos OS Releases 18.1, 18.2 R1, and 18.3 R1:** • Ports heth-0-0 to heth-0-3 are mapped to the LAN ports ge-0/0/0 to ge-0/0/3, respectively. • Ports heth-0-4 and heth-0-5 are mapped to the WAN ports ge-1/0/1 and ge-1/0/2, respectively. **For Junos OS Release 18.2 R2** • Ports heth-0-0, heth-0-1, and heth-0-2 are mapped to the LAN ports ge-0/0/0 to ge-0/0/2, respectively. • Port heth-0-4 is mapped to the LAN port ge-0/0/3. Ports heth-0-3 and heth-0-5 are mapped to the WAN ports ge-1/0/1 and ge-1/0/2, respectively.
heth-1-0 to heth-1-7	Physical ports on the expansion module of the NFX150-S1 device. These ports are mapped to the ge-0/0/n ports by default. Ports heth-1-0 to heth-1-5 are 10 Mbps/100 Mbps/1 Gbps tri-speed copper ports mapped to the LAN ports ge-0/0/4 to ge-0/0/9, respectively. Ports heth-1-6 and heth-1-7 are 1 Gbps SFP ports mapped to the LAN ports ge-0/0/10 and ge-0/0/11 respectively.
ge-0/0/x	Logical Layer 2 interfaces, which can be used for LAN connectivity. The values of x ranges from: • 0 to 3 for NFX150 devices without an expansion module • 0 to 11 for NFX150 devices with an expansion module
ge-1/0/x	A set of up to 10 logical Layer 3 interfaces. Each of these interfaces can have 4k sub-interfaces. The value of x ranges from 0 to 9.
cl-1/1/0	The LTE cellular interface, which carries the physical layer attributes.
dl0	The LTE dialer interface, which carries Layer 3 and security services. The security flow session contains the dl0 interface as the ingress or egress interface.
st0	Secure tunnel interface used for IPsec VPNs.
fxp0	The out-of-band management interface.

The list of supported transceivers for the NFX150 is located at https://pathfinder.juniper.net/hct/product/.

Table 7 on page 26 illustrates the default mapping between the physical and virtual interfaces on a NFX150 device.

Table 6: Default Mapping of Physical Ports to Virtual Ports on NFX150 (for Junos OS Releases 18.1, 18.2 R1, and 18.3 R1)

Physical Port	Virtual Interface (Layer 2 dataplane)	Virtual Interface (Layer 3 dataplane)
heth-0-0	ge-0/0/0	NA
heth-0-1	ge-0/0/1	NA
heth-0-2	ge-0/0/2	NA
heth-0-3	ge-0/0/3	NA
heth-0-4	NA	ge-1/0/1
heth-0-5	NA	ge-1/0/2

Table 7: Default Mapping of Physical Ports to Virtual Ports on NFX150 (for Junos OS Releases 18.2 R2)

Physical Port	Virtual Interface (Layer 2 dataplane)	Virtual Interface (Layer 3 dataplane)
heth-0-0	ge-0/0/0	NA
heth-0-1	ge-0/0/1	NA
heth-0-2	ge-0/0/2	NA
heth-0-3	NA	ge-1/0/1
heth-0-4	ge-0/0/3	NA
heth-0-5	NA	ge-1/0/2

Table 8 on page 26 illustrates the default mapping between the physical ports on the expansion module and the virtual interfaces.

Table 8: Default Mapping of Physical Ports to Virtual Ports for the Expansion Module

Physical Port	Virtual Port (Layer 2 dataplane)
heth-1-0	ge-0/0/4
heth-1-1	ge-0/0/5
heth-1-2	ge-0/0/6

Table 8: Default Mapping of Physical Ports to Virtual Ports for the Expansion Module (continued)

Physical Port	Virtual Port (Layer 2 dataplane)
heth-1-3	ge-0/0/7
heth-1-4	ge-0/0/8
heth-1-5	ge-0/0/9
heth-1-6	ge-0/0/10
heth-1-7	ge-0/0/11

NOTE: The expansion module ports are mapped to the Layer 2 dataplane interfaces by default. You can change the mapping to suit your requirement. Any of the ports on the chassis and expansion module can be mapped to the ge-1/0/x or ge-0/0/x interfaces. Any change in port mapping configuration will automatically reset the affected FPC.

Supported Features

Table 9 on page 27 lists the Junos features supported on NFX150.

Table 9: Features Supported on NFX150

Junos OS Release	Routing	Security	Switching
18.1R1	• BGP, OSPF, RIP, IS-IS, • MVRP	• NAT • ALG • IPSec • IPv6 NTP • IPv6 TACACS • CoS • Firewall filters	• LLDP • Port mirroring • IGMP/MLD snooping • MLD snooping • Persistent MAC learning • L2Rewrite • Native VLAN
18.2 R1		• Application Security • IDP • Integrated User Firewall • UTM	

For more details on supported features, see Feature Explorer.

Performance Modes

Starting in Junos OS Release 19.1R1, NFX150 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.

Licensing

For features or scaling levels that require a license, you must install and properly configure the license to meet the requirements for using the licensable feature or scale level. The device enables you to commit a configuration that specifies a licensable feature or scale without a license for a 30-day grace period. The grace period is a short-term grant that enables you to start using features in the pack or scale up to the system limits (regardless of the license key limit) without a license key installed. The grace period begins when the licensable feature or scaling level is actually used by the device (not when it is first committed). In other words, you can commit licensable features or scaling limits to the device configuration, but the grace period does not begin until the device uses the licensable feature or exceeds a licensable scaling level.

For information about how to purchase software licenses, contact your Juniper Networks sales representative. Junos OS software implements an honor-based licensing structure and provides you with a 30-day grace period to use the feature without a license key installed. The grace period begins when you configure the feature and your device uses the licensed feature for the first time, but not necessarily when you install the license. After the grace period expires, the system generates system log messages saying that the feature requires a license. To clear the error message and use the licensed feature properly, you must install and verify the required license.

NOTE: Configurations might include both licensed and nonlicensed features. For these situations, the license is enforced up to the point where the license can be clearly distinguished. For example, an authentication-order configuration is shared by both Authentication, Authorization, and Accounting (AAA), which is licensed, and by Layer 2 Tunneling Protocol (L2TP), which is not licensed. When the configuration is committed, the device does not issue any license warnings, because it is not yet known whether AAA or L2TP is using the configuration. However, at runtime, the device checks for a license when AAA authenticates clients, but does not check when L2TP authenticates clients.

The device reports any license breach as a warning log message whenever a configuration is committed that contains a feature or scale limit usage that requires a license. Following the 30-day grace period, the device periodically reports the breach to syslog messages until a license is installed and properly configured on the device to resolve the breach.

NOTE: Successful commitment of a licensable feature or scaling configuration does not imply that the required licenses are installed or not required. If a required license is not present, the system issues a warning message after it commits the configuration.

Related Documentation

- Initial Configuration on NFX150 Devices on page 33
- Mapping Interfaces on NFX150 Devices on page 51

Junos OS Releases Supported on NFX Series Hardware

The Table 10 on page 29 provides details of Junos OS software releases supported on the NFX Series devices.

Table 10: 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
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 on page 30
- Software Version Compatibility on page 30

Hardware Compatibility

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

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

Hardware Compatibility Tool

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

Software Version Compatibility

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

NOTE: **Starting in Junos OS Release 18.1R1, NFX150 and NFX250 devices support the same version of platform software and vSRX. For example, see** Table 11 on page 30.

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 11: Software Compatibility Details with vSRX and Cloud CPE Solution

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

Table 11: Software Compatibility Details with vSRX and Cloud CPE Solution (continued)

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

CHAPTER 2

Initial Configuration

Initial Configuration on NFX150 Devices

Factory-Default Settings

The NFX150 device is shipped with the following factory-default settings:

Table 12: Security Policies

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

Table 13: Interface Mapping (for Junos OS Releases 18.1, 18.2 R1, and 18.3 R1)

Port Label	Interface	Virtual Interface	Security Zone	DHCP State	IP Address
0/0 to 0/3	heth-0-0 to heth-0-3	ge-0/0/0 to ge-0/0/3	trust	Server	192.168.2.1/24
0/4	heth-0-4	ge-1/0/1	untrust	Client	ISP assigned
0/5	heth-0-5	ge-1/0/2	untrust	Client	ISP assigned
MGMT	fxp0	N/A	N/A	N/A	192.168.1.1/24

Table 14: Interface Mapping (for Junos OS Releases 18.2 R2 and 18.4R1)

Port Label	Interface	Virtual Interface	Security Zone	DHCP State	IP Address
0/0 to 0/2	heth-0-0 to heth-0-2	ge-0/0/0 to ge-0/0/2	trust	Server	192.168.2.1/24
0/3	heth-0-3	ge-1/0/1	untrust	Client	ISP assigned
0/4	heth-0-4	ge-0/0/3	trust	Server	192.168.2.1/24
0/5	heth-0-5	ge-1/0/2	untrust	Client	ISP assigned
MGMT	fxp0	N/A	N/A	N/A	192.168.1.1/24

Table 15: LTE Interfaces

Interface	Security Zone	IP Address
cl-1/1/0	N/A	N/A
dl0 (logical)	untrust	ISP assigned

The NFX150 device is shipped with the following services enabled by default: DHCP, HTTPS, and TFTP.

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

Enabling Basic Connectivity

1. Ensure that the NFX150 device is powered on.

2. Connect to the console port:

   a. Plug one end of the Ethernet cable into the console port on your NFX150 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:

      Baud rate—9600; Parity—N; 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 it 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** and enter the password **juniper123**. If the software completes booting before you connect to the console, you might need to press the **Enter** key for the prompt to appear:

   NOTE: Starting with Junos OS Release 18.1R2 or later, the root password is not configured for initial configuration of the NFX150 devices.

   ```
   login: root
   password: juniper123
   ```

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 the Internet connection for 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
```

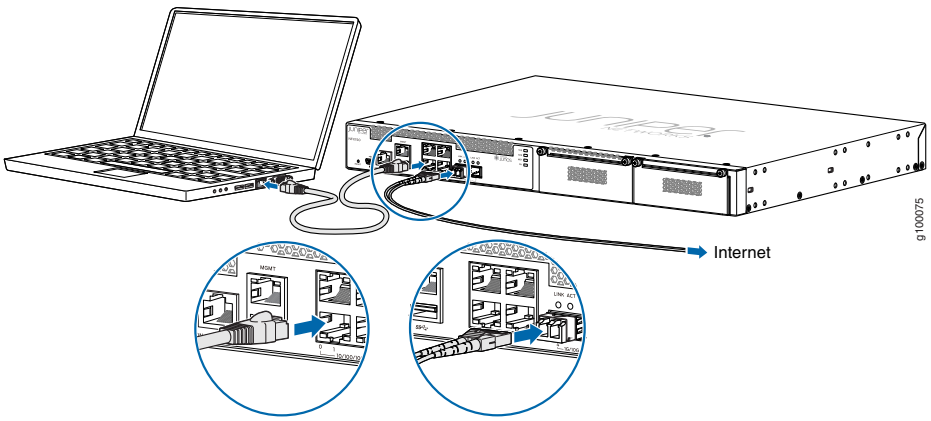
Establishing the Connection

1. Connect the device to the Internet Service Provider (ISP) by using the following step:

   NOTE: For information on interface mapping, see Table 13 on page 33 and Table 15 on page 34.

   Connect one of the WAN ports to the ISP. The device is assigned an IP address by the ISP through DHCP.

   Figure 4: Connecting the Interfaces on an NFX150-S1 Device



   Optionally, you can obtain a SIM card from the ISP and connect the device through LTE.

   NOTE: The LTE expansion module must be purchased separately.

2. Connect the laptop to one of the front panel LAN ports. The laptop is assigned an IP address by the DHCP server running on the interface.

3. Open a browser on your laptop, navigate to https://www.juniper.net, and verify your connectivity.

Related Documentation

- *Installing and Configuring the LTE Module*

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* .
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:

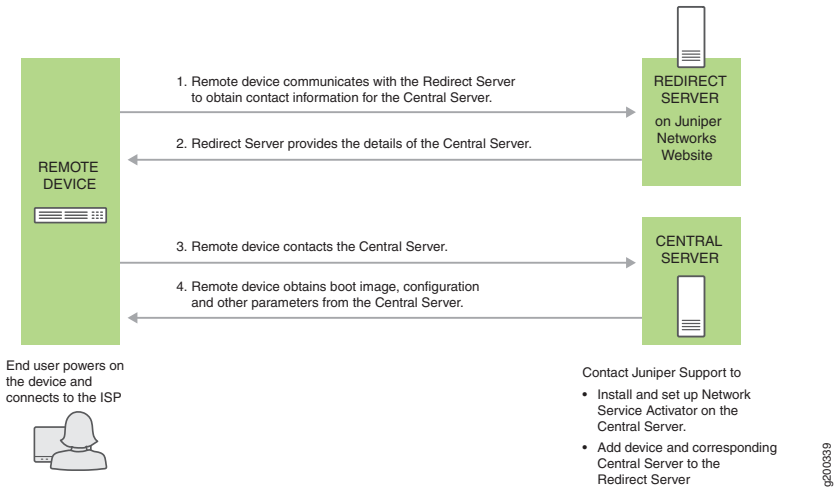
```
user@host>show system phone-home pre-stage configuration
user@host>show system phone-home pre-stage certificate
user@host>show system phone-home pre-stage
```

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 5 on page 39 illustrates the workflow of the initial provisioning of NFX Series devices.

Figure 5: 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 5 on page 39 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.

Configuring the LTE Module on NFX Devices

The LTE module can be configured in three modes:

- Always-on—The LTE module connects to the 3G/4G network after booting. The connection is always maintained, as long as there are no network or connectivity problems.

  NOTE: **The default mode for LTE module is always-on. For the LTE module to be operational, you only need to install one SIM card on the LTE module before powering on the device. There is no additional configuration required.**

- Dial-on-demand—The LTE module initiates a connection when it receives interesting traffic. You define interesting traffic using the dialer filter. To configure dial-on-demand using a dialer filter, you first configure the dialer filter and then apply the filter to the dialer interface.
- Backup—The LTE module connects to the 3G/4G network when the primary connection fails.

You can configure the LTE module either as a primary interface or as a backup interface. When configured as the primary interface, the LTE module supports both the always-on and dial-on-demand modes. When configured as the backup interface, the LTE module connects to the network only when the primary interface fails.

NOTE: **Starting in Junos OS Release 19.1R1, you can configure LTE modules on both nodes in a chassis cluster to provide backup WAN support.**

Profile configuration is not needed in most scenarios, as LTE has a built-in database of many service providers and can automatically select the profile to use. Occasionally, you might need to specify profiles explicitly in the configuration, in which case, the automatic profile selection is disabled.

Before you begin the configuration, insert the Subscriber Identity Module (SIM) in the LTE module. The SIM uses a profile to establish a connection with the network. You can configure up to 16 profiles for each SIM card. The LTE module supports two SIM cards and so you can configure a total of 32 profiles, although only one profile can be active at a time. To configure the SIM profile, you will require the following information from the service provider:

- Username and password
- Access Point Name (APN)
- Authentication (Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP))

- Configuring the LTE Module for Primary Mode on page 41
- Configuring the LTE Module for Dial-on-Demand Mode on page 43
- Configuring the LTE Module for Backup Mode on page 45

Configuring the LTE Module for Primary Mode

Before you begin the procedure, ensure that the logical interface (dl0.0) is not configured as a backup. If dl0.0 is configured as a backup option for any interface on the device, then this configuration overrides the configuration outlined in this procedure, and the LTE module will function as a backup interface.

Use the **show interfaces | display set | match backup-option | match dl0.0** command to check whether any interface uses dl0.0 as a backup interface. If dl0.0 is configured as a backup interface, then delete the configuration by issuing the following command: **delete interfaces *interface-name* unit 0 backup-options interface dl0.0**

To configure the LTE module as a primary interface:

1. Configure the dialer interface:

   user@host# set interfaces dl0 unit 0 family inet negotiate-address
   user@host# set interfaces dl0 unit 0 family inet6 negotiate-address
   user@host# set interfaces dl0 unit 0 dialer-options pool *dialer-pool-number*
   user@host# set interfaces dl0 unit 0 dialer-options dial-string *dial-number*
   user@host# set interfaces dl0 unit 0 dialer-options always-on

   NOTE: To configure the LTE interface in a chassis cluster, configure the redial-delay to specify the delay (in seconds) to switch to the secondary cl interface when the active cl interface times out.

   user@host# set interfaces dl0 unit 0 dialer-options redial-delay *time-in-seconds*

2. Configure the dialer pool for the LTE physical interface:

   user@host# set interfaces cl-1/1/0 dialer-options pool *dialer-pool-number*

The ***dialer-pool-number*** is always 1 as there is only one LTE interface on the NFX150.

NOTE: An NFX150 chassis cluster supports two cl interfaces, cl-1/1/0 (primary node) and cl-8/1/0 (secondary node).

To configure LTE interfaces on an NFX150 chassis cluster, specify the priority for the interfaces. The interface with the higher priority becomes the active interface.

user@host# set interfaces cl-1/1/0 dialer-options pool *dialer-pool-number* priority *priority-number*

If you assign the same priority to both interfaces, then the interface that is listed first in the configuration becomes the active interface. To verify which interface is being used as the active interface, run the **show dialer pools** command.

3. Configure the profile.

   user@host# run request modem wireless create-profile profile-id *profile-id* cl-1/1/0 slot *sim-slot-number* access-point-name *apn-name* authentication-method *none*

NOTE: **sim-slot-number** is the slot on the module in which the SIM card is inserted.

4. Verify that the profile is configured successfully:

   user@host# run show modem wireless profiles cl-1/1/0 slot 1

5. Activate the SIM card:

   user@host# set interfaces cl-1/1/0 act-sim *sim-slot-number*

6. Select the profile and configure the radio access type for the SIM card:

   user@host# set interfaces cl-1/1/0 cellular-options sim *sim-slot-number* select-profile profile-id *profile-id*
   user@host# set interfaces cl-1/1/0 cellular-options sim *sim-slot-number* radio-access automatic

NOTE: If a SIM card is installed in the second slot, then select the profile and configure the radio access type for the SIM card in the second slot as well.

7. Verify the status of the wireless network and dialer interface:

```
user@host# run show modem wireless network
user@host# run show interfaces dl0.0
```

Configuring the LTE Module for Dial-on-Demand Mode

When the LTE module is configured as a primary interface, it can function either in always-on mode or in dial-on-demand mode. In always-on mode, the interface remains connected to the network whereas In dial-on-demand mode, the connection is established only when needed.

In dial-on-demand mode, the dialer interface is enabled only when network traffic configured as an "interesting traffic" arrives on the network. Interesting traffic triggers or activates the wireless WAN connection. You define an interesting packet by using the dialer filter. To configure dial-on-demand by using a dialer filter, you first configure the dialer filter and then apply the filter to the dialer interface.

Once the traffic is sent over the network, an inactivity timer is triggered and the connection is closed after the timer expires.

NOTE: The dial-on-demand mode is supported only if the LTE module is configured as a primary interface.

To configure the LTE module as a dial-on-demand interface:

1. Configure the dialer interface:

   ```
   user@host# set interfaces dl0 unit 0 family inet negotiate-address
   user@host# set interfaces dl0 unit 0 family inet6 negotiate-address
   user@host# set interfaces dl0 unit 0 family inet filter dialer dialer-filter-name
   user@host# set interfaces dl0 unit 0 dialer-options pool dialer-pool-number
   user@host# set interfaces dl0 unit 0 dialer-options dial-string dial-number
   ```

   NOTE: To configure the LTE interface in a chassis cluster, configure the redial-delay to specify the delay (in seconds) to switch to the secondary cl interface when the active cl interface times out.

   ```
   user@host# set interfaces dl0 unit 0 dialer-options redial-delay time-in-seconds
   ```

2. (Optional) Configure the **idle-timeout** value, which determines the duration for which the connection will remain enabled in the absence of interesting traffic.

   ```
   user@host# set interfaces dl0 unit 0 dialer-options idle-timeout idle-timeout-value
   ```

3. Configure the dialer pool for the LTE physical interface:

   ```
   user@host# set interfaces cl-1/1/0 dialer-options pool dialer-pool-number
   ```

   The ***dialer-pool-number*** is always 1 as there is only one LTE interface on the NFX150.

NOTE: An NFX150 chassis cluster supports two cl interfaces, cl-1/1/0 (primary node) and cl-8/1/0 (secondary node).

To configure LTE interfaces on an NFX150 chassis cluster, specify the priority for the interfaces. The interface with the higher priority becomes the active interface.

user@host# set interfaces cl-1/1/0 dialer-options pool *dialer-pool-number* priority *priority-number*

If you assign the same priority to both interfaces, then the interface that is listed first in the configuration becomes the active interface. To verify which interface is being used as the active interface, run the show dialer pools command.

4. Create the dialer filter rule:

   user@host# set firewall family inet dialer-filter *dialer-filter-name* term *term1* from destination-address *ip-address* then note

5. Set the default route:

   user@host# set routing-options static route *ip-address* next-hop dl0.0

6. Configure the profile.

   user@host# run request modem wireless create-profile profile-id *profile-id* cl-1/1/0 slot *sim-slot-number* access-point-name *apn-name* authentication-method *none*

   NOTE: *sim-slot-number* is the slot on the module in which the SIM card is inserted.

7. Verify that the profile is configured successfully:

   user@host# run show modem wireless profiles cl-1/1/0 slot 1

8. Activate the SIM card:

   user@host# set interfaces cl-1/1/0 act-sim *sim-slot-number*

9. Select the profile and configure the radio access type for the SIM card:

   user@host# set interfaces cl-1/1/0 cellular-options sim *sim-slot-number* select-profile profile-id *profile-id*
   user@host# set interfaces cl-1/1/0 cellular-options sim *sim-slot-number* radio-access automatic

NOTE: If a SIM card is installed in the second slot, then select the profile and configure the radio access type for the SIM card in the second slot as well.

10. Verify the configuration by sending traffic to the destination address. The traffic is routed to the dl0 interface and if it matches the dialer filter rule, then the dl0 is triggered to dial.

11. Verify the status of the wireless network and dialer interface:

```
user@host# run show modem wireless network
user@host# run show interfaces dl0.0
```

Configuring the LTE Module for Backup Mode

You can configure the LTE module as a backup interface. If the primary interface fails, the LTE module connects to the network and remains online only until the primary interface becomes functional. The dialer interface is enabled only when the primary interface fails.

To configure the LTE module as a backup interface:

1. Configure the dialer interface:

```
user@host# set interfaces dl0 unit 0 family inet negotiate-address
user@host# set interfaces dl0 unit 0 family inet6 negotiate-address
user@host# set interfaces dl0 unit 0 dialer-options pool dialer-pool-number
user@host# set interfaces dl0 unit 0 dialer-options dial-string dial-number
```

NOTE: To configure the LTE interface in a chassis cluster, configure the redial-delay to specify the delay (in seconds) to switch to the secondary cl interface when the active cl interface times out.

```
user@host# set interfaces dl0 unit 0 dialer-options redial-delay time-in-seconds
```

2. Configure the dialer pool for the LTE physical interface:

```
user@host# set interfaces cl-1/1/0 dialer-options pool dialer-pool-number
```

The ***dialer-pool-number*** is always 1 as there is only one LTE interface on the NFX150.

NOTE: An NFX150 chassis cluster supports two cl interfaces, cl-1/1/0 (primary node) and cl-8/1/0 (secondary node).

To configure LTE interfaces on an NFX150 chassis cluster, specify the priority for the interfaces. The interface with the higher priority becomes the active interface.

user@host# set interfaces cl-1/1/0 dialer-options pool *dialer-pool-number* priority *priority-number*

If you assign the same priority to both interfaces, then the interface that is listed first in the configuration becomes the active interface. To verify which interface is being used as the active interface, run the **show dialer pools** command.

3. Configure the profile.

   user@host# run request modem wireless create-profile profile-id *profile-id* cl-1/1/0 slot *sim-slot-number* access-point-name *l3vpn.corp* authentication-method none

   NOTE: **sim-slot-number** is the slot on the LTE module in which the SIM card is inserted.

4. Verify that the profile is configured successfully:

   user@host# run show modem wireless profiles cl-1/1/0 slot 1

5. Activate the SIM card:

   user@host# set interfaces cl-1/1/0 act-sim *sim-slot-number*

6. Select the profile and configure the radio access type for the SIM card:

   user@host# set interfaces cl-1/1/0 cellular-options sim *sim-slot-number* select-profile profile-id *profile-id*
   user@host# set interfaces cl-1/1/0 cellular-options sim *sim-slot-number* radio-access automatic

   NOTE: If a SIM card is installed in the second slot, then select the profile and configure the radio access type for the SIM card in the second slot as well.

7. Configure the Ethernet interface as the primary interface, which connects to the wireless network. Configure the dl0 interface as the backup interface.

```
user@host# set interfaces ge-1/0/2 unit 0 family inet address 192.168.2.1/24
user@host# set interfaces ge-1/0/2 unit 0 backup-options interface dl0.0
```

8. Verify the status of the wireless network and dialer interface:

```
user@host# run show modem wireless network
user@host# run show interfaces dl0.0
```

Related Documentation

- Upgrading the Modem Firmware on NFX Devices Through Over-the-Air (OTA) on page 47

Upgrading the Modem Firmware on NFX Devices Through Over-the-Air (OTA)

Over-the-Air (OTA) firmware upgrade enables automatic and timely upgrade of modem firmware when new firmware versions are available. The OTA upgrade can be enabled or disabled on the LTE module. OTA is disabled by default.

NOTE: When upgrading the software on the NFX devices, the LTE firmware is also upgraded if the software contains a newer firmware version.

1. Enable OTA upgrade on the LTE module:

```
user@host > request modem wireless fota cl-1/1/0 enable
```

```
Set FOTA on modem succeeded
```

2. Initiate the firmware upgrade:

```
user@host > request modem wireless upgrade cl-1/1/0
```

```
Launch FOTA upgrade succeeded
```

3. Verify the firmware upgrade status:

```
user@host > show modem wireless firmware cl-1/1/0
```

```
LTE mPIM firmware details
  Product name: Junos LTE mPIM
  Serial number: D23F4349-10FA-41AA-A538-03648DE
  Hardware version: AcceleratedConcepts/porter
  Firmware version: 17.11.13
  MAC: 00:00:5e:00:53:82
  System uptime: 4632 seconds
Wireless modem firmware details
  Modem firmware version:
9999999_9904609_SWI9X30C_02.24.05.06_00_GENERIC_002.026_000
  Modem Firmware build date: 19/05/2017
  Card type: MC7455
  Modem manufacturer: Sierra Wireless, Inc
  Hardware version: 1.0
```

```
  Power & Temperature: Normal 3368 mV, Normal 29.00 C
OTA status
  State: Enabled
  New firmware available: No
Number of SIM: 1
Slot of active: 1
Status of SIM 1
  SIM state: SIM present
  Modem PIN security status: Disabled
  SIM status: SIM Okay
  SIM user operation needed: No Op
  Retries remaining: 3
```

4. Check the LTE module connection status:

   user@host > show modem wireless network cl-1/1/0

```
LTE Connection details
  Connected time: 2880
  IP: 10.12.219.210
  Gateway: 10.12.219.209
  DNS: 123.123.123.123
  IPv6: ::
  Gatewayv6: ::
  DNSv6: ::
  Input bps: 0
  Output bps: 0
  Bytes Received: 1952
  Bytes Transferred: 2164
  Packets Received: 10
  Packets Transferred: 20
Wireless Modem Network Info
  Current Modem Status: Connected
  Current Service Status: Normal
  Current Service Type: PS
  Current Service Mode: LTE
  Current Band: B3
  Network: UNICOM
  Mobile Country Code (MCC): 460
  Mobile Network Code (MNC): 1
  Location Area Code (LAC): 65534
  Routing Area Code (RAC): 0
  Cell Identification: 239907605
  Access Point Name (APN): 3gnet
  Public Land Mobile Network (PLMN): CHN-UNICOM
  Physical Cell ID (PCI): 452
  International Mobile Subscriber Identification (IMSI): ***************
  International Mobile Equipment Identification (IMEI/MEID): ****************
  Integrate Circuit Card Identity (ICCID): 89860117811046631207
  Reference Signal Receiving Power (RSRP): -71
  Reference Signal Receiving Quality (RSRQ): -8
  Signal to Interference-plus-Noise Ratio (SiNR): 19
  Signal Noise Ratio (SNR): 22
  Energy per Chip to Interference (ECIO): 0
```

Related Documentation

- Configuring the LTE Module on NFX Devices on page 40

CHAPTER 3

Configuring Interfaces

Mapping Interfaces on NFX150 Devices

Mapping Physical Interfaces to Virtual Interfaces on NFX150 Devices

The NFX150 devices are shipped with the default mapping as described in "NFX150 Feature Overview" on page 21. You can change the mapping to suit your needs. Any of the physical ports can be mapped to the ge-0/0/x or ge-1/0/x interfaces. Any change in port mapping configuration will automatically reset the affected FPC.

- To map a physical port to a virtual interface, use the following command:

  ```
  root# set vmhost virtualization-options interfaces virtual-interface-name mapping interface physical-interface-name
  ```

  For example, to map the physical port heth-0-2 to the Layer 2 dataplane (FPC0) interface ge-0/0/3, the command is as follows:

  ```
  root# set vmhost virtualization-options interfaces ge-0/0/3 mapping interface heth-0-2
  ```

- To map a physical port to the FPC0, use the following command:

  ```
  root# set vmhost virtualization-options interfaces virtual-interface-name mapping interface physical-interface-name
  ```

- To map a physical port to the FPC1, use the following commands:

  ```
  root# set vmhost virtualization-options interfaces virtual-interface-name mapping interface physical-interface-name
  root# set interfaces virtual-interface-name vlan-tagging
  ```

```
root# set interfaces virtual-interface-name unit 0 vlan-id vlan-id
root# set interfaces virtual-interface-name unit 0 family inet address ip-address
```

Mapping Physical Ports to VNF Interfaces Through SR-IOV

You can configure Layer 3 services using single-root I/O virtualization (SR-IOV). To map a VNF interface to a physical interface by using the SR-IOV virtual function, use the following command:

```
root# set virtual-network-functions vnf-name interfaces interface-name mapping interface physical-interface-name virtual-function
```

Mapping Layer 3 Dataplane Interfaces to OVS

The ge-1/0/0 interface is always mapped to the service chaining backplane (OVS). To map additional Layer 3 dataplane interfaces to the system bridge, use the following command:

```
root# set vmhost virtualization-options interfaces interface-name
```

Related Documentation

- Configuring the In-Band Management Interface on page 52

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 NFX150 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 16 on page 53.

Table 16: 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

The ADSL Mini-PIM facilitates a maximum of 10 virtual circuits on supported security devices.

Supported security devices with Mini-PIMs can use PPP over Ethernet over ATM (PPPoEoA) and PPP over ATM (PPPoA) to connect through ADSL lines only.

- ADSL2 and ADSL2+ on page 54

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.

Configuring ADSL SFP Interface Using VLANs on NFX150 Network Services Platform

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

To configure ADSL SFP interfaces on NFX150 devices:

1. Connect to the host.

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

2. Configure the WAN side front panel port with vlan-tagging.

```
user@host# set interfaces virtual-interface-name vlan-tagging
```

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

3. Configure a VLAN for the WAN side front panel port.

```
user@host# set interfaces virtual-interface-name unit 0 vlan-id vlan-id
```

```
user@host# set interfaces ge-1/0/1 unit 0 vlan-id 152
```

4. Configure the WAN side front panel port with an IP address.

   set interfaces *virtual-interface-name* unit 0 family inet address *ip-address*

   ```
   user@host# set interfaces ge-1/0/1 unit 0 family inet address 152.1.1.152/24
   ```

5. Configure the physical (heth) interface with ADSL SFP options.

   `user@host#` **set vmhost interfaces *physical-interface-name* dsl-sfp-options adsl-options vpi *vpi* vci *vci* encap *encapsulation***

   ```
   user@host# set vmhost interfaces heth-0-4 dsl-sfp-options adsl-options vpi 8 vci 36
     encap llcsnap-bridged-802.1q
   ```

   NOTE:
   - The default value for **encap** is **llcsnap-bridged-802.1q**.
   - The ADSL SFP interface is enabled only if you configure **vci** and **vpi**. By default, **vci** and **vpi** are disabled.

6. Map the physical (heth) interfaces to the virtual (ge) interfaces.

   `user@host#` **set vmhost virtualization-options interfaces *virtual-interface-name* mapping interface *physical-interface-name***

   ```
   user@host# set vmhost virtualization-options interfaces ge-1/0/1 mapping interface
     heth-0-4
   ```

7. Commit the configuration.

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

To verify the configuration, enter the **show interfaces heth-0-4** command.

```
[edit]
user@host# show interfaces heth-0-4
Physical interface: heth-0-4, Enabled, Physical link is Up
  Link-level type: Ethernet, Media type: Fiber, MTU: 9192, ADSL2P mode, Speed:
1Gbps, Duplex: Full-duplex, Auto-negotiation: Disabled
  ADSL status:
    Modem status  : Showtime (Adsl2plus)
    DSL mode      :     Auto    Annex A
  Device flags   : Present Running
  Current address: 58:00:bb:ac:c8:51, Hardware address: 58:00:bb:ac:c8:51
```

Configuring ADSL SFP Interface Without Using VLANs on NFX150 Network Services Platform

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

To configure ADSL SFP interfaces on NFX150 devices:

1. Connect to the host.

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

2. Configure the WAN side front panel port with an IP address.

   set interfaces *virtual-interface-name* unit 0 family inet address *ip-address*

```
user@host# set interfaces ge-1/0/1 unit 0 family inet address 153.1.1.153/24
```

3. Configure the physical (heth) interface with ADSL SFP options.

   `user@host#` **set vmhost interfaces *physical-interface-name* dsl-sfp-options adsl-options vpi *vpi* vci *vci* encap *encapsulation***

```
user@host# set vmhost interfaces heth-0-4 dsl-sfp-options adsl-options vpi 8 vci 36
  encap llcsnap-bridged-802.1q
```

   NOTE:
   - The default value for encap is llcsnap-bridged-802.1q.
   - The ADSL SFP interface is enabled only if you configure vci and vpi. By default, vci and vpi are disabled.

4. Map the physical (heth) interfaces to the virtual (ge) interfaces.

   `user@host#` **set vmhost virtualization-options interfaces *virtual-interface-name* mapping interface *physical-interface-name***

```
user@host# set vmhost virtualization-options interfaces ge-1/0/1 mapping interface
  heth-0-4
```

5. Commit the configuration.

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

To verify the configuration, enter the **show interfaces heth-0-4** command.

```
[edit]
user@host# show interfaces heth-0-4
```

```
Physical interface: heth-0-4, Enabled, Physical link is Up
  Link-level type: Ethernet, Media type: Fiber, MTU: 9192, ADSL2P mode, Speed:
1Gbps, Duplex: Full-duplex, Auto-negotiation: Disabled
  ADSL status:
    Modem status  : Showtime (Adsl2plus)
    DSL mode      :     Auto    Annex A
  Device flags   : Present Running
  Current address: 58:00:bb:ac:c8:51, Hardware address: 58:00:bb:ac:c8:51
```

Related Documentation

VDSL2 Interfaces on NFX150 Devices

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 on page 58

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 6 on page 59.

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 7 on page 59.

   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 6 on page 59 shows a typical VDSL2 network topology.

Figure 6: Typical VDSL2 End-to-End Connectivity and Topology Diagram

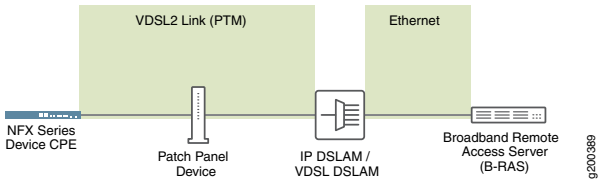
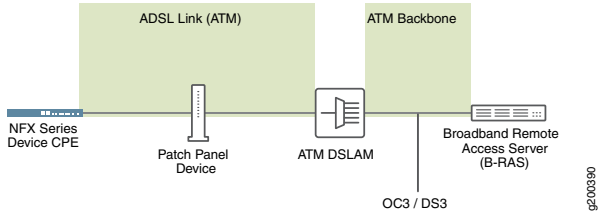


Figure 7 on page 59 shows a backward-compatible ADSL topology using ATM DSLAM.

Figure 7: 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 17 on page 59. (Platform support depends on the Junos OS release in your installation.)

Table 17: VDSL2 Annex A and Annex B Features

Features	POTS
Devices	JNP-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 JNP-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 heth-0-4 and heth-0-5.

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 18 on page 60 lists the different profiles supported on the VDSL2 interfaces and their properties.

Table 18: 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)

VDSL2 Interfaces Supported Features

The following features are supported on the VDSL2 interfaces:

- ADSL2 and ADSL2+ backward compatibility with Annex A, Annex M support
- PTM or EFM (802.3ah) support
- Operation, Administration, and Maintenance (OAM) support for ADSL2 and ADSL2+ modes

- Multilink Point-to-Point Protocol (MLPPP) (supported only when the VDSL2 Mini-PIM is operating in ADSL2 mode)
- MTU size of 1514 bytes (maximum) in VDSL2 mode and 1496 bytes in ADSL mode.
- Support for maximum of 10 permanent virtual connections (PVCs) (only in ADSL2 and ADSL2+ mode)

Configuring VDSL SFP Interface Using VLANs on NFX150 Network Services Platform

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

To configure VDSL SFP interfaces on NFX150 devices:

1. Connect to the host.

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

2. Configure the WAN side front panel port with vlan-tagging.

   `user@host#` **set interfaces *virtual-interface-name* vlan-tagging**

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

3. Configure a VLAN for the WAN side front panel port.

   `user@host#` **set interfaces *virtual-interface-name* unit *logical-unit-number* vlan-id *vlan-id***

```
user@host# set interfaces ge-1/0/1 unit 0 vlan-id 151
```

4. Configure the WAN side front panel port with an IP address.

   `user@host#` **set interfaces *virtual-interface-name* unit *logical-unit-number* family inet address *ip-address***

```
user@host# set interfaces ge-1/0/1 unit 0 family inet address 151.1.1.151/24
```

5. Configure the physical (heth) interface with VDSL SFP options, VDSL profile, and carrier settings on the VDSL SFP interface.

   `user@host#` **vmhost interfaces *physical-interface-name* dsl-sfp-options vdsl-options profile *profile* carrier *carrier***

```
user@host# set vmhost interfaces heth-0-4 dsl-sfp-options vdsl-options profile auto
  carrier auto
```

NOTE:

- The default value for **vdsl-options profile** is **auto**. The value **auto** supports all profiles ranging from 8a to 17a.
- The default value for **vdsl-options carrier** is **auto**. The value **auto** includes a43 and b43.

6. Map the physical (heth) interfaces to the virtual (ge) interfaces.

   `user@host#` **set vmhost virtualization-options interfaces** ***virtual-interface-name*** **mapping interface** ***physical-interface-name***

```
user@host# set vmhost virtualization-options interfaces ge-1/0/1 mapping interface
  heth-0-4
```

7. Commit the configuration.

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

To verify the configuration, enter the **show interfaces heth-0-4** command.

```
[edit]
user@host# show interfaces heth-0-4
Physical interface: heth-0-4, Enabled, Physical link is Up
  Link-level type: Ethernet, Media type: Fiber, MTU: 9192, VDSL2 mode, Speed:
1Gbps, Duplex: Full-duplex, Auto-negotiation: Disabled
  VDSL status:
    Modem status  : Showtime (Auto)
    VDSL profile  : Profile-8b
  Device flags   : Present Running
  Current address: d8:b1:22:33:5e:51, Hardware address: d8:b1:22:33:5e:51
```

Configuring VDSL SFP Interface Without Using VLANs on NFX150 Network Services Platform

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

To configure VDSL SFP interfaces on NFX150 devices:

1. Connect to the host.

```
user@host> configure
```

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

2. Configure the WAN side front panel port with an IP address.

   `user@host#` **set interfaces** ***virtual-interface-name*** **unit** ***logical-unit-number*** **family inet address** ***ip-address***

   ```
   user@host# set interfaces ge-1/0/1 unit 0 family inet address 151.1.1.151/24
   ```

3. Configure the physical (heth) interface with VDSL SFP options, VDSL profile, and carrier settings on the VDSL SFP interface.

   `user@host#` **vmhost interfaces** ***physical-interface-name*** **dsl-sfp-options vdsl-options profile** ***profile*** **carrier** ***carrier***

   ```
   user@host# set vmhost interfaces heth-0-4 dsl-sfp-options vdsl-options profile auto
     carrier auto
   ```

   NOTE:
   - The default value for **vdsl-options profile** is **auto**. The value **auto** supports all profiles ranging from 8a to 17a.
   - The default value for **vdsl-options carrier** is **auto**. The value **auto** includes a43 and b43.

4. Map the physical (heth) interfaces to the virtual (ge) interfaces.

   `user@host#` **set vmhost virtualization-options interfaces** ***virtual-interface-name*** **mapping interface** ***physical-interface-name***

   ```
   user@host# set vmhost virtualization-options interfaces ge-1/0/1 mapping interface
     heth-0-4
   ```

5. Commit the configuration.

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

To verify the configuration, enter the **show interfaces heth-0-4** command.

```
[edit]
user@host# show interfaces heth-0-4
Physical interface: heth-0-4, Enabled, Physical link is Up
  Link-level type: Ethernet, Media type: Fiber, MTU: 9192, VDSL2 mode, Speed:
1Gbps, Duplex: Full-duplex, Auto-negotiation: Disabled
```

```
VDSL status:
  Modem status  : Showtime (Auto)
  VDSL profile  : Profile-8b
Device flags   : Present Running
Current address: d8:b1:22:33:5e:51, Hardware address: d8:b1:22:33:5e:51
```

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 19 on page 66 lists the IPsec features supported on NFX150 devices.

Table 19: 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 19: 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 67
- Configuring Routing Options on page 68
- Configuring Security IKE on page 68
- Configuring Security IPsec on page 70
- Configuring Security Policies on page 72
- Configuring Security Zones on page 73

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 75
- Integrated User Firewall Support on NFX Devices on page 75

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 75

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 73

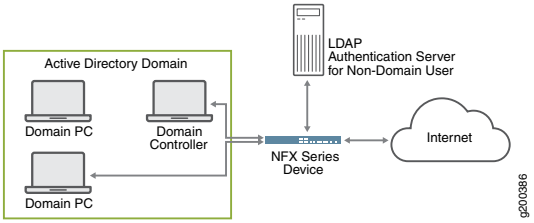
Integrated User Firewall Support on NFX Devices

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 8 on page 76 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 8: 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 73

CHAPTER 5

Configuring VNFs

Prerequisites to Onboard Virtual Network Functions on NFX150 Devices

You can onboard and manage Juniper 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 NFX150 Devices" on page 77.

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 NFX150 Devices

The NFX150 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 the VNF Image

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

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 81.

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 20 on page 80 lists the CPUs available for VNF usage for the NFX150 models.

Table 20: CPUs Available for VNF Usage (Junos OS 19.1R1 Release)

Model	CPUs Available for VNF Usage		
	Throughput Mode	Hybrid Mode	Compute Mode
NFX150-C-S1	0	1	2
NFX150-C-S1-AE	0	1	2
NFX150-C-S1-AA	0	1	2
NFX150-C-S1E-AE	0	1	2
NFX150-C-S1E-AA	0	1	2
NFX150-S1	0	2	4
NFX150-S1E	0	2	4

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, use the following command:

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

To specify the number of virtual CPUs that are required for a VNF, use the following commands:

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

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

2. Pin 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 either be a number or a range. By default, a VNF is allocated with one virtual CPU that is not pinned to any physical CPU.

NOTE: You cannot change the CPU configuration of a VNF when the VNF is in running state. Restart the VNF for changes to take effect.

To enable hardware-virtualization or hardware-acceleration for VNF CPUs, type the following command:

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

Allocate Memory for a VNF

On NFX150 devices running Junos OS Release 18.1R1, enabling hugepages for VNFs and pre-reserving of hugepages are not supported.

Table 21 on page 81 lists the possible memory availability for VNF usage for the NFX150 models.

Table 21: Memory Availability for VNF Usage

Model	Memory Availability for VNF Usage (Junos OS 19.1R1 Release)
NFX150-C-S1	1 GB
NFX150-C-S1-AE	1 GB
NFX150-C-S1-AA	1 GB
NFX150-C-S1E-AE	9 GB
NFX150-C-S1E-AA	9 GB
NFX150-S1	7 GB
NFX150-S1E	23 GB

To specify the maximum primary memory that the VNF can use, enter the following command:

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

NOTE: You cannot change the memory configuration of a VNF if the VNF is in the running state. Restart the VNF for 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.

Configuring VNF Interfaces and VLANs

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

- To attach a VNF interface to a physical interface 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 optional and it is the port VLAN ID.

- To create a VLAN:

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

- To 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 the VNF are persistent across VNF restarts.
  - If the VNF supports hot-plugging, you can attach the interfaces when the VNF is in the running state. Otherwise, add the interfaces, and then restart the VNF.
  - You cannot change the mapping of VNF interface when the VNF is in running state.

  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 delete a VNF interface:

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

NOTE:

- To delete an interface, you must stop the VNF, delete the interface, and start the VNF.
- After attaching or detaching a virtual function, you must restart the VNF for changes to take effect.
- eth0 and eth1 are reserved for default VNF interfaces that are connected to the internal network and 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 convention. VNF interfaces that are configured in 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 JCP and 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
```

Configuring VNF Storage Devices

The NFX150 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, enter the following command:

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

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

To add a virtual USB storage device, enter the following command:

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

To attach an additional hard disk, enter the following command:

```
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 a hard disk from the VNF, enter the following command:

```
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 changes to take effect. The CD detach operation fails if the device is in use within the VNF.
- 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 in running state.
- You must save the source file in the /var/public directory and the file must have read and write permission for all users.

Instantiating a VNF

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

While instantiating a VNF with an image, two VNF interfaces are added by default. These interfaces are required for management and internal network. The target Peripheral Component Interconnect (PCI) addresses, such as 0000:00:03:0 and 0000:00:04:0 are reserved for these interfaces.

- To instantiate a VNF using an image:

  NOTE: Only Qcow2 and Raw image types are supported.

  ```
  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 configuring VNFs, do not use VNF names in the format vnf*n*—for example, vnf1, vnf2, and so on. Configurations containing 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, and it is recommended to allow the system to allocate a UUID for the VNF.

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

Verify that the VNF Instantiated Successfully

Verify that the VNF instantiated successfully by using the following command:

```
user@host> show virtual-network-functions
ID       Name                                                 State      Liveliness
------------------------------------------------------------------------------------
1        vjunos0                                              Running    alive
2        centos1                                              Running    alive
3        centos2                                              Running    alive
11057    LTE                                                  Running    alive
```

The **Liveliness** output field of a VNF indicates whether the IP address of the VNF is reachable or not reachable over the internal management network. The default IP address of the liveliness bridge is 192.0.2.1/24.

Instantiating a VNF Using an XML Descriptor File

You can also instantiate a VNF by using an XML descriptor file. You must place the XML 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 and create a VNF again.

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.

Configuring Analyzer VNF and Port-mirroring

The **Port-mirroring** feature allows you to monitor network traffic. If the feature is enabled on a VNF interface, the OVS system bridge sends a copy of all network packets of that VNF interface to the analyzer VNF for analysis. You can use the port-mirroring or analyzer commands for analyzing the network traffic.

NOTE:

- Port-mirroring is supported only on VNF interfaces that are connected to an OVS system bridge.
- VNF interfaces must be configured before configuring port-mirroring options.
- If the analyzer VNF is active after you configure, you must restart the VNF for changes to take effect.
- You can configure up to four input ports and only one output port for an analyzer rule.
- Output ports must be unique in all analyzer rules.
- After changing the configuration of the input VNF interfaces, you must de-activate and activate the analyzer rules referencing to it along with the analyzer VNF restart.

To configure the analyzer VNF and enable port-mirroring:

1. Configure the analyzer VNF:

```
[edit]
user@host#set virtual-network-functions analyzer-vnf-name image file-path
user@host#set virtual-network-functions analyzer-vnf-name interfaces interface-name
  analyzer
```

2. Enable port-mirroring of the network traffic in the input and output ports of the VNF interface and analyzer VNF:

```
user@host# set vmhost forwarding-options analyzer analyzer-instance-name input
  [ingress | egress] virtual-network-function vnf-name interface interface-name
user@host# set vmhost forwarding-options analyzer analyzer-rule-name output
  virtual-network-function analyzer-vnf-name interface interface-name
```

Related Documentation

- Configuring VNFs on NFX150 Devices on page 77

CHAPTER 6

Configuring High Availability

Chassis Cluster on NFX150 Devices

A chassis cluster, where two devices operate as a single device, provides high availability on NFX150 devices. Chassis clustering involves the synchronizing of configuration files and the dynamic runtime session states between the devices, which are part of the chassis cluster setup.

NFX150 Chassis Cluster Overview

You can configure NFX150 devices to operate in cluster mode by connecting and configuring a pair of devices to operate like a single node, providing redundancy at the device, interface, and service level.

When two devices are configured to operate as a chassis cluster, each device becomes a node of that cluster. The two nodes back up each other, with one node acting as the primary device and the other node acting as the secondary device, ensuring stateful failover of processes and services when the system or hardware fails. If the primary device fails, the secondary device takes over the processing of traffic.

The nodes of a cluster are connected together through two links called control link and fabric link. The devices in a chassis cluster synchronize the configuration, kernel, and PFE session states across the cluster to facilitate high availability, failover of stateful services, and load balancing.

- Control link—Synchronizes the configuration between the nodes. When you submit configuration statements to the cluster, the configuration is automatically synchronized over the control interface.

  To create a control link in a chassis cluster, connect the heth-0-0 port on one node to the heth-0-0 port on the second node.

NOTE: You can use only the heth-0-0 port to create a control link.

- Fabric link (data link)—Forwards traffic between the nodes. Traffic arriving on a node that needs to be processed on the other node is forwarded over the fabric link. Similarly, traffic processed on a node that needs to exit through an interface on the other node is forwarded over the fabric link.

  You can use any port except the heth-0-0 to create a fabric link.

Chassis Cluster Modes

The chassis cluster can be configured in active/passive or active/active mode.

- **Active/passive mode**—In active/passive mode, the transit traffic passes through the primary node while the backup node is used only in the event of a failure. When a failure occurs, the backup device becomes the master and takes over all forwarding tasks.
- **Active/active mode**—In active/active mode, the transit traffic passes through both nodes all the time.

Chassis Cluster Interfaces

The chassis cluster interfaces include:

- Redundant Ethernet (reth) interface—A pseudo-interface that includes a physical interface from each node of a cluster. The reth interface of the active node is responsible for passing the traffic in a chassis cluster setup.

  A reth interface must contain, at minimum, a pair of Fast Ethernet interfaces or a pair of Gigabit Ethernet interfaces that are referred to as child interfaces of the redundant Ethernet interface (the redundant parent). If two or more child interfaces from each node are assigned to the redundant Ethernet interface, a redundant Ethernet interface link aggregation group can be formed.

NOTE: You can configure a maximum of 128 reth interfaces on NFX150 devices.

- Control interface—An interface that provides the control link between the two nodes in the cluster. This interface is used for routing updates and for control plane signal traffic, such as heartbeat and threshold information that trigger node failover.

NOTE: By default, the heth-0-0 port is configured as the dedicated control interface on NFX150 devices. Therefore, you cannot map the heth-0-0 port to any other virtual interface if the device is part of a chassis cluster.

- Fabric interface—An interface that provides the physical connection between two nodes of a cluster. A fabric interface is formed by connecting a pair of Ethernet interfaces back-to-back (one from each node). The Packet Forwarding Engines of the cluster

uses this interface to transmit transit traffic and to synchronize the runtime state of the data plane software. You must specify the physical interfaces to be used for the fabric interface in the configuration.

Chassis Cluster Limitation

Redundant LAG (RLAG) of reth member interfaces of the same node is not supported. A reth interface with more than one child interface per node is called RLAG.

Example: Configuring a Chassis Cluster on NFX150 Devices

This example shows how to set up chassis clustering on NFX150 devices.

Requirements

Before you begin:

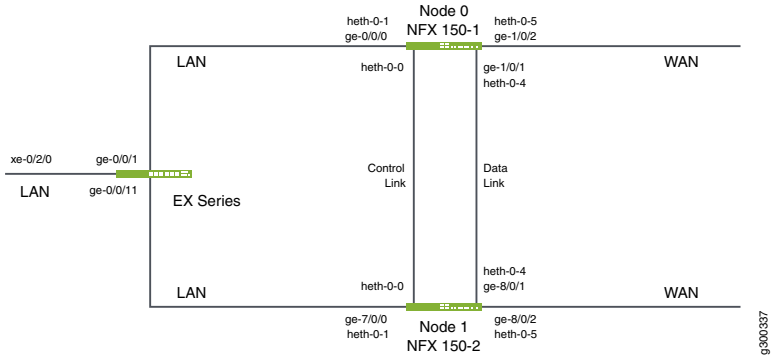
- Physically connect the two devices and ensure that they are the same NFX150 model.
- Ensure that both devices are running the same Junos OS version
- Remove all interface mapping for the control port heth-0-0 on both the nodes.
- Connect the dedicated control port heth-0-0 on node 0 to the heth-0-0 port on node 1.
- Connect the fabric port on node 0 to the fabric port on node 1.

Overview

Figure 9 on page 96 shows the topology used in this example. This example shows how to set up basic active/passive chassis clustering. One device actively maintains control of the chassis cluster. The other device passively maintains its state for cluster failover capabilities in case the active device becomes inactive.

NOTE: This example does not describe in detail miscellaneous configurations such as how to configure security features. They are essentially the same as they would be for standalone configurations.

Figure 9: NFX150 Chassis Cluster



Configuration

Configuring a Chassis Cluster

Step-by-Step Procedure

1. Configure the cluster ID on both the nodes and reboot the devices. A reboot is required to enter into cluster mode after the cluster ID and node ID are set.

   NOTE: You must enter the operational mode to issue the commands on both devices.

   ```
   user@host1> set chassis cluster cluster-id 1 node 0 reboot
   user@host2> set chassis cluster cluster-id 1 node 1 reboot
   ```

   The cluster-id is the same on both devices, but the node ID must be different because one device is node 0 and the other device is node 1. The range for the cluster-id is 0 through 255 and setting it to 0 is equivalent to disabling cluster mode.

2. Verify that the chassis cluster is configured successfully:

   - `user@host1> show chassis cluster status`

   ```
   Monitor Failure codes:
       CS  Cold Sync monitoring        FL  Fabric Connection monitoring
       GR  GRES monitoring             HW  Hardware monitoring
       IF  Interface monitoring        IP  IP monitoring
       LB  Loopback monitoring         MB  Mbuf monitoring
       NH  Nexthop monitoring          NP  NPC monitoring
       SP  SPU monitoring              SM  Schedule monitoring
       CF  Config Sync monitoring      RE  Relinquish monitoring

   Cluster ID: 1
   Node   Priority Status               Preempt Manual   Monitor-failures

   Redundancy group: 0 , Failover count: 0
   ```

```
node0  1        primary             no      no       None
node1  1        secondary           no      no       None
```

- root@NFX150-1> **show chassis cluster information**

```
node0:
--------------------------------------------------------------------------
Redundancy Group Information:

    Redundancy Group 0 , Current State: primary, Weight: 255

        Time            From                To                  Reason
        Mar 15 11:33:47 hold                secondary           Hold
timer expired
        Mar 15 11:34:03 secondary           primary             Only
node present

Chassis cluster LED information:
    Current LED color: Green
    Last LED change reason: No failures

node1:
--------------------------------------------------------------------------
Redundancy Group Information:

    Redundancy Group 0 , Current State: secondary, Weight: 255

        Time            From                To                  Reason
        Mar 15 12:14:49 hold                secondary           Hold
timer expired

Chassis cluster LED information:
    Current LED color: Green
    Last LED change reason: No failures
```

After the chassis cluster is set up, you can enter the configuration mode and perform all the configurations on the primary node, node0.

3. Configure the host names and the out-of-band management IP addresses for nodes 0 and 1:

```
user@host1# set groups node0 system host-name NFX150-1
user@host1# set groups node0 interfaces fxp0 unit 0 family inet address 10.204.41.80/20

user@host1# set groups node1 system host-name NFX150-2
user@host1# set groups node1 interfaces fxp0 unit 0 family inet address 10.204.41.90/20
```

If you are accessing the device from a different subnet other than the one configured for the out-of-band management, then set up a static route

```
user@host1# set groups node0 routing-options static route 0.0.0.0/0 next-hop
10.204.47.254
user@host1# set groups node1 routing-options static route 0.0.0.0/0 next-hop
10.204.47.254
```

4. Map the physical LAN port to the virtual LAN interface on FPC0:


```
user@host1# set groups node0 vmhost virtualization-options interfaces ge-0/0/0 mapping
interface heth-0-1
user@host1# set groups node1 vmhost virtualization-options interfaces ge-7/0/0 mapping
interface heth-0-2
```

NOTE: In a chassis cluster, the FPC1 ports on the secondary node are denoted as ge-8/0/x, and the FPC0 ports are denoted as ge-7/0/x.

5. Map the physical WAN port to the virtual WAN interface on FPC1:

```
user@host1# set groups node0 vmhost virtualization-options interfaces ge-1/0/2 mapping
interface heth-0-5
user@host1# set groups node1 vmhost virtualization-options interfaces ge-8/0/2 mapping
interface heth-0-5
```

6. Configure port peering between the FPC0 and FPC1 on nodes 0 and 1. Port peering ensures that when a LAN interface controlled by the Layer 2 dataplane (FPC0) fails, the corresponding interface on the Layer 3 dataplane (FPC1) is marked down and vice versa. This helps in the failover of the corresponding redundant group to the secondary node.

```
user@host# set groups node0 chassis cluster redundant-interface ge-1/0/0
mapping-interface ge-0/0/0
user@host# set groups node1 chassis cluster redundant-interface ge-8/0/0
mapping-interface ge-7/0/0
```

7. Configure the fabric ports:

```
user@host1# set groups node0 vmhost virtualization-options interfaces ge-1/0/1 mapping
interface heth-0-4
user@host1# set groups node1 vmhost virtualization-options interfaces ge-8/0/1 mapping
interface heth-0-4
user@host1# set interfaces fab0 fabric-options member-interfaces ge-1/0/1
user@host1# set interfaces fab1 fabric-options member-interfaces ge-8/0/1
```

8. Apply the node-specific configurations on nodes 0 and 1:

```
user@host1# set apply-groups "${node}"
```

9. Enable the system to perform control link recovery automatically. After it determines that the control link is healthy, the system issues an automatic reboot on the node that was disabled when the control link failed. When the disabled node reboots, it rejoins the cluster

```
user@host1# set chassis cluster control-link-recovery
```

10. Verify the interfaces:

```
user@host1# run show chassis cluster interfaces
```

Configuring Redundant Groups and Redundant Interfaces

A redundancy group (RG) defines failover properties for a group of devices. When a failure occurs, a RG enables the control plane to fail over to the secondary node. RETH is the redundant interface consisting of two Ethernet links, one from each device in the cluster to form a single logical interface. All logical configurations are tied to the reth interface through the RGs.

Step-by-Step Procedure

1. Configure redundancy groups 0 and 1. RG 0 controls the control plane and it determines the primary node. RG 1 controls the data plane and includes the data plane ports. Each node has interfaces in a redundancy group.

   As part of redundancy group configuration, you must also define the priority for control plane and data plane—which device is preferred for the control plane, and which device is preferred for the data plane. For chassis clustering, higher priority is preferred. The higher number takes precedence.

   In this configuration, node 0 is the active node as it is associated with RG0. You must configure all changes in the cluster through node 0. If node 0 fails, then node 1 will be the active node.

   ```
   user@host1# set chassis cluster redundancy-group 1 node 0 priority 100
   user@host1# set chassis cluster redundancy-group 1 node 1 priority 100
   user@host1# set chassis cluster redundancy-group 2 node 0 priority 100
   user@host1# set chassis cluster redundancy-group 2 node 1 priority 100
   ```

2. Enable preempt for RG1.

   ```
   user@host1# set chassis cluster redundancy-group 1 preempt
   ```

   NOTE: If preempt is added to a redundancy group configuration, the device with the higher priority in the group can initiate a failover to become master. By default, preemption is disabled.

3. Configure the interfaces that the redundancy groups need to monitor to determine whether an interface is up or down.

   By default, redundancy groups have a threshold tolerance value of 255. When an interface monitored by a redundancy group becomes unavailable, its weight is subtracted from the redundancy group's threshold. When a redundancy group's threshold reaches 0, it fails over to the other node.

   ```
   user@host# set chassis cluster redundancy-group 1 interface-monitor ge-1/0/0 weight 255
   user@host# set chassis cluster redundancy-group 1 interface-monitor ge-8/0/0 weight
   255
   user@host# set chassis cluster redundancy-group 2 interface-monitor ge-1/0/2 weight
   255
   user@host# set chassis cluster redundancy-group 2 interface-monitor ge-8/0/2 weight
   255
   ```

4. Configure the data interfaces so that in the event of a data plane failover, the other chassis cluster member can take over the connection seamlessly.

   Define the following parameters:

   - The maximum number of reth interfaces for the cluster, so that the system can allocate the appropriate resources for them.

     ```
     user@host1# set chassis cluster reth-count 5
     ```

   - The heartbeat interval and threshold, which define the wait time before failover is triggered in the chassis cluster.

     ```
     user@host1# set chassis cluster heartbeat-interval 1000
     user@host1# set chassis cluster heartbeat-threshold 5
     ```

   - Membership information of the member interfaces to reth interfaces.

     ```
     user@host# set interfaces ge-1/0/0 gigether-options redundant-parent reth1
     user@host# set interfaces ge-1/0/2 gigether-options redundant-parent reth2
     user@host# set interfaces ge-8/0/0 gigether-options redundant-parent reth1
     user@host# set interfaces ge-8/0/2 gigether-options redundant-parent reth2
     ```

5. Configure the reth interfaces:

   - Configure reth1:

     ```
     user@host1# set interfaces reth1 vlan-tagging
     user@host1# set interfaces reth1 redundant-ether-options redundancy-group 1
     user@host1# set interfaces reth1 unit 0 vlan-id 100
     user@host1# set interfaces reth1 unit 0 family inet address 192.0.3.1/24
     user@host1# set interfaces reth1 unit 0 family inet6 address  2001:db8:1:1::/64
     ```

   - Configure reth2:

     ```
     user@host1# set interfaces reth2 vlan-tagging
     user@host1# set interfaces reth2 redundant-ether-options redundancy-group 2
     user@host1# set interfaces reth2 unit 0 vlan-id 200
     user@host1# set interfaces reth2 unit 0 family inet address · 203.0.113.1/24
     user@host1# set interfaces reth2 unit 0 family inet6 address  2001:db8:2:1::/64
     ```

6. Configure security policies to allow traffic from LAN to WAN, and from WAN to LAN:

   ```
   user@host1# set security policies default-policy permit-all
   user@host1# set security zones security-zone trust host-inbound-traffic system-services
   all
   user@host1# set security zones security-zone trust host-inbound-traffic protocols all
   user@host1# set security zones security-zone trust interfaces all
   ```

Verification

Verifying Chassis Cluster Status

Purpose Verify the status of the chassis cluster and its interfaces.

Action From the operational mode, issue the following commands:

- Verify the status of the cluster:

```
root@NFX150-1> show chassis cluster status
```

```
Monitor Failure codes:
    CS  Cold Sync monitoring        FL  Fabric Connection monitoring
    GR  GRES monitoring             HW  Hardware monitoring
    IF  Interface monitoring        IP  IP monitoring
    LB  Loopback monitoring         MB  Mbuf monitoring
    NH  Nexthop monitoring          NP  NPC monitoring
    SP  SPU monitoring              SM  Schedule monitoring
    CF  Config Sync monitoring      RE  Relinquish monitoring

Cluster ID: 1
Node   Priority Status               Preempt Manual   Monitor-failures

Redundancy group: 0 , Failover count: 0
node0  1        primary              no      no       None
node1  1        secondary            no      no       None

Redundancy group: 1 , Failover count: 0
node0  100      primary              yes     no       None
node1  100      secondary            yes     no       None

Redundancy group: 2 , Failover count: 0
node0  100      primary              no      no       None
node1  100      secondary            no      no       None
```

- Verify the redundancy groups:

```
root@NFX150-1> show chassis cluster information
```

```
node0:
--------------------------------------------------------------------------
Redundancy Group Information:

    Redundancy Group 0 , Current State: primary, Weight: 255

        Time            From                To                  Reason
        Mar 21 12:06:18 hold                secondary           Hold timer
expired
        Mar 21 12:18:46 secondary           primary             Remote node
reboot

    Redundancy Group 1 , Current State: primary, Weight: 255

        Time            From                To                  Reason
        Mar 21 12:06:19 hold                secondary           Hold timer
expired
        Mar 21 12:08:51 secondary           primary             Remote is in
 secondary hold

    Redundancy Group 2 , Current State: primary, Weight: 255

        Time            From                To                  Reason
        Mar 21 12:06:19 hold                secondary           Hold timer
expired
        Mar 21 12:18:46 secondary           primary             Remote node
```

```
reboot

Chassis cluster LED information:
    Current LED color: Green
    Last LED change reason: No failures

node1:
--------------------------------------------------------------------------
Redundancy Group Information:

    Redundancy Group 0 , Current State: secondary, Weight: 255

        Time            From                To                  Reason
        Mar 21 13:02:05 hold                secondary           Hold timer
expired

    Redundancy Group 1 , Current State: secondary, Weight: 255

        Time            From                To                  Reason
        Mar 21 13:02:05 hold                secondary           Hold timer
expired

    Redundancy Group 2 , Current State: secondary, Weight: 255

        Time            From                To                  Reason
        Mar 21 13:02:06 hold                secondary           Hold timer
expired

Chassis cluster LED information:
    Current LED color: Green
    Last LED change reason: No failures
```

- Verify the status of the interfaces:

```
root@NFX150-1> show chassis cluster interfaces
Control link status: Up

Control interfaces:
    Index   Interface   Monitored-Status   Internal-SA   Security
    0       em1         Up                 Disabled      Disabled

Fabric link status: Up

Fabric interfaces:
    Name    Child-interface    Status                    Security
                               (Physical/Monitored)
    fab0    ge-1/0/1           Up   / Up                 Disabled
    fab0
    fab1    ge-8/0/1           Up   / Up                 Disabled
    fab1

Redundant-ethernet Information:
    Name         Status      Redundancy-group
    reth0        Down        Not configured
    reth1        Down        1
    reth2        Down        2
    reth3        Down        Not configured
    reth4        Down        Not configured
```

```
Redundant-pseudo-interface Information:
    Name         Status      Redundancy-group
    lo0          Up          0

Interface Monitoring:
    Interface         Weight    Status                    Redundancy-group
                                (Physical/Monitored)
    ge-8/0/0          255       Up  /  Up                 1
    ge-1/0/0          255       Up  /  Up                 1
    ge-8/0/2          255       Up  /  Up                 2
    ge-1/0/2          255       Up  /  Up                 2
```

- Verify the status of the port peering interfaces:

```
root@NFX150-1> show chassis cluster port-peering
node0:
--------------------------------------------------------------------------

Port peering interfaces:
    Backend L3                Mapped Peer L2
    Interface  Status         Interface  Status
    ge-1/0/0    Up            ge-0/0/0   Up

node1:
--------------------------------------------------------------------------

Port peering interfaces:
    Backend L3                Mapped Peer L2
    Interface  Status         Interface  Status
    ge-8/0/0    Up            ge-7/0/0   Up
```

Related Documentation

- Monitoring of Global-Level Objects in a Chassis Cluster
- Monitoring Chassis Cluster Interfaces
- Monitoring IP Addresses on a Chassis Cluster
- Configuring Cluster Failover Parameters
- Chassis Cluster Redundancy Group Failover

Upgrading or Disabling a Chassis Cluster on NFX150 Devices

Upgrading Individual Devices in a Chassis Cluster Separately

Devices in a chassis cluster can be upgraded separately one at a time.

NOTE: During this type of chassis cluster upgrade, a service disruption of about 3 to 5 minutes occurs.

To upgrade each device in a chassis cluster separately:

1. Load the new image file on node 0.
2. Perform the image upgrade without rebooting the node by entering:

   `user@host>` **request vmhost software add *image_name***

3. Load the new image file on node 1.
4. Repeat Step 2.
5. Reboot both nodes simultaneously.

Disabling a Chassis Cluster

If you want to operate the device as a standalone device or remove a node from a chassis cluster, you must disable the chassis cluster.

To disable a chassis cluster, enter the following command:

```
{primary:node1}
```

`user@host>` **set chassis cluster disable reboot**

After the system reboots, the chassis cluster is disabled.

NOTE: You can also disable the chassis cluster by setting the cluster-id to zero on both the nodes:

`user@host>`**set chassis cluster cluster-id 0 node 0 reboot**
`user@host>`**set chassis cluster cluster-id 0 node 1 reboot**

CHAPTER 7

Configuring Service Chaining

Service Chaining on NFX150 Devices

Understanding Service Chaining

In many network environments, it is common for traffic to flow through several *network services* on the way to its destination. These services—firewalls, Network Address Translators (NAT), load balancers, and so on—are generally spread across multiple network elements. Each device is a separate piece of hardware, providing a different service, and requiring separate operation and management. This method of linking together multiple network functions could be thought of as *physical service chaining*.

A more efficient model for service chaining is to virtualize and consolidate network functions onto a single device.

Virtualized service chaining is supported on NFX150 devices starting with Junos OS Release 18.1. Virtual network functions (VNFs) can be installed and linked together to provide L2, L3, and L4-L7 services for traffic flowing through the device.

Configuring Service Chaining Using VLANs

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

To configure service chaining:

1. Create a VLAN. Use one of the following commands:
   - Create a VLAN without a VLAN ID. You can add only access ports to this VLAN:

     set vmhost vlans *vlan-name* vlan-id none

   - Create a VLAN with a VLAN ID:

     set vmhost vlans *vlan-name* vlan-id *vlan-id*

   - Create a VLAN using a list of VLAN IDs:

     set vmhost vlans *vlan-name* vlan-id-list *vlan-id range* | *comma-separated list*

2. Attach an interface on the VNF to the VLAN:

   set virtual-network-functions *vnf-name* interfaces eth*x* mapping vlan mode [access|trunk]
   set virtual-network-functions *vnf-name* interfaces eth*x* mapping vlan members *list*

3. Attach a native VLAN ID to the VNF interface:

   set virtual-network-functions *vnf-name* interfaces eth*x* mapping vlan native-vlan-id *vlan-id*

Configuring Service Chaining Using DHCP Services on VLANs

Using DHCP services, you need not manually configure the IP addresses on the VNF interfaces to achieve service-chaining. Enable DHCP clients on the glue bridge interfaces within the VNF for an IP address to be assigned from the DHCP pool.

To configure service chaining:

1. Create a VLAN with a VLAN ID **none**.

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

   NOTE: To use the DHCP pooling feature, the VLAN ID must be set to none.

2. Specify the IP address pool to be used:

   ```
   user@host#  set access address-assignment pool p4 family inet network network-address
   user@host#  set access address-assignment pool p4 family inet range r4 low start-IP-address
   user@host#  set access address-assignment pool p4 family inet range r4 high end-IP-address
   ```

3. Attach an interface from FPC1 to the VLAN:

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

4. Configure an IP address on the interface and enable dhcp-server on it.

   ```
   user@host# set interface ge-1/0/x unit 0 family inet address address/prefix-length
   user@host# set system services dhcp-local-server group grp1 interface ge-1/0/x
   ```

5. Attach an interface on the VNF to the VLAN to complete the service chain:

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

6. Enable the DHCP client on the VNF.

To check the assigned IP address, use the *show system visibility vnf* command.

Example: Configuring Service Chaining Using VLANs on NFX150 Network Services Platform

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

Requirements

This example uses the following hardware and software components:

- NFX150 running Junos OS Release 18.1R1

Before you configure service chaining, be sure you have:

- Installed and launched the relevant VNFs, assigned the corresponding interfaces, and configured the resources.

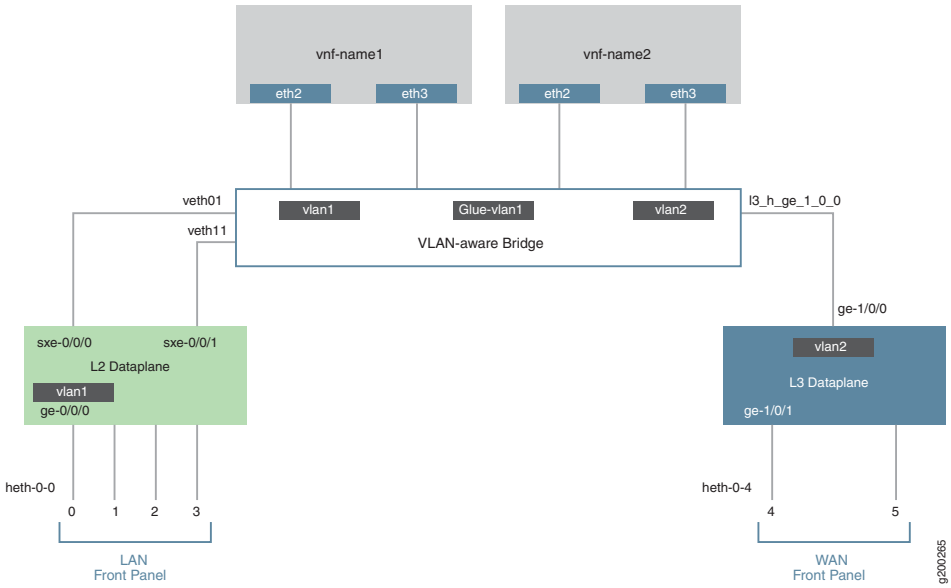
Overview

Service chaining on a device running the disaggregated Junos OS allows multiple services, or virtual network functions (VNFs), to be applied to traffic as it 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 device running the disaggregated Junos OS, as shown in Figure 10 on page 108.

Figure 10: Service Chaining Using VLANs



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

- The front panel ports.
- The internal-facing ports.
- The VM interfaces. VNF interfaces must use the format eth#, where # is from 0 through 9.
- VLANs, to provide bridging between the sxe and VM interfaces.

Configuration

- Configuring the Interfaces on page 108
- Configuring the VNF Interfaces and Creating the Service Chain on page 111

Configuring the Interfaces

Step-by-Step Procedure

To configure the interfaces:

1. Connect to the JCP.

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

2. Map the physical (heth) interfaces to the virtual (ge) interfaces.

```
user@jcp# set vmhost virtualization-options interfaces ge-0/0/2 mapping interface
heth-0-2
user@jcp# set vmhost virtualization-options interfaces ge-1/0/1 mapping interface heth-0-4
```

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

```
user@jcp# 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 could be a trunk port if appropriate.

```
user@jcp# set interfaces ge-0/0/2.0 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@jcp# set interfaces sxe-0/0/0.0 family ethernet-switching interface-mode trunk
user@jcp# set interfaces sxe-0/0/0.0 family ethernet-switching vlan members vlan1
```

6. Configure the WAN side front panel port with vlan-tagging and an IP address:

```
user@jcp# set interfaces ge-1/0/1 vlan-tagging
user@jcp# set interfaces ge-1/0/1.0 vlan-id 1178
user@jcp#  set interfaces ge-1/0/1.0 family inet address 192.0.2.1/24
```

7. Configure the WAN side internal-facing interface as a vlan-tagged interface and assign an IP address to it:

```
user@jcp# set interfaces ge-1/0/0 vlan-tagging
user@jcp# set interfaces ge-1/0/0.0 vlan-id 1177
user@jcp#  set interfaces ge-1/0/0.0 family inet address 203.0.113.2/24
```

8. Commit the configuration.

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

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

```
[edit]
user@host# show interfaces ge-0/0/2
```

```
mtu 9192;
unit 0 {
    family ethernet-switching {
        vlan {
            members [ default 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 vlans
```

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

Configuring the VNF Interfaces and Creating the Service Chain

Step-by-Step Procedure

Once you have completed the configuration on JCP, you need to:

1. Configure the vmhost instance with either with LAN, WAN, or glue-vlan to be used for service chaining

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

2. Bring up the VNF (vnf-name1) with one virtio interface mapped to VLAN, and another interface mapped to glue-vlan.

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

3. Similarly bring up the second VNF (vnf-name2) with one interface mapped to VLAN2, and the second interface mapped to the same glue-vlan.

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

4. Finally, configure the IP addresses and static routes for each interface of the VNFs as shown in Figure 10 on page 108.

Related Documentation

- *Understanding Service Chaining on Disaggregated Junos OS Platforms*
- *Disaggregated Junos OS VMs*
- *Understanding Virtio Usage*

Example: Configuring Service Chaining Using SR-IOV on NFX150 Network Services Platform

This example shows how to configure service chaining using SR-IOV on NFX150 platforms.

Requirements

This example uses the following hardware and software components:

- NFX150 running Junos OS Release 18.1R1

Before you configure service chaining, be sure you have:

- Installed and launched the relevant VNFs

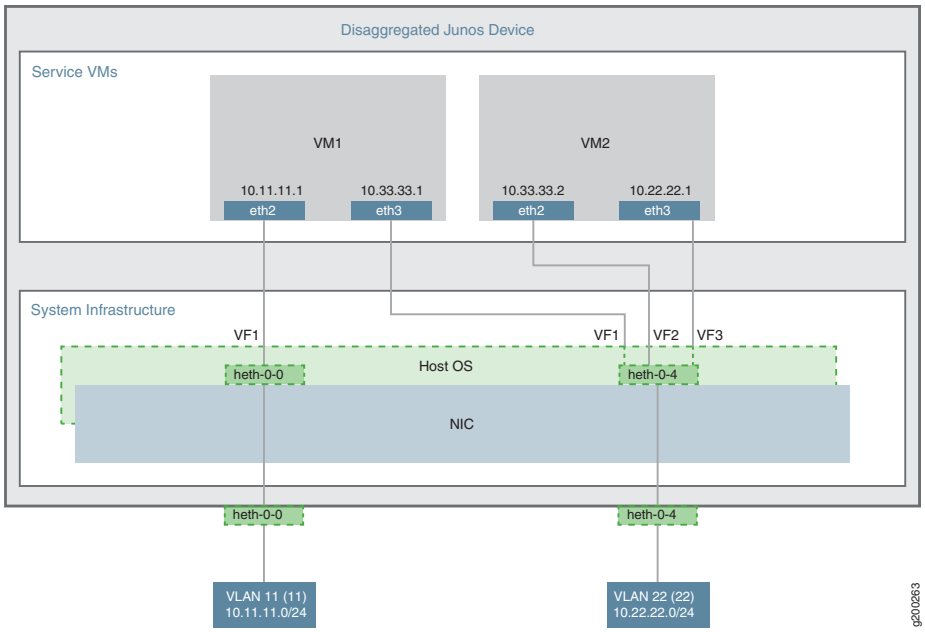
Overview

Service chaining on a device running the disaggregated Junos OS allows multiple services, or virtual network functions (VNFs), to be applied to traffic as it 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 device running the disaggregated Junos OS, as shown in Figure 11 on page 112.

Figure 11: Service Chaining Using SR-IOV—Device Infrastructure



This example uses the front panel ports heth-0-0 and heth-0-4. The VMs use two interfaces each, eth2 and eth3.

These elements are generally separated into two parts: a *LAN side* and a *WAN side*.

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

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

- The front panel ports, heth-0-0 and heth-0-4.
- The internal-facing ports, sxe-0/0/0 and sxe-0/0/1.
- The VNF interfaces. VNF interfaces must use the format eth#, where # is from 0 through 9.
- The virtual function setting, to indicate SR-IOV is being used to provide direct access between the sxe and VNF interfaces.

Configuration

This example describes:

Configuring the Packet Forwarding Engine Interfaces

CLI Quick Configuration

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

```
[edit]
user@jcp#
```

```
set vlans Vlan11 vlan-id 11
set interfaces ge-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 ge-1/0/1 family ethernet-switching interface-mode trunk
set interfaces ge-1/0/1 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. Connect to the JCP.

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

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

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

3. Configure the Packet Forwarding Engine's LAN-side front panel port, and add it to the LAN-side VLAN.

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

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

4. Configure the Packet Forwarding Engine's 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@jcp# set interfaces sxe-0/0/0.0 family ethernet-switching interface-mode trunk
   user@jcp# set interfaces sxe-0/0/0.0 family ethernet-switching vlan member Vlan11
   ```

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

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

6. Configure the Packet Forwarding Engine's 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@jcp# set interfaces ge-1/0/1 family ethernet-switching interface-mode trunk
   user@jcp# set interfaces ge-1/0/1 family ethernet-switching vlan members Vlan22
   ```

7. Configure the Packet Forwarding Engine's WAN-side internal-facing interface as a trunk port, and add it 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@jcp# set interfaces sxe-0/0/1.0 family ethernet-switching interface-mode trunk
   user@jcp# set interfaces sxe-0/0/1.0 family ethernet-switching vlan members Vlan22
   ```

8. Commit the configuration.

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

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

```
[edit]
user@jcp# show interfaces ge-0/0/0
unit 0 {
   family ethernet-switching {
      vlan {
         members Vlan11;
      }
   }
}

[edit]
user@jcp# show interfaces ge-1/0/1
unit 0 {
   family ethernet-switching {
      interface-mode trunk;
      vlan {
         members Vlan22;
      }
   }
}

[edit]
user@jcp# show interfaces sxe-0/0/0
unit 0 {
   family ethernet-switching {
      interface-mode trunk;
      vlan {
         members Vlan11;
      }
   }
}

[edit]
user@jcp# show interfaces sxe-0/0/1
unit 0 {
   family ethernet-switching {
      interface-mode trunk;
      vlan {
         members Vlan22;
      }
   }
}

[edit]
user@jcp# show vlans
Vlan11 {
   vlan-id 11;
}
Vlan22 {
   vlan-id 22;
```

```
}
```

Creating the Service Chain

Step-by-Step Procedure

To configure the VNF interfaces and create the service chain:

1. Configure *vnf-name1'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. VNF must use the interfaces from eth0 through eth9.

   The heth interface is the configurable representation of the related NIC interface.

   ```
   user@jcp> configure
   [edit]
   user@jcp# set virtual-network-functions vnf-name1 interfaces eth2 mapping heth-0-0
   virtual-function
   ```

2. Configure the *vnf-name1's* WAN-side interface from the eth3 VNF interface as shown in Figure 11 on page 112.

   ```
   user@jcp# set virtual-network-functions vnf-name1 interfaces eth3 mapping heth-0-4
   virtual-function
   ```

3. Similarly bring up *vnf-name2* with both interfaces eth2 and eth3 on heth-0-4.

   ```
   user@jcp# set virtual-network-functions vnf-name2 interfaces eth2 mapping heth-0-4
   virtual-function
   user@jcp# set virtual-network-functions vnf-name2 interfaces eth3 mapping heth-0-4
   virtual-function
   ```

4. Finally, configure the IP addresses and static routes for each interface of the VNFs, and add routes to achieve the 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

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

Requirements

This example uses the following hardware and software components:

- NFX150 running Junos OS Release 18.1R1

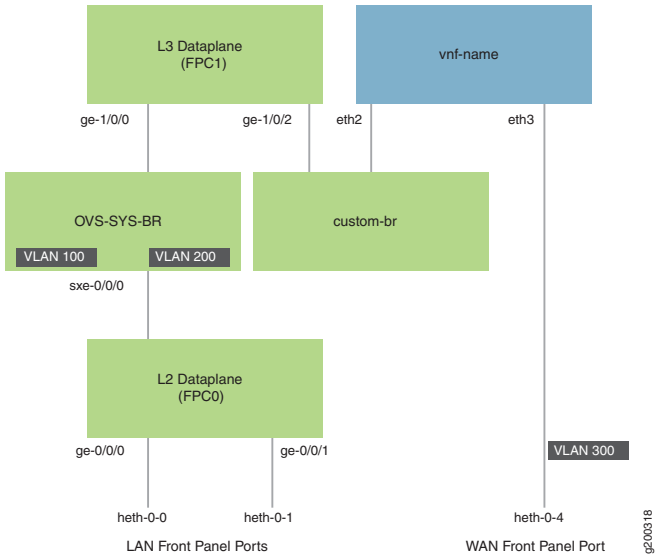
Overview

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

Topology

This example uses the topology shown in Figure 12 on page 117.

Figure 12: Service Chaining Using a Custom Bridge



Configuration

- Create VLANs and the Custom Bridge on page 118
- Map the Interfaces on page 118
- Configure the Layer 2 Datapath on page 118
- Configure the Layer 3 Datapath on page 119
- Configure the VNF on page 119

Create VLANs and 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
```

Map the Interfaces

Step-by-Step Procedure

1. Map the heth-0-0 physical port to the FPC0 interface.

```
user@host# set vmhost virtualization-options interfaces ge-0/0/0 mapping interface
heth-0-0
```

2. Map the heth-0-1 physical port to the FPC0 interface.

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

3. Map the FPC1 interface ge-1/0/1 to the system bridge OVS.

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

4. Map the FPC1 interface ge-1/0/2 to the custom bridge.

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

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 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
```

Configure the Layer 3 Datapath

Step-by-Step Procedure

1. 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 100
user@host# set interfaces ge-1/0/1 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
```

Configure the VNF

Step-by-Step Procedure

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. Create a VNF interface on the custom OVS bridge:

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

5. Attach a VNF interface to a physical interface by using the SR-IOV virtual function:

```
user@host# set virtual-network-functions vnf-name interfaces eth3 mapping interface
heth-0-4 virtual-function vlan-id 300
```

6. Specify the memory allocation for the VNF:

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

Verifying the Configuration

Verify the Control Plane Configuration

Purpose Verify the control plane configuration:

Action To verify the control plane configuration:

- 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                  custom-br
                                                          ge-1/0/2.0
vmhost                  vlan200              200
```

- Verify that the VNF is operational. View the status of the VNF to ensure that the VNF is up and running.

```
user@host# show virtual-network-functions vnf-name
ID       Name                                              State      Liveliness
-------------------------------------------------------------------------------
1        vjunos0                                             Running    alive
2        centos1                                             Running    alive
3        centos2                                             Running    alive
11057    LTE                                                 Running    alive
```

The **Liveliness** output field of the VNF indicates whether the IP address of the VNF is reachable or not reachable from JCP.

To view more details of the VNF:

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

Verify the Data Plane Configuration

Purpose Verify the data plane configuration.

Action To verify the data plane configuration:

- Verify the status of the physical ports.

```
user@host> show interfaces heth-0-0 statistics
```

```
Physical interface: heth-0-0, 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:00:53:8d, Hardware address: 00:00:5e:00:53:8d
    Input packets : 272469
    Output packets: 674
  MAC statistics:
    Input bytes: 17438016, Input packets: 272469, Output bytes: 48658, Output
packets: 674
  VF statistics:
    VF Number: 0, PCI Address: 0000:02:10:1, Mapped to: ge-0/0/0
      Input bytes: 17433984, Input packets: 272406, Output bytes: 48658, Output
 packets: 674, Multicast packets: 272406
    VF Number: 1, PCI Address: 0000:02:10:5, Mapped to: ge-0/0/0
      Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
    VF Number: 2, PCI Address: 0000:02:11:1, Mapped to: ge-0/0/0
      Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
    VF Number: 3, PCI Address: 0000:02:11:5, Mapped to: ge-0/0/0
      Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
```

- 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 (1d 22:28 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 : 125892
  Output packets: 22
  Protocol eth-switch, MTU: 9192
    Flags: Is-Primary
```

Example: Configuring Service Chaining for LAN-WAN Routing

This example shows how to configure service chaining for LAN-WAN routing.

Requirements

This example uses the following hardware and software components:

- NFX150 running Junos OS Release 18.1R1

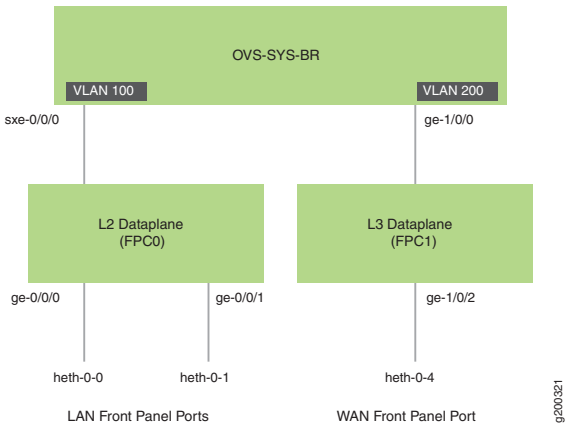
Overview

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 117.

Figure 13: Service Chaining Using a Custom Bridge



Configuration

Map the Interfaces

Step-by-Step Procedure

1. Map the heth-0-0 physical port to the FPC0 interface.

   ```
   user@host# set vmhost virtualization-options interfaces ge-0/0/0 mapping interface heth-0-0
   ```

2. Map the heth-0-1 physical port to the FPC0 interface.

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

3. Map the FPC1 interface ge-1/0/2 to the physical port heth-0-4.

   ```
   user@host# set vmhost virtualization-options interfaces ge-1/0/2 mapping interface heth-0-4
   ```

Configure 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@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
   ```

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
   ```

Configure 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
```

Verification

- Verifying the Status of the Interfaces on page 124

Verifying the Status of the Interfaces

Purpose Verify the status of the Layer 2 and Layer 3 interfaces.

Action To verify the status of the interfaces:

- Verify the status of the physical ports.

```
user@host> show interfaces heth-0-0 statistics
Physical interface: heth-0-0, 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:00:53:8d, Hardware address: 00:00:5e:00:53:8d
    Input packets : 272469
    Output packets: 674
  MAC statistics:
    Input bytes: 17438016, Input packets: 272469, Output bytes: 48658, Output
packets: 674
  VF statistics:
    VF Number: 0, PCI Address: 0000:02:10:1, Mapped to: ge-0/0/0
      Input bytes: 17433984, Input packets: 272406, Output bytes: 48658, Output
 packets: 674, Multicast packets: 272406
    VF Number: 1, PCI Address: 0000:02:10:5, Mapped to: ge-0/0/0
      Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
    VF Number: 2, PCI Address: 0000:02:11:1, Mapped to: ge-0/0/0
      Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
    VF Number: 3, PCI Address: 0000:02:11:5, Mapped to: ge-0/0/0
      Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
```

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

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

For example:

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

```
Physical interface: ge-0/0/0, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 518
  Link-level type: Ethernet, MTU: 9192, LAN-PHY mode, Speed: 1000mbps,
  BPDU Error: None, Loop Detect PDU Error: None, Ethernet-Switching Error: None,

  MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled,
  Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 00:00:5e:00:53:43, Hardware address: 00:00:5e:00:53:43
  Last flapped   : 2018-04-18 05:38:22 UTC (2d 10:07 ago)
  Statistics last cleared: Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Input errors: 0, Output errors: 0
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                             0
    Errored blocks                         0
  Ethernet FEC statistics              Errors
    FEC Corrected Errors                    0
    FEC Uncorrected Errors                  0
    FEC Corrected Errors Rate               0
    FEC Uncorrected Errors Rate             0
  PRBS Statistics : Disabled
  Interface transmit statistics: Disabled

  Logical interface ge-0/0/0.0 (Index 333) (SNMP ifIndex 524)
    Flags: Up SNMP-Traps 0x24024000 Encapsulation: Ethernet-Bridge
    Input packets : 147888
    Output packets: 22
    Protocol eth-switch, MTU: 9192
      Flags: Is-Primary
```

Example: Configuring Cross Connect on NFX150 Devices

This example shows how to configure cross-connect on NFX150 devices.

Requirements

This example uses the following hardware and software components:

- NFX150 running Junos OS Release 18.1R1

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.**

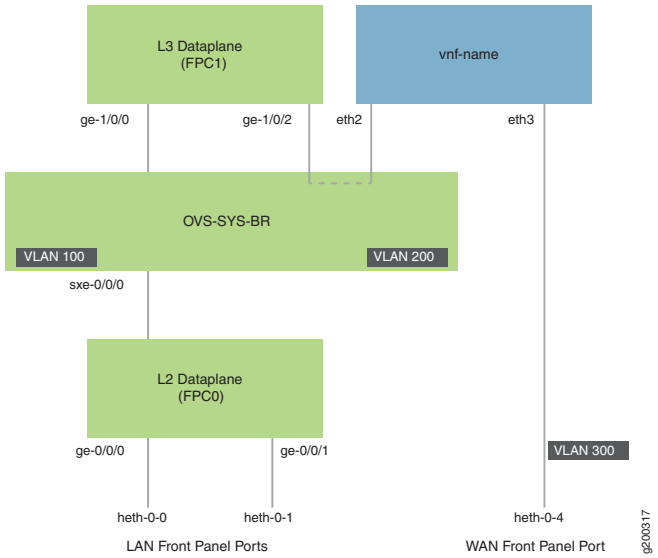
The **Cross-connect** feature supports the following:

- 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 network traffic flow from trunk to access port through POP operation.
  - Supports network traffic flow from access to trunk port through PUSH operation.
  - Supports VLAN PUSH, POP, and SWAP operations.

Topology

This example uses the topology shown in Figure 12 on page 117.

Figure 14: Configuring Cross-Connect



Configuration

Create VLANs

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 a VLAN for the WAN-side interface.

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

Map the Interfaces

Step-by-Step Procedure

1. Map the heth-0-0 physical port to the FPC0 interface.

   ```
   user@host# set vmhost virtualization-options interfaces ge-0/0/0 mapping interface heth-0-0
   ```

2. Map the heth-0-1 physical port to the FPC0 interface.

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

3. Map the FPC1 interface ge-1/0/2 to the system bridge OVS.

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

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
```

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
```

Configure 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
```

Configure the VNF

Step-by-Step Procedure

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. Create a host VLAN:

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

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
```

6. Attach a VNF interface to a physical interface by using the SR-IOV virtual function:

```
user@host# set virtual-network-functions vnf-name interfaces eth3 mapping interface
heth-0-4 virtual-function vlan-id 300
```

7. Specify the memory allocation for the VNF:

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

Configure 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

- Verify the Control Plane Configuration on page 129
- Verify the Data Plane Configuration on page 130

Verify the Control Plane Configuration

Purpose Verify the control plane configuration:

Action To verify the control plane configuration:

- 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                  custom-br
                                                          ge-1/0/2.0
vmhost                  vlan200              200
```

- Verify that the VNF is operational. View the status of the VNF to ensure that the VNF is up and running.

```
user@host# show virtual-network-functions vnf-name
ID       Name                                              State      Liveliness
------------------------------------------------------------------------------
2        VNF                                             Running    alive
```

The **Liveliness** output field of the VNF indicates whether the IP address of the VNF is reachable or not reachable from JCP.

To view more details of the VNF:

```
user@host# show virtual-network-functions vnf-name detail
Virtual Network Function Information
------------------------------------

Id:                 2
Name:               VNF
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
```

Verify the Data Plane Configuration

Purpose Verify the data plane configuration.

Action To verify the data plane configuration:

- Verify the status of the physical ports.

```
user@host> show interfaces heth-0-0 statistics
Physical interface: heth-0-0, 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:00:53:8d, Hardware address: 00:00:5e:00:53:8d
    Input packets : 311143
    Output packets: 674
  MAC statistics:
    Input bytes: 19913152, Input packets: 311143, Output bytes: 48658, Output
packets: 674
  VF statistics:
    VF Number: 0, PCI Address: 0000:02:10:1, Mapped to: ge-0/0/0
      Input bytes: 19909120, Input packets: 311080, Output bytes: 48658, Output
 packets: 674, Multicast packets: 311080
    VF Number: 1, PCI Address: 0000:02:10:5, Mapped to: ge-0/0/0
```

```
     Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
    VF Number: 2, PCI Address: 0000:02:11:1, Mapped to: ge-0/0/0
     Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
    VF Number: 3, PCI Address: 0000:02:11:5, Mapped to: ge-0/0/0
     Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
```

- 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 (6d 00:28 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 : 311115
    Output packets: 22
    Protocol eth-switch, MTU: 9192
      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: 158, SNMP ifIndex: 536
```

```
  Link-level type: Ethernet, MTU: 1518, LAN-PHY mode, Link-mode: Full-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: 00:00:5e:00:53:5d, Hardware address: 00:00:5e:00:53:5d
  Last flapped   : 2018-04-23 06:03:29 UTC (1d 00:04 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-1/0/2.0 (Index 342) (SNMP ifIndex 538)
    Flags: Up SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.200 ]  Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Security: Zone: untrust
    Allowed host-inbound traffic : dns dhcp tftp https
    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

    Protocol multiservice, MTU: Unlimited

  Logical interface ge-1/0/2.32767 (Index 343) (SNMP ifIndex 545)
    Flags: Up SNMP-Traps 0x4004000 VLAN-Tag [ 0x0000.0 ]  Encapsulation: ENET2

    Input packets : 0
    Output packets: 0
    Security: Zone: Null
    Protocol multiservice, MTU: Unlimited
      Flags: None
```

Related Documentation

- Example: Configuring Cross-Connect Using a Custom Bridge on NFX150 Devices on page 135

Example: Configuring Service Chaining for LAN Routing

This example shows how to configure service chaining for LAN routing.

Requirements

This example uses the following hardware and software components:

- NFX150 running Junos OS Release 18.1R1

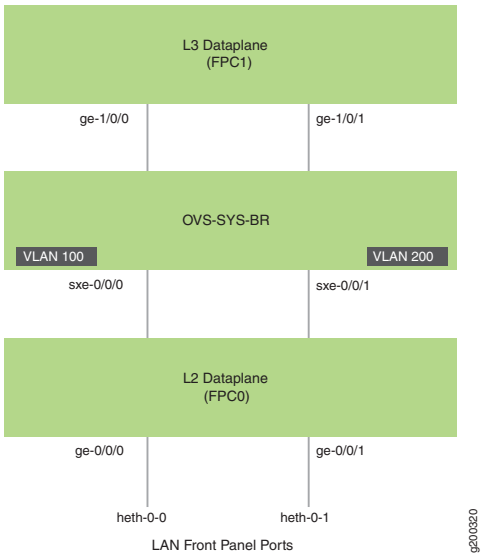
Overview

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 12 on page 117.

Figure 15: Service Chaining for LAN Routing



Configuration

Map the Interfaces

Step-by-Step Procedure

1. Map the heth-0-0 physical port to the FPC0 interface.

```
user@jcp# set vmhost virtualization-options interfaces ge-0/0/1 mapping interface
heth-0-0
```

2. Map the heth-0-1 physical port to the FPC0 interface.

```
user@jcp# set vmhost virtualization-options interfaces ge-0/0/2 mapping interface
heth-0-1
```

Configure the Layer 2 Datapath

Step-by-Step Procedure

1. Configure VLANs for the LAN-side interfaces.

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

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

```
user@jcp# set interfaces ge-0/0/1 unit 0 family ethernet-switching interface-mode trunk
user@jcp# set interfaces ge-0/0/1 unit 0 family ethernet-switching vlan members vlan100
user@jcp# set interfaces ge-0/0/2 unit 0 family ethernet-switching interface-mode trunk
user@jcp# set interfaces ge-0/0/2 unit 0 family ethernet-switching vlan members vlan100
```

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

Configure the Layer 3 Datapath

Step-by-Step Procedure

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

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

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

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

Related Documentation

- Example: Configuring Service Chaining for LAN-WAN Routing on page 122

Example: Configuring Cross-Connect Using a Custom Bridge on NFX150 Devices

This example shows how to configure cross-connect using a custom bridge on NFX150 devices.

Requirements

This example uses the following hardware and software components:

- NFX150 running Junos OS Release 18.1R1

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.**

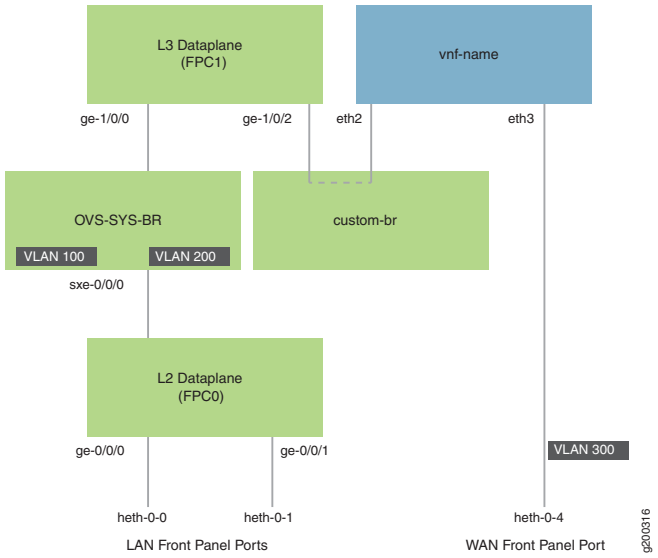
The **Cross-connect** feature supports the following:

- 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 network traffic flow from trunk to access port through POP operation.
  - Supports network traffic flow from access to trunk port through PUSH operation.
  - Supports VLAN PUSH, POP, and SWAP operations.

Topology

This example uses the topology shown in Figure 12 on page 117.

Figure 16: Configuring Cross-Connect



Configuration

Create VLANs

Step-by-Step Procedure

1. Configure VLANs for the LAN-side interfaces.

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

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

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

Map the Interfaces

Step-by-Step Procedure

1. Map the heth-0-0 physical port to the FPC0 interface.

   ```
   user@jcp# set vmhost virtualization-options interfaces ge-0/0/0 mapping interface heth-0-0
   ```

2. Map the heth-0-1 physical port to the FPC0 interface.

```
user@jcp# set vmhost virtualization-options interfaces ge-0/0/1 mapping interface heth-0-1
```

3. Map the FPC1 interface ge-1/0/2 to the custom bridge.

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

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

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

Configure the Layer 3 Datapath

Step-by-Step Procedure

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

```
user@jcp# set interfaces ge-1/0/0 vlan-tagging
user@jcp# set interfaces ge-1/0/0 unit 0 vlan-id 100
user@jcp# 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@jcp# set interfaces ge-1/0/2 vlan-tagging
user@jcp# set interfaces ge-1/0/2 unit 0 vlan-id 200
user@jcp# set interfaces ge-1/0/2 unit 0 family inet address 203.0.113.2/24
```

Configure the VNF

Step-by-Step Procedure

1. Launch the VNF:

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

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

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

3. Pin a virtual CPU to a physical CPU:

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

4. Create a host VLAN:

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

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

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

6. Attach a VNF interface to a physical interface by using the SR-IOV virtual function:

```
user@jcp# set virtual-network-functions vnf-name interfaces eth3 mapping interface
heth-0-4 virtual-function vlan-id 300
```

7. Specify the memory allocation for the VNF:

```
user@jcp# set virtual-network-functions memory size 1048576
```

Configure Cross-Connect

Step-by-Step Procedure

1. Configure cross-connect:

```
user@jcp# set vmhost cross-connect c1 virtual-interface ge-1/0/2
user@jcp# set vmhost cross-connect c1 virtual-network-function vnf-name interface eth2
```

Verifying the Configuration

Verify the Control Plane Configuration

Purpose Verify the control plane configuration:

Action To verify the control plane configuration:

- 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                  custom-br
                                                          ge-1/0/2.0
vmhost                  vlan200              200
```

- Verify that the VNF is operational. View the status of the VNF to ensure that the VNF is up and running.

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

```
ID       Name                                                State      Liveliness
-------------------------------------------------------------------------------
2        VNF                                               Running    alive
```

The **Liveliness** output field of the VNF indicates whether the IP address of the VNF is reachable or not reachable from JCP.

To view more details of the VNF:

```
user@host# show virtual-network-functions VNF detail
```

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

Id:                 2
Name:               VNF
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
```

Verify the Data Plane Configuration

Purpose Verify the data plane configuration.

Action To verify the data plane configuration:

- Verify the status of the physical ports.

```
user@host> show interfaces heth-0-0 statistics
```

```
Physical interface: heth-0-0, 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:00:53:8d, Hardware address: 00:00:5e:00:53:8d
    Input packets : 311143
    Output packets: 674
  MAC statistics:
    Input bytes: 19913152, Input packets: 311143, Output bytes: 48658, Output
packets: 674
  VF statistics:
    VF Number: 0, PCI Address: 0000:02:10:1, Mapped to: ge-0/0/0
      Input bytes: 19909120, Input packets: 311080, Output bytes: 48658, Output
 packets: 674, Multicast packets: 311080
    VF Number: 1, PCI Address: 0000:02:10:5, Mapped to: ge-0/0/0
      Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
    VF Number: 2, PCI Address: 0000:02:11:1, Mapped to: ge-0/0/0
      Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
```

```
    VF Number: 3, PCI Address: 0000:02:11:5, Mapped to: ge-0/0/0
      Input bytes: 0, Input packets: 0, Output bytes: 0, Output packets: 0,
Multicast packets: 0
```

- 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 (6d 00:28 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 : 311115
    Output packets: 22
    Protocol eth-switch, MTU: 9192
      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: 158, SNMP ifIndex: 536
  Link-level type: Ethernet, MTU: 1518, LAN-PHY mode, Link-mode: Full-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: 00:00:5e:00:53:5d, Hardware address: 00:00:5e:00:53:5d
  Last flapped   : 2018-04-23 06:03:29 UTC (1d 00:04 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-1/0/2.0 (Index 342) (SNMP ifIndex 538)
    Flags: Up SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.200 ]  Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Security: Zone: untrust
    Allowed host-inbound traffic : dns dhcp tftp https
    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

    Protocol multiservice, MTU: Unlimited

  Logical interface ge-1/0/2.32767 (Index 343) (SNMP ifIndex 545)
    Flags: Up SNMP-Traps 0x4004000 VLAN-Tag [ 0x0000.0 ]  Encapsulation: ENET2

    Input packets : 0
    Output packets: 0
    Security: Zone: Null
    Protocol multiservice, MTU: Unlimited
      Flags: None
```

Related Documentation

- Example: Configuring Cross Connect on NFX150 Devices on page 125

CHAPTER 8

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 146

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 9

Operational Commands

- request chassis cluster failover node
- request chassis cluster failover redundancy-group
- request chassis cluster failover reset
- request chassis fpc
- 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 chassis cluster control-plane statistics
- show chassis cluster data-plane interfaces
- show chassis cluster data-plane statistics
- show chassis cluster information
- show chassis cluster interfaces
- show chassis cluster statistics
- show chassis cluster status
- 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 chassis cluster failover node

Syntax

```
request chassis cluster failover node node-number
redundancy-group group-number
```

Release Information Command introduced in Junos OS Release 9.0.

Description For chassis cluster configurations, initiate manual failover in a redundancy group from one node to the other, which becomes the primary node, and automatically reset the priority of the group to 255. The failover stays in effect until the new primary node becomes unavailable, the threshold of the redundancy group reaches 0, or you use the **request chassis cluster failover reset** command.

After a manual failover, you must use the **request chassis cluster failover reset** command before initiating another failover.

Options

- **node** *node-number*—Number of the chassis cluster node to which the redundancy group fails over.
- **Range:** 0 through 1
- **redundancy-group** *group-number*—Number of the redundancy group on which to initiate manual failover. Redundancy group 0 is a special group consisting of the two Routing Engines in the chassis cluster.

  Range: 0 through 255

Required Privilege Level maintenance

Related Documentation

- *clear chassis cluster failover-count*
- request chassis cluster failover reset on page 154
- show chassis cluster status on page 184

List of Sample Output request chassis cluster failover node on page 151

Output Fields When you enter this command, you are provided feedback on the status of your request.

Sample Output

request chassis cluster failover node

```
user@host> request chassis cluster failover node 0 redundancy-group 1
Initiated manual failover for redundancy group 1
```

request chassis cluster failover redundancy-group

Syntax

request chassis cluster failover node *node-number* redundancy-group *redundancy-group-number*

Release Information

Command introduced in Junos OS Release 9.0.

Description

For chassis cluster configurations, initiate manual failover in a redundancy group from one node to the other, which becomes the primary node, and automatically reset the priority of the group to 255. The failover stays in effect until the new primary node becomes unavailable, the threshold of the redundancy group reaches 0, or you use the **request chassis cluster failover reset** command.

After a manual failover, you must use the **request chassis cluster failover reset** command before initiating another failover.

Options

- **node** ***node-number***—Number of the chassis cluster node to which the redundancy group fails over.
- **Range:** 0 or 1
- **redundancy-group** ***group-number***—Number of the redundancy group on which to initiate manual failover. Redundancy group 0 is a special group consisting of the two Routing Engines in the chassis cluster.

  Range: 0 through 255

Required Privilege Level

maintenance

Related Documentation

- *Initiating a Chassis Cluster Manual Redundancy Group Failover*
- *Verifying Chassis Cluster Failover Status*

List of Sample Output

request chassis cluster failover redundancy-group on page 152

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request chassis cluster failover redundancy-group

```
user@host> request chassis cluster failover redundancy-group 0 node 1

{primary:node0}
user@host> request chassis cluster failover redundancy-group 0 node 1
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Initiated manual failover for redundancy group 0
```

request chassis cluster failover reset

Syntax

request chassis cluster failover reset
redundancy-group *group-number*

Release Information

Command introduced in Junos OS Release 9.0.

Description

In chassis cluster configurations, undo the previous manual failover and return the redundancy group to its original settings.

Options

redundancy-group ***group-number***—Number of the redundancy group on which to reset manual failover. Redundancy group 0 is a special group consisting of the two Routing Engines in the chassis cluster.

Range: 0 through 255

Required Privilege Level

maintenance

Related Documentation

- *clear chassis cluster failover-count*
- request chassis cluster failover node on page 151
- show chassis cluster status on page 184

List of Sample Output

request chassis cluster failover reset on page 154

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

request chassis cluster failover reset

```
user@host> request chassis cluster failover reset redundancy-group 0
```

request chassis fpc

Syntax request chassis fpc (offline | online | restart) slot *slot-number*

Release Information Command modified in Junos OS Release 9.2.
Command introduced in Junos OS Release 17.2 for PTX10008 Routers.

Description Control the operation of the Flexible PIC Concentrator (FPC).

NOTE: The SRX5K-SPC-2-10-40 (SPC1) and SRX5K-SPC-4-15-320 (SPC2) does not support the **request chassis fpc** command. SRX5K-SPC3 card supports **request chassis fpc** command.

Options **offline**—Take the FPC offline.

online—Bring the FPC online.

restart—Restart the FPC.

slot *slot-number*—Specify the FPC slot number.

Required Privilege Level maintenance

Related Documentation
- *show chassis fpc (View)*

Output Fields When you enter this command, you are provided feedback on the status of your request.

Sample Output

request chassis fpc (SRX Series)

```
user@host> request chassis fpc online slot 0
FPC 0 already online
```

request chassis fpc (PTX10008 Router)

```
user@host> request chassis fpc online slot 1
FPC 0 already online
```

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 157

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 158

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 159

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 160

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 161

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 162
request vmhost software add (NFX250 (NG)) on page 163

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 chassis cluster control-plane statistics

Syntax **show chassis cluster control-plane statistics**

Release Information Command introduced in Junos OS Release 9.3. Output changed to support dual control ports in Junos OS Release 10.0.

Description Display information about chassis cluster control plane statistics.

Required Privilege Level view

Related Documentation
- *clear chassis cluster control-plane statistics*

List of Sample Output
show chassis cluster control-plane statistics on page 166
show chassis cluster control-plane statistics (SRX5000 Line Devices) on page 166

Output Fields Table 22 on page 165 lists the output fields for the **show chassis cluster control-plane statistics** command. Output fields are listed in the approximate order in which they appear.

Table 22: show chassis cluster control-plane statistics Output Fields

Field Name	Field Description
Control link statistics	Statistics of the control link used by chassis cluster traffic. Statistics for **Control link 1** are displayed when you use dual control links (SRX5600 and SRX5800 devices only). • **Heartbeat packets sent**—Number of heartbeat messages sent on the control link. • **Heartbeat packets received**—Number of heartbeat messages received on the control link. • **Heartbeat packet errors**—Number of heartbeat packets received with errors on the control link.
Fabric link statistics	Statistics of the fabric link used by chassis cluster traffic. Statistics for **Child Link 1** are displayed when you use dual fabric links. • **Probes sent**—Number of probes sent on the fabric link. • **Probes received**—Number of probes received on the fabric link.
Switch fabric link statistics	Statistics of the switch fabric link used by chassis cluster traffic. • **Probe state**—State of the probe, **UP** or **DOWN**. • **Probes sent**—Number of probes sent. • **Probes received**—Number of probes received. • **Probe recv error** —Error in receiving probe. • **Probe send error**—Error in sending probe.

Sample Output

show chassis cluster control-plane statistics

```
user@host> show chassis cluster control-plane statistics
```

```
Control link statistics:
    Control link 0:
        Heartbeat packets sent: 11646
        Heartbeat packets received: 8343
        Heartbeat packet errors: 0
Fabric link statistics:
    Child link 0
        Probes sent: 11644
        Probes received: 8266
   Switch fabric link statistics:
    Probe state : DOWN
    Probes sent: 8145
    Probes received: 8013
    Probe recv errors: 0
    Probe send errors: 0
```

Sample Output

show chassis cluster control-plane statistics (SRX5000 Line Devices)

```
user@host> show chassis cluster control-plane statistics
```

```
Control link statistics:
    Control link 0:
        Heartbeat packets sent: 2061982
        Heartbeat packets received: 2060367
        Heartbeat packet errors: 0
   Control link 1:
        Heartbeat packets sent: 2061982
        Heartbeat packets received: 0
        Heartbeat packet errors: 0
Fabric link statistics:
    Child link 0
        Probes sent: 3844342
        Probes received: 3843841
    Child link 1
        Probes sent: 0
        Probes received: 0
```

show chassis cluster data-plane interfaces

Syntax **show chassis cluster data-plane interfaces**

Release Information Command introduced in Junos OS Release 10.2.

Description Display the status of the data plane interface (also known as a fabric interface) in a chassis cluster configuration.

Required Privilege Level view

Related Documentation
- *cluster (Chassis)*

List of Sample Output show chassis cluster data-plane interfaces on page 167

Output Fields Table 23 on page 167 lists the output fields for the **show chassis cluster data-plane interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 23: show chassis cluster data-plane interfaces Output Fields

Field Name	Field Description
fab0/fab1	Name of the logical fabric interface. • **Name**—Name of the physical Ethernet interface. • **Status**—State of the fabric interface: **up** or **down**.

Sample Output

show chassis cluster data-plane interfaces

```
user@host> show chassis cluster data-plane interfaces
fab0:
    Name                Status
    ge-2/1/9            up
    ge-2/2/5            up
fab1:
    Name                Status
    ge-8/1/9            up
    ge-8/2/5            up
```

show chassis cluster data-plane statistics

Syntax **show chassis cluster data-plane statistics**

Release Information Command introduced in Junos OS Release 9.3.

Description Display information about chassis cluster data plane statistics.

Required Privilege Level view

Related Documentation
- *clear chassis cluster data-plane statistics*

List of Sample Output show chassis cluster data-plane statistics on page 169

Output Fields Table 24 on page 168 lists the output fields for the **show chassis cluster data-plane statistics** command. Output fields are listed in the approximate order in which they appear.

Table 24: show chassis cluster data-plane statistics Output Fields

Field Name	Field Description
Services Synchronized	• **Service name**—Name of the service. • **Rtos sent**—Number of runtime objects (RTOs) sent. • **Rtos received**—Number of RTOs received. • **Translation context**—Messages synchronizing Network Address Translation (NAT) translation context. • **Incoming NAT**—Messages synchronizing incoming Network Address Translation (NAT) service. • **Resource manager**—Messages synchronizing resource manager groups and resources. • **Session create**—Messages synchronizing session creation. • **Session close**—Messages synchronizing session close. • **Session change**—Messages synchronizing session change. • **Gate create**—Messages synchronizing creation of pinholes (temporary openings in the firewall). • **Session ageout refresh request**—Messages synchronizing request session after age-out. • **Session ageout refresh reply**—Messages synchronizing reply session after age-out. • **IPsec VPN**—Messages synchronizing VPN session. • **Firewall user authentication**—Messages synchronizing firewall user authentication session. • **MGCP ALG**—Messages synchronizing MGCP ALG sessions. • **H323 ALG**—Messages synchronizing H.323 ALG sessions. • **SIP ALG**—Messages synchronizing SIP ALG sessions. • **SCCP ALG**—Messages synchronizing SCCP ALG sessions. • **PPTP ALG**—Messages synchronizing PPTP ALG sessions. • **RTSP ALG**—Messages synchronizing RTSP ALG sessions.

Sample Output

show chassis cluster data-plane statistics

```
user@host> show chassis cluster data-plane statistics
```

```
Services Synchronized:
    Service name                                RTOs sent    RTOs received
    Translation context                         0            0
    Incoming NAT                                0            0
    Resource manager                            0            0
    Session create                              0            0
    Session close                               0            0
    Session change                              0            0
    Gate create                                 0            0
    Session ageout refresh requests             0            0
    Session ageout refresh replies              0            0
    IPsec VPN                                   0            0
    Firewall user authentication                0            0
    MGCP ALG                                    0            0
    H323 ALG                                    0            0
    SIP ALG                                     0            0
    SCCP ALG                                    0            0
    PPTP ALG                                    0            0
    RTSP ALG                                    0            0
```

show chassis cluster information

Syntax show chassis cluster information

Release Information Command introduced in Junos OS Release 12.1X47-D10.

Description Display chassis cluster messages. The messages indicate each node's health condition and details of the monitored failure.

Required Privilege Level view

Related Documentation
- show chassis cluster status on page 184

List of Sample Output
show chassis cluster information on page 170
show chassis cluster information (Monitoring Abnormal Case) on page 171
show chassis cluster information (Preempt Delay Timer) on page 173

Output Fields Table 25 on page 170 lists the output fields for the **show chassis cluster information** command. Output fields are listed in the approximate order in which they appear.

Table 25: show chassis cluster information Output Fields

Field Name	Field Description
Node	Node (device) in the chassis cluster (**node0** or **node1**).
Redundancy Group Information	• Redundancy Group—ID number (0 - 255) of a redundancy group in the cluster. • Current State—State of the redundancy group: **primary**, **secondary**, **hold**, or **secondary-hold**. • Weight—Relative importance of the redundancy group. • Time—Time when the redundancy group changed the state. • From—State of the redundancy group before the change. • To—State of the redundancy group after the change. • Reason—Reason for the change of state of the redundancy group.
Chassis cluster LED information	• Current LED color—Current color state of the LED. • Last LED change reason—Reason for change of state of the LED.

Sample Output

show chassis cluster information

```
user@host> show chassis cluster information

node0:
```

```
--------------------------------------------------------------------------
Redundancy Group Information:

    Redundancy Group 0 , Current State: primary, Weight: 255

        Time            From           To             Reason
        Mar 27 17:44:19 hold           secondary      Hold timer expired
        Mar 27 17:44:27 secondary      primary        Better priority (200/200)

    Redundancy Group 1 , Current State: primary, Weight: 255

        Time            From           To             Reason
        Mar 27 17:44:19 hold           secondary      Hold timer expired
        Mar 27 17:44:27 secondary      primary        Remote yield (0/0)

    Redundancy Group 2 , Current State: secondary, Weight: 255

        Time            From           To             Reason
        Mar 27 17:44:19 hold           secondary      Hold timer expired
        Mar 27 17:44:27 secondary      primary        Remote yield (0/0)
        Mar 27 17:50:24 primary        secondary-hold Preempt/yield(100/200)
        Mar 27 17:50:25 secondary-hold secondary      Ready to become secondary

Chassis cluster LED information:
    Current LED color: Green
    Last LED change reason: No failures

node1:
--------------------------------------------------------------------------
Redundancy Group Information:

    Redundancy Group 0 , Current State: secondary, Weight: 255

        Time            From           To             Reason
        Mar 27 17:44:27 hold           secondary      Hold timer expired

    Redundancy Group 1 , Current State: secondary, Weight: 255

        Time            From           To             Reason
        Mar 27 17:44:27 hold           secondary      Hold timer expired
        Mar 27 17:50:23 secondary      primary        Remote yield (100/0)
        Mar 27 17:50:24 primary        secondary-hold Preempt/yield(100/200)
        Mar 27 17:50:25 secondary-hold secondary      Ready to become secondary

    Redundancy Group 2 , Current State: primary, Weight: 255

        Time            From           To             Reason
        Mar 27 17:44:27 hold           secondary      Hold timer expired
        Mar 27 17:50:23 secondary      primary        Remote yield (200/0)

Chassis cluster LED information:
    Current LED color: Green
    Last LED change reason: No failures
```

Sample Output

show chassis cluster information (Monitoring Abnormal Case)

```
user@host> show chassis cluster information
```

The following output is specific to monitoring abnormal (unhealthy) case.

```
node0:
--------------------------------------------------------------------------
Redundancy Group Information:

    Redundancy Group 0 , Current State: secondary, Weight: 255

        Time            From           To             Reason
        Apr  1 11:07:38 hold           secondary      Hold timer expired
        Apr  1 11:07:41 secondary      primary        Only node present
        Apr  1 11:29:20 primary        secondary-hold Manual failover
        Apr  1 11:34:20 secondary-hold secondary      Ready to become secondary

    Redundancy Group 1 , Current State: primary, Weight: 0

        Time            From           To             Reason
        Apr  1 11:07:38 hold           secondary      Hold timer expired
        Apr  1 11:07:41 secondary      primary        Only node present

    Redundancy Group 2 , Current State: primary, Weight: 255

        Time            From           To             Reason
        Apr  1 11:07:38 hold           secondary      Hold timer expired
        Apr  1 11:07:41 secondary      primary        Only node present

Chassis cluster LED information:
    Current LED color: Amber
    Last LED change reason: Monitored objects are down

Failure Information:

    IP Monitoring Failure Information:
    Redundancy Group 1, Monitoring Status: Failed
    IP Address        Status       Reason
    1.1.1.1           Unreachable  redundancy-group state unknown

node1:
--------------------------------------------------------------------------
Redundancy Group Information:

    Redundancy Group 0 , Current State: primary, Weight: 255

        Time            From           To             Reason
        Apr  1 11:08:40 hold           secondary      Hold timer expired
        Apr  1 11:29:20 secondary      primary        Remote is in secondary hold


    Redundancy Group 1 , Current State: secondary, Weight: 0

        Time            From           To             Reason
        Apr  1 11:08:40 hold           secondary      Hold timer expired

    Redundancy Group 2 , Current State: secondary, Weight: 255

        Time            From           To             Reason
        Apr  1 11:08:40 hold           secondary      Hold timer expired

Chassis cluster LED information:
```

```
    Current LED color: Amber
    Last LED change reason: Monitored objects are down

Failure Information:

    IP Monitoring Failure Information:
    Redundancy Group 1, Monitoring Status: Failed
    IP Address        Status       Reason
    1.1.1.1           Unreachable  redundancy-group state unknown
```

Sample Output

show chassis cluster information (Preempt Delay Timer)

```
user@host> show chassis cluster information

node0:
--------------------------------------------------------------------------
Redundancy Group Information:

    Redundancy Group 0 , Current State: secondary, Weight: 255

        Time            From           To             Reason
        Aug  4 12:30:02 hold           secondary      Hold timer expired
        Aug  4 12:30:05 secondary      primary        Only node present
        Aug  4 14:19:58 primary        secondary-hold Manual failover
        Aug  4 14:24:58 secondary-hold secondary      Ready to become secondary

    Redundancy Group 1 , Current State: secondary, Weight: 255

        Time            From           To             Reason
        Aug  4 14:07:57 secondary      primary        Remote is in secondary hold

        Aug  4 14:20:23 primary        secondary-hold Monitor failed: IF
        Aug  4 14:20:24 secondary-hold secondary      Ready to become secondary
        Aug  4 14:20:54 secondary      primary        Remote is in secondary hold

        Aug  4 14:21:30 primary        secondary-hold Monitor failed: IF
        Aug  4 14:21:31 secondary-hold secondary      Ready to become secondary

Chassis cluster LED information:
    Current LED color: Green
    Last LED change reason: No failures

node1:
--------------------------------------------------------------------------
Redundancy Group Information:

    Redundancy Group 0 , Current State: primary, Weight: 255

        Time            From           To             Reason
        Aug  4 12:33:47 hold           secondary      Hold timer expired
        Aug  4 14:19:57 secondary      primary        Remote is in secondary hold


    Redundancy Group 1 , Current State: primary, Weight: 255

        Time            From           To             Reason
        Aug  4 14:07:56 secondary-hold secondary      Ready to become secondary
```

```
       Aug  4 14:20:22 secondary      primary        Remote is in secondary hold

       Aug  4 14:20:37 primary        primary-preempt-hold Preempt (99/101)
       Aug  4 14:20:52 primary-preempt-hold secondary-hold Primary preempt hold
 timer e
       Aug  4 14:20:53 secondary-hold secondary      Ready to become secondary
       Aug  4 14:21:28 secondary      primary        Remote yield (99/0)

Chassis cluster LED information:
    Current LED color: Green
    Last LED change reason: No failures
```

show chassis cluster interfaces

Syntax **show chassis cluster interfaces**

Release Information Command modified in Junos OS Release 9.0. Output changed to support dual control ports in Junos OS Release 10.0. Output changed to support control interfaces in Junos OS Release 11.2. Output changed to support redundant pseudo interfaces in Junos OS Release 12.1X44-D10. For SRX5000 line devices, output changed to support the internal security association (SA) option in Junos OS Release 12.1X45-D10. Output changed to support MACsec status on control and fabric interfaces in Junos OS Release 15.1X49-D60.

Description Display the status of the control interface in a chassis cluster configuration.

Required Privilege Level view

Related Documentation
- *cluster (Chassis)*

List of Sample Output
show chassis cluster interfaces on page 176
show chassis cluster interfaces (SRX5000 line devices) on page 177
show chassis cluster interfaces on page 178
show chassis cluster interfaces(SRX5400, SRX5600, and SRX5800 Devices with SRX5000 line SRX5K-SCB3 [SCB3] with Enhanced Midplanes and SRX5K-MPC3-100G10G [IOC3] or SRX5K-MPC3-40G10G [IOC3]) on page 178

Output Fields Table 26 on page 175 lists the output fields for the **show chassis cluster interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 26: show chassis cluster interfaces Output Fields

Field Name	Field Description
Control link status	State of the chassis cluster control interface: **up** or **down**.
Control interfaces	• **Index**—Index number of the chassis cluster control interface. • **Name**—Name of the chassis cluster control interface. • **Monitored-Status**—Monitored state of the interface: **up** or **down**. • **Internal SA**—State of the internal SA option on the chassis cluster control link: **enabled** or **disabled**. NOTE: This field is available only on SRX5000 line devices. • **Security**—State of MACsec on chassis cluster control interfaces.
Fabric link status	State of the fabric interface: **up** or **down**.

Table 26: show chassis cluster interfaces Output Fields (continued)

Field Name	Field Description
Fabric interfaces	• **Name**—Name of the fabric interface. • **Child-interface**—Name of the child fabric interface. • **Status**—State of the interface: **up** or **down**. • **Security**—State of MACsec on chassis cluster fabric interfaces.
Redundant-ethernet Information	• **Name**—Name of the redundant Ethernet interface. • **Status**—State of the interface: **up** or **down**. • **Redundancy-group**—Identification number (1–255) of the redundancy group associated with the redundant Ethernet interface.
Redundant-pseudo-interface Information	• **Name**—Name of the redundant pseudointerface. • **Status**—State of the redundant pseudointerface: **up** or **down**. • **Redundancy-group**—Identification number (1–255) of the redundancy group associated with the redundant pseudointerface.
Interface Monitoring	• **Interface**—Name of the interface to be monitored. • **Weight**—Relative importance of the interface to redundancy group operation. • **Status**—State of the interface: **up** or **down**. • **Redundancy-group**—Identification number of the redundancy group associated with the interface.

Sample Output

show chassis cluster interfaces

```
user@host> show chassis cluster interfaces
Control link status: Up

Control interfaces:
    Index   Interface   Monitored-Status   Security
    0       em0         Up                 Disabled
    1       em1         Down               Disabled

Fabric link status: Up

Fabric interfaces:
    Name    Child-interface    Status   Security
    fab0    ge-0/1/0           Up       Disabled
    fab0
    fab1    ge-6/1/0           Up       Disabled
    fab1

Redundant-ethernet Information:
    Name         Status      Redundancy-group
    reth0        Up          1
    reth1        Up          2
    reth2        Down        Not configured
    reth3        Down        Not configured
    reth4        Down        Not configured
    reth5        Down        Not configured
```

```
    reth6        Down        Not configured
    reth7        Down        Not configured
    reth8        Down        Not configured
    reth9        Down        Not configured
    reth10       Down        Not configured
    reth11       Down        Not configured

Redundant-pseudo-interface Information:
    Name         Status       Redundancy-group
     lo0           Up               1

Interface Monitoring:
    Interface         Weight    Status    Redundancy-group
    ge-0/1/9          100       Up        0
    ge-0/1/9          100       Up
```

Sample Output

show chassis cluster interfaces (SRX5000 line devices)

user@host> **show chassis cluster interfaces**

```
Control link status: Up


 Control interfaces:
    Index   Interface   Monitored-Status   Internal-SA   Security
    0       em0         Up                 Disabled      Disabled
    1       em1         Down               Disabled      Disabled
Fabric link status: Up

Fabric interfaces:
    Name    Child-interface    Status                    Security
                               (Physical/Monitored)
    fab0    xe-1/0/3           Up   / Down               Disabled
    fab0
    fab1    xe-7/0/3           Up   / Down               Disabled
    fab1

Redundant-ethernet Information:
    Name         Status      Redundancy-group
    reth0        Up          1
    reth1        Up          2
    reth2        Down        Not configured
    reth3        Down        Not configured
    reth4        Down        Not configured
    reth5        Down        Not configured
    reth6        Down        Not configured
    reth7        Down        Not configured
    reth8        Down        Not configured
    reth9        Down        Not configured
    reth10       Down        Not configured
    reth11       Down        Not configured

Redundant-pseudo-interface Information:
    Name         Status       Redundancy-group
     lo0           Up               1

Interface Monitoring:
    Interface         Weight    Status    Redundancy-group
```

```
    ge-0/1/9          100       Up        0
    ge-0/1/9          100       Up
```

Sample Output

show chassis cluster interfaces

user@host> **show chassis cluster interfaces**

The following output is specific to fabric monitoring failure:

```
Control link status: Up

Control interfaces:
    Index   Interface    Monitored-Status   Internal-SA  Security
    0       fxp1         Up                 Disabled     Disabled

Fabric link status: Down

Fabric interfaces:
    Name    Child-interface    Status       Security
                               (Physical/Monitored)
    fab0    ge-0/0/2           Down / Down     Disabled
    fab0
    fab1    ge-9/0/2           Up   / Up       Disabled
    fab1

Redundant-pseudo-interface Information:
    Name         Status      Redundancy-group
    lo0          Up          0
```

Sample Output

show chassis cluster interfaces (SRX5400, SRX5600, and SRX5800 Devices with SRX5000 line SRX5K-SCB3 [SCB3] with Enhanced Midplanes and SRX5K-MPC3-100G10G [IOC3] or SRX5K-MPC3-40G10G [IOC3])

user@host> **show chassis cluster interfaces**

The following output is specific to SRX5400, SRX5600, and SRX5800 devices in a chassis cluster cluster, when the PICs containing fabric links on the SRX5K-MPC3-40G10G (IOC3) are powered off to turn on alternate PICs. If no alternate fabric links are configured on the PICs that are turned on, RTO synchronous communication between the two nodes stops and the chassis cluster session state will not back up, because the fabric link is missing.

```
Control link status: Up

Control interfaces:
    Index   Interface   Monitored-Status   Internal-SA   Security
    0       em0         Up                 Disabled     Disabled
    1       em1         Down               Disabled     Disabled

Fabric link status: Down
```

```
Fabric interfaces:
    Name    Child-interface    Status        Security
                               (Physical/Monitored)
    fab0     <<< fab child missing once PIC off lined    Disabled
    fab0
    fab1    xe-10/2/7          Up   / Down               Disabled
    fab1

Redundant-ethernet Information:
    Name         Status      Redundancy-group
    reth0        Up          Not configured
    reth1        Down        1

Redundant-pseudo-interface Information:
    Name         Status      Redundancy-group
    lo0          Up          0
```

show chassis cluster statistics

Syntax **show chassis cluster statistics**

Release Information Command modified in Junos OS Release 9.0. Output changed to support dual control ports in Junos OS Release 10.0.

Description Display information about chassis cluster services and interfaces.

Required Privilege Level view

Related Documentation
- *clear chassis cluster statistics*

List of Sample Output
show chassis cluster statistics on page 181
show chassis cluster statistics (SRX5000 Line Devices) on page 182
show chassis cluster statistics (SRX5000 Line Devices) on page 183

Output Fields Table 27 on page 180 lists the output fields for the **show chassis cluster statistics** command. Output fields are listed in the approximate order in which they appear.

Table 27: show chassis cluster statistics Output Fields

Field Name	Field Description
Control link statistics	Statistics of the control link used by chassis cluster traffic. Statistics for **Control link 1** are displayed when you use dual control links (SRX5000 lines only). Note that the output for the SRX5000 lines will always show **Control link 0** and **Control link 1** statistics, even though only one control link is active or working. • **Heartbeat packets sent**—Number of heartbeat messages sent on the control link. • **Heartbeat packets received**—Number of heartbeat messages received on the control link. • **Heartbeat packet errors**—Number of heartbeat packets received with errors on the control link.
Fabric link statistics	Statistics of the fabric link used by chassis cluster traffic. Statistics for **Child Link 1** are displayed when you use dual fabric links. • **Probes sent**—Number of probes sent on the fabric link. • **Probes received**—Number of probes received on the fabric link.

Table 27: show chassis cluster statistics Output Fields (continued)

Field Name	Field Description
Services Synchronized	• **Service name**—Name of the service. • **Rtos sent**—Number of runtime objects (RTOs) sent. • **Rtos received**—Number of RTOs received. • **Translation context**—Messages synchronizing Network Address Translation (NAT) translation context. • **Incoming NAT**—Messages synchronizing incoming Network Address Translation (NAT) service. • **Resource manager**—Messages synchronizing resource manager groups and resources. • **Session create**—Messages synchronizing session creation. • **Session close**—Messages synchronizing session close. • **Session change**—Messages synchronizing session change. • **Gate create**—Messages synchronizing creation of pinholes (temporary openings in the firewall). • **Session ageout refresh request**—Messages synchronizing request session after age-out. • **Session ageout refresh reply**—Messages synchronizing reply session after age-out. • **IPsec VPN**—Messages synchronizing VPN session. • **Firewall user authentication**—Messages synchronizing firewall user authentication session. • **MGCP ALG**—Messages synchronizing MGCP ALG sessions. • **H323 ALG**—Messages synchronizing H.323 ALG sessions. • **SIP ALG**—Messages synchronizing SIP ALG sessions. • **SCCP ALG**—Messages synchronizing SCCP ALG sessions. • **PPTP ALG**—Messages synchronizing PPTP ALG sessions. • **RTSP ALG**—Messages synchronizing RTSP ALG sessions. • **MAC address learning**—Messages synchronizing MAC address learning.

Sample Output

show chassis cluster statistics

```
user@host> show chassis cluster statistics
Control link statistics:
    Control link 0:
        Heartbeat packets sent: 798
        Heartbeat packets received: 784
        Heartbeat packets errors: 0
Fabric link statistics:
    Child link 0
        Probes sent: 793
        Probes received: 0
Services Synchronized:
    Service name                            RTOs sent    RTOs received
    Translation context                     0            0
    Incoming NAT                            0            0
    Resource manager                        0            0
    Session create                          0            0
    Session close                           0            0
    Session change                          0            0
```

```
    Gate create                              0           0
    Session ageout refresh requests          0           0
    Session ageout refresh replies           0           0
    IPsec VPN                                0           0
    Firewall user authentication             0           0
    MGCP ALG                                 0           0
    H323 ALG                                 0           0
    SIP ALG                                  0           0
    SCCP ALG                                 0           0
    PPTP ALG                                 0           0
    RTSP ALG                                 0           0
    MAC address learning                     0           0
```

Sample Output

show chassis cluster statistics (SRX5000 Line Devices)

```
user@host> show chassis cluster statistics
Control link statistics:
    Control link 0:
        Heartbeat packets sent: 258689
        Heartbeat packets received: 258684
        Heartbeat packets errors: 0
    Control link 1:
        Heartbeat packets sent: 258689
        Heartbeat packets received: 258684
        Heartbeat packets errors: 0
Fabric link statistics:
    Child link 0
        Probes sent: 258681
        Probes received: 258681
    Child link 1
        Probes sent: 258501
        Probes received: 258501
Services Synchronized:
    Service name                             RTOs sent    RTOs received
    Translation context                      0            0
    Incoming NAT                             0            0
    Resource manager                         0            0
    Session create                           1            0
    Session close                            1            0
    Session change                           0            0
    Gate create                              0            0
    Session ageout refresh requests          0            0
    Session ageout refresh replies           0            0
    IPSec VPN                                0            0
    Firewall user authentication             0            0
    MGCP ALG                                 0            0
    H323 ALG                                 0            0
    SIP ALG                                  0            0
    SCCP ALG                                 0            0
    PPTP ALG                                 0            0
    RPC ALG                                  0            0
    RTSP ALG                                 0            0
    RAS ALG                                  0            0
    MAC address learning                     0            0
    GPRS GTP                                 0            0
```

Sample Output

show chassis cluster statistics (SRX5000 Line Devices)

```
user@host> show chassis cluster statistics
Control link statistics:
    Control link 0:
        Heartbeat packets sent: 82371
        Heartbeat packets received: 82321
        Heartbeat packets errors: 0
    Control link 1:
        Heartbeat packets sent: 0
        Heartbeat packets received: 0
        Heartbeat packets errors: 0
Fabric link statistics:
    Child link 0
        Probes sent: 258681
        Probes received: 258681
    Child link 1
        Probes sent: 258501
        Probes received: 258501
Services Synchronized:
    Service name                            RTOs sent    RTOs received
    Translation context                     0            0
    Incoming NAT                            0            0
    Resource manager                        0            0
    Session create                          1            0
    Session close                           1            0
    Session change                          0            0
    Gate create                             0            0
    Session ageout refresh requests         0            0
    Session ageout refresh replies          0            0
    IPSec VPN                               0            0
    Firewall user authentication            0            0
    MGCP ALG                                0            0
    H323 ALG                                0            0
    SIP ALG                                 0            0
    SCCP ALG                                0            0
    PPTP ALG                                0            0
    RPC ALG                                 0            0
    RTSP ALG                                0            0
    RAS ALG                                 0            0
    MAC address learning                    0            0
    GPRS GTP                                0            0
```

show chassis cluster status

Syntax

show chassis cluster status
<redundancy-group ***group-number*** **>**

Release Information

Support for monitoring failures added in Junos OS Release 12.1X47-D10.

Description

Display the current status of the Chassis Cluster. You can use this command to check the status of chassis cluster nodes, redundancy groups, and failover status.

Options

- none—Display the status of all redundancy groups in the chassis cluster.
- **redundancy-group** ***group-number***—(Optional) Display the status of the specified redundancy group.

Required Privilege Level

view

Related Documentation

- *redundancy-group (Chassis Cluster)*
- *clear chassis cluster failover-count*
- request chassis cluster failover node on page 151
- request chassis cluster failover reset on page 154

List of Sample Output

show chassis cluster status on page 185
show chassis cluster status with preemptive delay on page 186
show chassis cluster status redundancy-group 1 on page 186

Output Fields

Table 28 on page 184 lists the output fields for the **show chassis cluster status** command. Output fields are listed in the approximate order in which they appear.

Table 28: show chassis cluster status Output Fields

Field Name	Field Description
Cluster ID	ID number (1-15) of a cluster is applicable for releases upto Junos OS Release 12.1X45-D10. ID number (1-255) is applicable for Releases 12.1X45-D10 and later. Setting a cluster ID to 0 is equivalent to disabling a cluster.
Redundancy-Group	You can create up to 128 redundancy groups in the chassis cluster.
Node name	Node (device) in the chassis cluster (**node0** or **node1**).
Priority	Assigned priority for the redundancy group on that node.

Table 28: show chassis cluster status Output Fields (continued)

Field Name	Field Description
Status	State of the redundancy group (**Primary**, **Secondary**, **Lost**, or **Unavailable**). • **Primary**—Redundancy group is active and passing traffic. • **Secondary**—Redundancy group is passive and not passing traffic. • **Lost**—Node loses contact with the other node through the control link. Most likely to occur when both nodes are in a cluster and there is a control link failure, one node cannot exchange heartbeats, or when the other node is rebooted. • **Unavailable**—Node has not received a single heartbeat over the control link from the other node since the other node booted up. Most likely to occur when one node boots up before the other node, or if only one node is present in the cluster.
Preempt	• **Yes**: Primary state can be preempted based on priority. • **No**: Change in priority will not preempt the primary state.
Manual failover	• **Yes**: Primary state is set manually through the CLI with the **request chassis cluster failover node** or **request chassis cluster failover redundancy-group** command. This overrides **Priority** and **Preempt**. • **No**: Primary state is not set manually through the CLI.
Monitor-failures	• **None**: Cluster working properly. • **Monitor Failure code**: Cluster is not working properly and the respective failure code is displayed.

Sample Output

show chassis cluster status

```
user@host> show chassis cluster status


Monitor Failure codes:
  CS  Cold Sync monitoring        FL  Fabric Connection monitoring
    GR  GRES monitoring             HW  Hardware monitoring
    IF  Interface monitoring        IP  IP monitoring
    LB  Loopback monitoring         MB  Mbuf monitoring
    NH  Nexthop monitoring          NP  NPC monitoring
    SP  SPU monitoring              SM  Schedule monitoring
    CF  Config Sync monitoring

Cluster ID: 1
Node   Priority Status         Preempt Manual   Monitor-failures

Redundancy group: 0 , Failover count: 1
node0  200      primary        no      no       None
node1  1        secondary      no      no       None

Redundancy group: 1 , Failover count: 1
node0  101      primary        no      no       None
node1  1        secondary      no      no       None
```

Sample Output

show chassis cluster status with preemptive delay

```
user@host> show chassis cluster status

Cluster ID: 1
Node   Priority Status         Preempt Manual   Monitor-failures
Redundancy group: 0, Failover count: 1
node0  200      primary        no      no       None
node1  100      secondary      no      no       None
Redundancy group: 1, Failover count: 3
node0 200   primary-preempt-hold    yes   no    None node1  100      secondary
               yes     no       None
```

Sample Output

show chassis cluster status redundancy-group 1

```
user@host> show chassis cluster status redundancy-group 1

Monitor Failure codes:
    CS  Cold Sync monitoring        FL  Fabric Connection monitoring
    GR  GRES monitoring             HW  Hardware monitoring
    IF  Interface monitoring        IP  IP monitoring
    LB  Loopback monitoring         MB  Mbuf monitoring
    NH  Nexthop monitoring          NP  NPC monitoring
    SP  SPU monitoring              SM  Schedule monitoring
    CF  Config Sync monitoring

Cluster ID: 1
Node   Priority Status         Preempt Manual   Monitor-failures

Redundancy group: 1 , Failover count: 1
node0  101      primary        no      no       None
node1  1        secondary      no      no       None
```

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 190
- show system visibility memory on page 198
- show system visibility network on page 200
- show system visibility vnf on page 205

List of Sample Output

show system visibility cpu (NFX150) on page 188
show system visibility cpu (NFX250 (NG)) on page 189

Output Fields

Table 29 on page 187 lists the output fields for the **show system visibility cpu** command. Output fields are listed in the approximate order in which they appear.

Table 29: 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 29: 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 187
- show system visibility memory on page 198
- show system visibility network on page 200
- show system visibility vnf on page 205

List of Sample Output
show system visibility host (NFX150) on page 192
show system visibility host (NFX250 (NG)) on page 195

Output Fields Table 30 on page 190 lists the output fields for the **show system visibility host** command. Output fields are listed in the approximate order in which they appear.

Table 30: 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 30: 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 30: 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 187
- show system visibility host on page 190
- show system visibility network on page 200
- show system visibility vnf on page 205

List of Sample Output

show system visibility memory (NFX150) on page 199
show system visibility memory (NFX250 (NG)) on page 199

Output Fields Table 31 on page 198 lists the output fields for the **show system visibility memory** command. Output fields are listed in the approximate order in which they appear.

Table 31: 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 31: 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 187
- show system visibility host on page 190
- show system visibility memory on page 198
- show system visibility vnf on page 205

List of Sample Output

show system visibility network (NFX150) on page 201
show system visibility network (NFX250 (NG)) on page 203

Output Fields

Table 32 on page 200 lists the output fields for the **show system visibility network** command. Output fields are listed in the approximate order in which they appear.

Table 32: 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 32: 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 187
- show system visibility host on page 190
- show system visibility memory on page 198
- show system visibility network on page 200

List of Sample Output show system visibility vnf on page 208

Output Fields Table 33 on page 205 lists the output fields for the **show system visibility vnf** command. Output fields are listed in the approximate order in which they appear.

Table 33: 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 33: 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 33: 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 210

Output Fields Table 34 on page 210 lists the output fields for the **show vmhost connections** command. Output fields are listed in the approximate order in which they appear.

Table 34: 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 212

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 213

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 214

Output Fields Table 35 on page 214 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 35: 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 216

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 217
show vmhost mode (Hybrid mode) on page 218
show vmhost mode (Compute mode) on page 219

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 220

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 222

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 224

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 225
show vmhost connections (NFX250 (NG)) on page 225

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 227

Output Fields Table 36 on page 226 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 36: 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

----
```