



Junos[®] OS

OpenConfig Feature Guide



Modified: 2019-03-25

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

Juniper Networks, the Juniper Networks logo, Juniper, and Junos are registered trademarks of Juniper Networks, Inc. in the United States and other countries. All other trademarks, service marks, registered marks, or registered service marks are the property of their respective owners.

Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

Junos® OS OpenConfig Feature Guide

Copyright © 2019 Juniper Networks, Inc. All rights reserved.

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

YEAR 2000 NOTICE

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

END USER LICENSE AGREEMENT

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

Table of Contents

	About the Documentation	vii
	Documentation and Release Notes	vii
	Using the Examples in This Manual	vii
	Merging a Full Example	viii
	Merging a Snippet	viii
	Documentation Conventions	ix
	Documentation Feedback	xi
	Requesting Technical Support	xi
	Self-Help Online Tools and Resources	xii
	Creating a Service Request with JTAC	xii
Chapter 1	OpenConfig Overview	13
	OpenConfig Overview	13
	OpenConfig Data Model Version	14
	Installing the OpenConfig Package	18
Chapter 2	gRPC Overview	21
	Understanding OpenConfig and gRPC on Junos Telemetry Interface	21
	Network Agent Software	22
	Using OpenConfig for Junos OS to Enable Junos Telemetry Interface	22
	Using gRPC to Stream Data	23
	Exporting Packet Forwarding Engine Traffic Sensor Data	24
	Enabling “ON CHANGE” Sensor Support Through Network Management Interface (gNMI)	26
	Enabling Client Streaming and Bidirectional Streaming of Telemetry Sensor Information	27
	Enabling Streaming of Telemetry Sensor Information for SR-TE policies (BGP or Static)	28
	Support for LSP Statistics	29
	Installing the Network Agent Package (Junos Telemetry Interface)	31
	gRPC Services for Junos Telemetry Interface	33
	Configuring gRPC for the Junos Telemetry Interface	34
	Configuring Bidirectional Authentication for gRPC for Junos Telemetry Interface	35
	Guidelines for gRPC Sensors (Junos Telemetry Interface)	37
	Supported gRPC Sensors	38
Chapter 3	OpenConfig to Junos Mapping	155
	Mapping OpenConfig BGP Commands to Junos Configuration	155
	Mapping OpenConfig Interface Commands to Junos Configuration	170
	Mapping OpenConfig LLDP Commands to Junos Configuration	175
	Mapping OpenConfig Local Routing Commands to Junos Configuration	176

	Mapping OpenConfig MPLS Commands to Junos Configuration	177
	Mapping OpenConfig Network Instance Commands to Junos Operation	186
	Mapping OpenConfig Routing Policy Commands to Junos Configuration	188
	Mapping OpenConfig VLAN Commands to Junos Configuration	192
Chapter 4	Configuration Statements	195
	netconf	196
	schema	197
	track-igp-metric (LSP)	198

List of Tables

	About the Documentation	vii
	Table 1: Notice Icons	ix
	Table 2: Text and Syntax Conventions	x
Chapter 1	OpenConfig Overview	13
	Table 3: OpenConfig Data Model Versions	14
Chapter 2	gRPC Overview	21
	Table 4: Telemetry RPCs	23
	Table 5: LSP Sensor Support	29
	Table 6: gRPC Sensors	38
	Table 7: Broadband Edge gRPC Sensors	107
Chapter 3	OpenConfig to Junos Mapping	155
	Table 8: Global BGP Configuration	155
	Table 9: AFI-SAFI Configuration	157
	Table 10: AFI-SAFI IPv4-Unicast Prefix-Limit Configuration	159
	Table 11: AFI-SAFI IPv6-Unicast Prefix-Limit Configuration	160
	Table 12: AFI-SAFI IPv4-Lbl-Unicast Prefix-Limit Configuration	160
	Table 13: AFI-SAFI IPv6-Lbl-Unicast Prefix-Limit Configuration	161
	Table 14: AFI-SAFI L3VPN-IPv4-Ucast Prefix-Limit Configuration	162
	Table 15: AFI-SAFI L3VPN-IPv6-Ucast Prefix-Limit Configuration	162
	Table 16: AFI-SAFI L3VPN-IPv4-Mcast Prefix-Limit Configuration	163
	Table 17: AFI-SAFI L3VPN-IPv6-Mcast Prefix-Limit Configuration	164
	Table 18: AFI-SAFI L2VPN-VPLS Prefix-Limit Configuration	164
	Table 19: AFI-SAFI L2VPN-EVPN Prefix-Limit Configuration	165
	Table 20: Peer-Group Configuration	166
	Table 21: Peer-Group Apply-Policy Configuration	167
	Table 22: Neighbors Configuration	168
	Table 23: Neighbors Apply-Policy Configuration	170
	Table 24: VRRP Configuration	171
	Table 25: IPv4 and IPv6 Address Configuration	172
	Table 26: Interface AE Configuration	173
	Table 27: LACP Configuration	173
	Table 28: Member Interface Configuration	173
	Table 29: Ethernet Configuration	173
	Table 30: IFD Configuration	174
	Table 31: IFL Configuration	174
	Table 32: Global LLDP Configuration	175
	Table 33: Interface Configuration	176
	Table 34: Static Route Configuration	176

Table 35: Local Aggregate Configuration	177
Table 36: Global MPLS Configuration	177
Table 37: TE Global Attributes	178
Table 38: TE Interface Attributes	179
Table 39: RSVP Signaling Protocols	180
Table 40: Label Switched Paths	181
Table 41: RSVP P2P Tunnel	183
Table 42: Network Instance	187
Table 43: Defined Set Configuration	189
Table 44: BGP Defined Set Configuration	189
Table 45: Policy Definition Configuration	189
Table 46: Top Level Group VLAN Configuration	192
Table 47: VLAN Tagged IFL Configuration	192
Table 48: VLAN Membership Configuration	192
Table 49: Routed VLAN Interfaces Configuration	193

About the Documentation

- Documentation and Release Notes on page vii
- Using the Examples in This Manual on page vii
- Documentation Conventions on page ix
- Documentation Feedback on page xi
- Requesting Technical Support on page xi

Documentation and Release Notes

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

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

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

Using the Examples in This Manual

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

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

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

Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

Merging a Snippet

To merge a snippet, follow these steps:

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

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

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


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

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

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

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

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

Documentation Conventions

Table 1 on page ix 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 x 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
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces or emphasizes important new terms. Identifies guide names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>Junos OS CLI User Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> 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 <i>metric</i> >;
(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 (<i>string1</i> <i>string2</i> <i>string3</i>)
# (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]
Indentation and braces ({ })	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; 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.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. To cancel the configuration, click Cancel.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select Protocols>Ospf .

Documentation Feedback

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

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



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

Requesting Technical Support

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

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

Self-Help Online Tools and Resources

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

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

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

Creating a Service Request with JTAC

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

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

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

CHAPTER 1

OpenConfig Overview

- [OpenConfig Overview on page 13](#)
- [OpenConfig Data Model Version on page 14](#)
- [Installing the OpenConfig Package on page 18](#)

OpenConfig Overview

OpenConfig is a collaborative effort in the networking industry to move toward a more dynamic, programmable method for configuring and managing multivendor networks. OpenConfig supports the use of vendor-neutral data models to configure and manage the network. These data models define the configuration and operational state of network devices for common network protocols or services. The data models are written in YANG, a standards-based, data modeling language that is modular, easy to read, and supports remote procedure calls (RPCs). Using industry standard models greatly benefits an operator with devices in a network from multiple vendors. The goal of OpenConfig is for operators to be able to use a single set of data models to configure and manage all the network devices that support the OpenConfig initiative.

OpenConfig for Junos OS supports the YANG data models and uses RPC frameworks to facilitate communications between a client and the router. You have the flexibility to configure your router directly by using Junos OS, or by using a third-party schema, such as OpenConfig. OpenConfig modules define a data model through its data, and the hierarchical organization of and constraints on that data. Each module is uniquely identified by a namespace URL to avoid possible conflicts with the Junos OS name.

The configuration and operational statements in Junos OS have corresponding path statements in OpenConfig. The following is a list of data modules for which mapping of OpenConfig and Junos OS configuration and operational statements is supported:

- BGP
- Interfaces
- LACP
- LLDP
- Local routing
- MPLS

- Network instance
- Platform
- Routing policy
- VLAN

For more information on the OpenConfig initiative, see <http://www.openconfig.net/>.

Related Documentation

- [OpenConfig Data Model Version on page 14](#)
- *Understanding YANG on Devices Running Junos OS*
- *NETCONF XML Management Protocol Developer Guide*

OpenConfig Data Model Version

Table 3 on page 14 lists the OpenConfig data model versions.

Table 3: OpenConfig Data Model Versions

OpenConfig Data Model	Junos OS Release	OpenConfig Supported Version	Supported Platform
• BGP (openconfig-bgp.yang)	16.1	2.0.1	Juniper Networks MX Series and PTX Series
• BGP NEIGHBOR (openconfig-bgp-neighbor.yang)	17.1	2.1.1	
• BGP POLICY (openconfig-bgp-policy.yang)	17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3		Juniper Networks MX Series, PTX Series, and QFX Series
• BGP TYPES (openconfig-bgp-types.yang)	18.4	4.0.1	
• BGP COMMON (openconfig-bgp-common.yang)	17.1	2.1.1	Juniper Networks MX Series and PTX Series
• BGP COMMON MULTIPROTOCOL (openconfig-bgp-common-multiprotocol.yang)	17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3		Juniper Networks MX Series, PTX Series, and QFX Series
• BGP COMMON STRUCTURE (openconfig-bgp-common-structure.yang)	18.4	4.0.1	
• BGP GLOBAL (openconfig-bgp-global.yang)			
• BGP PEER GROUP (openconfig-bgp-peer-group.yang)			
BGP ERRORS (openconfig-bgp-errors.yang)	18.4	4.0.1	Juniper Networks MX Series and PTX Series

Table 3: OpenConfig Data Model Versions (continued)

OpenConfig Data Model	Junos OS Release	OpenConfig Supported Version	Supported Platform
<ul style="list-style-type: none"> IF AGGREGATE (openconfig-if-aggregate.yang) IF ETHERNET (openconfig-if-ethernet.yang) IF IP (openconfig-if-ip.yang) IF IP EXT (openconfig-if-ip-ext.yang) INTERFACES (openconfig-interfaces.yang) 	16.1, 17.1, 17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4	1.0.1	Juniper Networks MX Series and PTX Series
I3 YANG (openconfig-network-instance-l3.yang)	17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4	0.4.0	Juniper Networks MX Series, PTX Series, and QFX Series
INET TYPES (openconfig-inet-types.yang)	17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4	0.1.0	Juniper Networks MX Series, PTX Series, and QFX Series
<ul style="list-style-type: none"> ISIS (openconfig-isis.yang) ISIS LSDB TYPES (openconfig-isis-lsdb-types.yang) 	17.2X75, 17.4, 18.1, 18.2, 18.3	0.2.1	Juniper Networks MX Series and PTX Series
<ul style="list-style-type: none"> ISIS LSP (openconfig-isis-lsp.yang) ISIS POLICY (openconfig-isis-policy.yang) ISIS ROUTING (openconfig-isis-routing.yang) ISIS TYPES (openconfig-isis-types) 	18.4	0.3.3	
LACP (openconfig-lacp.yang)	16.1, 17.1	1.0.2	Juniper Networks MX Series and PTX Series
	17.2, 17.2X75, 17.3, 17.4, 18.1		Juniper Networks MX Series, PTX Series, and QFX Series
	18.2, 18.3, 18.4	1.1.0	
<ul style="list-style-type: none"> LLDP (openconfig-lldp.yang) LLDP TYPES (openconfig-lldp-types.yang) 	16.1, 17.1, 17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4	0.1.0	Juniper Networks MX Series and PTX Series
LOCAL ROUTING (openconfig-local-routing.yang)	16.1, 17.1	1.0.0	Juniper Networks MX Series and PTX Series
	17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4		Juniper Networks MX Series, PTX Series, and QFX Series

Table 3: OpenConfig Data Model Versions (continued)

OpenConfig Data Model	Junos OS Release	OpenConfig Supported Version	Supported Platform
MPLS (openconfig-mpls.yang)	16.1, 17.1	1.0.0	Juniper Networks MX Series and PTX Series
	17.2		Juniper Networks MX Series, PTX Series, and QFX Series
	17.3	1.0.1	
	17.2X75, 17.4, 18.1, 18.2, 18.3, 18.4	2.2.0	
• MPLS IDP (openconfig-mpls-ldp.yang)	16.1, 17.1	1.0.0	Juniper Networks MX Series and PTX Series
• MPLS IGP (openconfig-mpls-igp.yang)	17.2, 17.3		Juniper Networks MX Series, PTX Series, and QFX Series
• MPLS RSVP (openconfig-mpls-rsvp.yang)	17.2X75, 17.4, 18.1, 18.2, 18.3, 18.4	2.2.0	
• MPLS SR (openconfig-mpls-sr.yang)			
• MPLS STATIC (openconfig-mpls-static.yang)			
• MPLS TE (openconfig-mpls-te.yang)			
• MPLS TYPES (openconfig-mpls-types.yang)			
NETWORK INSTANCE (openconfig-network-instance.yang)	17.3, 17.4, 18.1, 18.2, 18.3, 18.4	0.4.0	Juniper Networks MX Series, PTX Series, and QFX Series
	17.2X75	0.4.1	
• NETWORK INSTANCE I2 (openconfig-network-instance-l2.yang)	17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4	0.4.0	Juniper Networks MX Series, PTX Series, and QFX Series
• NETWORK INSTANCE TYPES (openconfig-network-instance-types.yang)			
• PLATFORM (openconfig-platform.yang)	16.1, 17.1, 17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4	0.3.0	Juniper Networks MX Series and PTX Series
• PLATFORM TYPES (openconfig-platform-types.yang)			
POLICY TYPES (openconfig-policy-types.yang)	16.1, 17.1	2.0.0	Juniper Networks MX Series and PTX Series
	17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4		Juniper Networks MX Series, PTX Series, and QFX Series

Table 3: OpenConfig Data Model Versions (continued)

OpenConfig Data Model	Junos OS Release	OpenConfig Supported Version	Supported Platform
<ul style="list-style-type: none"> RIB BGP (openconfig-rib-bgp.yang) RIB BGP EXT (openconfig-rib-bgp-ext.yang) RIB BGP TYPES (openconfig-rib-bgp-types.yang) 	16.1, 17.1	0.2.0	Juniper Networks MX Series and PTX Series
	17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4		Juniper Networks MX Series, PTX Series, and QFX Series
ROUTING POLICY (openconfig-routing-policy.yang)	16.1, 17.1	2.0.0	Juniper Networks MX Series and PTX Series
	17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4		Juniper Networks MX Series, PTX Series, and QFX Series
SEGMENT ROUTING (openconfig-segment-routing.yang)	17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4	0.0.3	Juniper Networks MX Series and PTX Series
TELEMETRY (openconfig-telemetry.yang)	16.1, 17.1, 17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4	0.2.0	Juniper Networks MX Series, PTX Series, and QFX Series
TRANSPORT TYPES (openconfig-transport-types.yang)	16.1	0.2.0	Juniper Networks MX Series and PTX Series
	17.1, 17.2, 17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4	0.3.1	
TYPES (openconfig-types.yang)	16.1	0.1.1	Juniper Networks MX Series and PTX Series
	17.1	0.2.0	Juniper Networks MX Series and PTX Series
	17.2, 17.3		Juniper Networks MX Series, PTX Series, and QFX Series
	17.2X75, 17.4, 18.1, 18.2, 18.3, 18.4	0.3.2	
<ul style="list-style-type: none"> VLAN CONFIGURATION SUPPORT (openconfig-vlan.yang) VLAN TYPES (openconfig-vlan-types.yang) 	16.1, 17.1, 17.2	1.0.1	Juniper Networks EX Series and QFX Series
	17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4		
YANG TYPES (openconfig-yang-types.yang)	17.2X75, 17.3, 17.4, 18.1, 18.2, 18.3, 18.4	0.1.0	Juniper Networks MX Series, PTX Series, and QFX Series

Related Documentation • [OpenConfig Overview on page 13](#)

- *Understanding YANG on Devices Running Junos OS*
- *NETCONF XML Management Protocol Developer Guide*

Installing the OpenConfig Package

Starting in Junos OS Release 18.3R1, the Junos OS image includes the OpenConfig package; therefore, you do not need to install OpenConfig separately on your device.

By default, the OpenConfig schema is not available through CLI. To unhide the OpenConfig knob from the CLI, run the following command:

set system schema openconfig unhide



NOTE: The `show system yang package` command in the operational mode does not display native Junos OS OpenConfig package. This is because the Junos OS image includes the OpenConfig package.

OpenConfig package includes the following files:

- OpenConfig set of data models—Data models are written in YANG.
- Translation scripts—Translates OpenConfig configuration schemas to Junos OS configuration schemas for each supported Junos OS release.
- Deviation modules—Specifies the unsupported nodes within the schema for each supported Junos OS release.
- Augmentation module—Specifies additions to various OpenConfig specified models.
- Dynamic rendering files—Maps operational state data for each supported Junos OS release.

In releases before Junos OS Release 18.3R1, OpenConfig for Junos OS software package have the following naming convention:

```
junos-openconfig-XX.YY.ZZ.JJ-signed.tgz (Junos OS)
junos-openconfig-x86-32-XX.YY.ZZ.JJ.tgz (Junos OS with Upgraded FreeBSD)
```

where:

- XX represents the OpenConfig major release number.
- YY represents the OpenConfig minor release number.
- ZZ represents the OpenConfig patch release number.
- JJ represents the Juniper Networks release number.



NOTE: The `junos-openconfig-x86-32-XX.YY.ZZ.JJ.tgz` package supports both 32 and 64 bit systems.

To install the OpenConfig for Junos OS software package, use the following command:

request system software add

For example:

```
user@router> request system software add junos-openconfig-XX.YY.ZZ.JJ-signed.tgz
```

or

```
user@router> request system software add junos-openconfig-x86-32-XX.YY.ZZ.JJ.tgz
```

For more details on the OpenConfig for Junos OS software package, see Release Notes available with the package on the [Juniper Software Download website](#).

Release History Table

Release	Description
18.3R1	Starting in Junos OS Release 18.3R1, the Junos OS image includes the OpenConfig package; therefore, you do not need to install OpenConfig separately on your device.

Related Documentation

- *Understanding YANG on Devices Running Junos OS*
- *NETCONF XML Management Protocol Developer Guide*
- *Software Installation and Upgrade Guide*
- *Release Information for Junos OS with Upgraded FreeBSD*
- [schema on page 197](#)

CHAPTER 2

gRPC Overview

- [Understanding OpenConfig and gRPC on Junos Telemetry Interface on page 21](#)
- [Installing the Network Agent Package \(Junos Telemetry Interface\) on page 31](#)
- [gRPC Services for Junos Telemetry Interface on page 33](#)
- [Guidelines for gRPC Sensors \(Junos Telemetry Interface\) on page 37](#)

Understanding OpenConfig and gRPC on Junos Telemetry Interface

Starting in Junos OS Release 16.1R3, you can use a set of remote procedure call (RPC) interfaces to configure the Junos Telemetry Interface and stream telemetry data using the gRPC framework. OpenConfig supports the use of vendor-neutral data models for configuring and managing multivendor networks. gRPC is an open source framework that provides secure and reliable transport of data.



NOTE: OpenConfig for Junos OS and gRPC are supported only on MPCs on MX Series and on PTX Series routers starting with Junos OS Release 16.1R3.

Starting with Junos OS Release 17.2R1, OpenConfig and gRPC are also supported on QFX10000 switches, QFX5200 switches, and PTX1000 routers.

Starting with Junos OS Release 17.3R1, Junos Telemetry Interface is supported on the Routing Control and Board (RCB) on PTX3000 routers, QFX5110 switches, and EX4600 and EX9200 switches.

OpenConfig and gRPC are not supported on MX80 and MX104 routers.

Starting with Junos OS Release 17.4R1, MX2008 routers are supported.

Starting with Junos OS Release 19.1R1, MX Series routers operating with MS-MIC and MS-MPC, QFX10002 switches, and PTX10002 routers are also supported.

- [Network Agent Software on page 22](#)
- [Using OpenConfig for Junos OS to Enable Junos Telemetry Interface on page 22](#)
- [Using gRPC to Stream Data on page 23](#)
- [Exporting Packet Forwarding Engine Traffic Sensor Data on page 24](#)

- [Enabling “ON CHANGE” Sensor Support Through Network Management Interface \(gNMI\) on page 26](#)
- [Enabling Client Streaming and Bidirectional Streaming of Telemetry Sensor Information on page 27](#)
- [Enabling Streaming of Telemetry Sensor Information for SR-TE policies \(BGP or Static\) on page 28](#)
- [Support for LSP Statistics on page 29](#)

Network Agent Software

Implementing OpenConfig with gRPC for Junos Telemetry Interface requires that you download and install a package called Network Agent if your Juniper Networks device is running a version of Junos OS with Upgraded FreeBSD. For all other versions of Junos OS, the Network Agent functionality is embedded in the software. Network Agent functions as a gRPC server and terminates the OpenConfig RPC interfaces. It is also responsible for streaming the telemetry data according to the OpenConfig specification. To view the OpenConfig specification for telemetry, see the [OpenConfig Telemetry specification](#). For more information about OpenConfig for Junos OS, see the *OpenConfig Feature Guide*.

The Network Agent component also supports server-based Secure Sockets Layer (SSL) authentication. Client-based SSL authentication is not supported. You must install SSL certificates on your Juniper Networks device.

For information about installing the Network Agent package, see [“Installing the Network Agent Package” on page 31](#).

Using OpenConfig for Junos OS to Enable Junos Telemetry Interface

OpenConfig for Junos OS specifies an RPC model to enable the Junos Telemetry Interface. You must download and install the OpenConfig for Junos OS package on your Juniper Networks device. This package also includes the required YANG models. Using a Web browser, navigate to the All Junos Platforms software download URL on the Juniper Networks webpage: <https://www.juniper.net/support/downloads/>. From the **Network Management** tab, scroll down to select **OpenConfig**. Select the **Software** tab. Select the appropriate version of OpenConfig module. Two versions are available, one for devices running Junos OS with Upgraded FreeBSD and another for devices running all other versions of Junos OS. For more information, see [“Installing the OpenConfig Package” on page 18](#) and *Understanding Junos OS YANG Modules*.

The programmatic interface **OpenConfigTelemetry** that is installed by the Network Agent package defines the telemetry gRPC service. The **telemetrySubscribe** RPC specifies the following subscription parameters:

- OpenConfig path that identifies the system resource to stream telemetry data, for example:
`/interfaces/interface/state/counters/`
- Interval at which data is reported and streamed to the collector server, in milliseconds, for example:
`sample_frequency = 4000`

The **telemetrySubscribe** RPC is used by a streaming server, or collector, to request an inline subscription for data at the specified path. The device should then send telemetry data back on the same connection as the subscription request.

Using gRPC to Stream Data

Per the OpenConfig specification, only gRPC-based transport is supported for streaming data. The gRPC server that is installed by the Network Agent package terminates the gRPC sessions from the management system that runs the client. RPC calls trigger the creation of Junos OS sensors that either stream data periodically or report events, which are then funneled onto the appropriate gRPC channel by Network Agent.



NOTE: Starting in Junos OS Release 18.2R1, when an external streaming server, or collector, provisions sensors to export data through gRPC on devices running Junos OS, the sensor configuration is committed to the `junos-analytics` instance of the ephemeral configuration database, and the configuration can be viewed by using the `show ephemeral-configuration instance junos-analytics operational` command. In earlier releases, the sensor configuration is committed to the default instance of the ephemeral configuration database.

See [Table 4 on page 23](#) for a list and descriptions of the RPCs implemented to the support the Junos Telemetry Interface.

Table 4: Telemetry RPCs

RPC Name	Description
telemetrySubscribe	Specify telemetry parameters and stream data for the specified list of OpenConfig paths.
getTelemetrySubscriptions	Retrieve the list of subscriptions that are created through telemetrySubscribe .
cancelSubscription	Unsubscribe a subscription created through telemetrySubscribe .

Data streamed through gRPC is formatted in OpenConfig key/value pairs in protocol buffers (gpb) messages. In this universal format, keys are strings that correspond to the path of the system resources in the OpenConfig schema for the device being monitored. The values correspond to integers or strings that identify the operational state of the system resource, such as interface counters, and the state of the resource.



NOTE: Starting in Junos OS Release 18.2R1, data streamed through gRPC can be formatted as protobuf in addition to key/value pairs for OpenConfig-based routing engine (RE) sensors. These sensors are in addition to the packet forwarding engine (PFE) sensors.

The following shows the universal key/value format:

```
message KeyValue {
    string key          = 1 [(telemetry_options).is_key = true];
    uint64 int_value    = 2;
    string str_value    = 3;
    string prefix_str   = 4;
}

message TelemetryStream {
    // router name or export IP address
    required string system_id = 1 [(telemetry_options).is_key = true];

    // line card / RE (slot number)
    optional uint32 component_id = 2 [(telemetry_options).is_key = true];

    // PFE (if applicable)
    optional uint32 sub_component_id = 3 [(telemetry_options).is_key = true];

    // timestamp (common to all entries in the kv array)
    optional uint64 timestamp = 4 [(telemetry_options).is_timestamp = true];

    // key / value pairs
    repeated KeyValue kv;
}
```

The following example shows how a set of counters for an interface can be represented:

```
key = "/interfaces/counters/rx-bytes",    int_value = 1000
key = "/interfaces/counters/tx-bytes",    int_value = 2000
key = "/interfaces/counters/rx-packets",  int_value = 10
key = "/interfaces/counters/rx-bytes",    int_value = 20
key = "/interfaces/counters/oper-state",  str_value = "up"
```

The Network Agent package provides a mapping table that maps field names to the OpenConfig key strings.

Exporting Packet Forwarding Engine Traffic Sensor Data

Starting with Junos OS Release 17.4R1, you can export Packet Forwarding Engine traffic statistics through the Junos Telemetry Interface for MX Series and PTX Series routers. Both UDP and gRPC are supported.

This sensor tracks reporting of Packet Forwarding Engine statistics counters and provides visibility into Packet Forwarding Engine error and drop statistics. The resource name for the sensor is `/junos/system/linecard/packet/usage/`. The OpenConfig paths report data specific to CPU, NPU and center chip (CC). The following paths are supported:

- `/components/component[name='FPCid:NPUid']/properties/property[name='counter']/state/value`, where FPC refers to the Flexible PIC Concentrator and NPU refers to the network processing unit (packet forwarding engine). A sample resource path is `/components/component[name='FPC0:NPU3']/properties/property[name='ts-output-pps']/state/value` where `hwds-data-error` is the counter for **Hardware Discards: Data Error**.

- `/components/component[name='FPCid:CCid']/properties/property[name='counter']/state/value`
, where FPC refers to the Flexible PIC Concentrator and CC refers to the center chip. A sample resource path is
`/components/component[name='FPC0:CC1']/properties/property[name='lpbk-packets']/state/value`
where `lpbk-packets` is the count of **Forward packets** specific to FPC0, center chip 1.
- `/components/component[name='FPCid']/properties/property[name='counter']/state/value`
, where FPC refers to the Flexible PIC Concentrator. A sample resource path is
`/components/component[name='FPC0']/properties/property[name='lts-input-packets']/state/value`
where `lts-input-packets` is the CPU counter **Local packets input**.

To provision the sensor to export data through gRPC, use the **telemetrySubscribe** RPC to specify telemetry parameters. For streaming through UDP, all parameters are configured at the **[edit services analytics]** hierarchy level.

The following is a map of counters to output fields in the **show pfe statistics traffic** command or **show pfe statistics traffic detail** command (supported only on MX Series routers).

CPU stats: (FPCX:CPUY)

Packet Forwarding Engine local traffic statistics:

Local packets input	:	2
Local packets output	:	1
Software input control plane drops	:	0
Software input high drops	:	0
Software input medium drops	:	0
Software input low drops	:	0
Software output drops	:	0
Hardware input drops	:	0

Counter

lts-input-packets	Local packets input
lts-output-packets	Local packets output
lts-sw-input-control-drops	Software input control plane drops
lts-sw-input-high-drops	Software input high drops
lts-sw-input-medium-drops	Software input medium drops
lts-sw-input-low-drops	Software input low drops
lts-sw-output-low-drops	Software output drops

NPU stats: (FPCX:CCY)

Input packets:	1169	0 pps
Output packets:	0	0 pps
Fabric Input :	277235149	16078 pps
Fabric Output :	277235149	16079 pps

Counter

ts-input-packets	Input packets
ts-input-packets-pps	Input packets in pps
ts-output-packets	Output packets
ts-output-packets-pps	Output packets in pps
ts-fabric-input-packets	Fabric Input
ts-fabric-input-packets-pps	Fabric Input in pps
ts-fabric-output-packets	Fabric Output

```

ts-fabric-output-packets-pps    Fabric Output in pps

Packet Forwarding Engine loopback statistics:
  Forward packets :                0                0 pps
  Forward bytes   :                0                0 bps
  Drop packets    :                0                0 pps
  Drop bytes      :                0                0 bps

Counter
lpbk-packets           Forward packets
lpbk-packets-pps       Forward packets pps
lpbk-packets-byte      Forward bytes
lpbk-packets-bps       Forward bytes   bps

lpbk-drop-packets      Drop packets
lpbk-drop-packets      Drop packets pps
lpbk-drop-packets      Drop bytes
lpbk-drop-packets      Drop bytes bps

Lu chips stats: FPCx:NPUI
Counter
lts-hw-input-drops
hwds-normal            Hardware discards normal discard
hwds-fabric            Hardware discards fabric drops
hwds-info-cell         Hardware discards info cell drops
hwds-timeout           Hardware discards timeour
hwds-truncated-key     Hardware discards truncated key
hwds-bits-to-test      Hardware discards bits to test
hwds-stack-underflow   Hardware discards stack underflow
hwds-stack-overflow    Hardware discards stack overflow
hwds-data-error        Hardware discards data error
hwds-extended          Hardware discards extended discard
hwds-invalid-iif       Hardware discards invalid interface
hwds-input-checksum    Hardware discards input checksum
hwds-output-mtu
hwds-inet-bad-route
hwds-inet6-bad-route
hwds-filter-discard
hwds-dlu-not-routable

```

Enabling “ON CHANGE” Sensor Support Through Network Management Interface (gNMI)

Periodical streaming of OpenConfig operational states and counters has been supported since Junos OS Release 16.1, exporting telemetry data from Juniper equipment to an external collector. While useful in collecting all the needed information and creating a baseline “snapshot,” periodical streaming is less useful for time-critical missions. In such instances, you can configure ON_CHANGE streaming for an external collector to receive information only when operational states experience a change in state.

To support ON_CHANGE streaming, a new specification called gRPC Network Management Interface (gNMI) is implemented for the modification and retrieval of configurations from a network element. Additionally, the gNMI specification can be used to generate and control telemetry streams from a network element to a data collection system. Using the new gNMI specification, one gRPC service definition can provide a

single implementation on a network element for both configuration and telemetry as well as a single NMS element to interact with a device by means of telemetry and configuration RPCs.

The Junos file package (junos-telemetry-interface) includes the gnmi.proto file and GnmiJuniperTelemetryHeader.proto Juniper extension for gNMI support.

Information about the RPCs supporting this feature can be found in the gNMI Proto file version 0.4.0 (the supported version) and the specification released

- <https://github.com/openconfig/reference/blob/master/rpc/gnmi/gnmi-specification.md>
- <https://github.com/openconfig/gnmi/blob/master/proto/gnmi/gnmi.proto>

The telemetry RPC **subscribe** under gNMI service supports ON_CHANGE streaming. RPC **subscribe** allows a client to request the target to send it values of particular paths within the data tree. Values may be streamed (STREAM), sent one-off on a long-lived channel (POLL), or sent one-off as a retrieval (ONCE).

If a subscription is made for a top level container with a sample frequency of 0, leaves with ON_CHANGE support are streamed based on events. Other leaves will not be streamed.



NOTE: In order to permit a device to decide which nodes will be streamed as ON_CHANGE and which will SAMPLE, the collector must subscribe for TARGET_DEFINED with sample_interval.

Enabling Client Streaming and Bidirectional Streaming of Telemetry Sensor Information

Starting with Junos OS Release 18.1R1, OpenConfig support through Remote Procedure Calls (gRPC) and JTI is extended to support client streaming and bidirectional streaming of telemetry sensor information on MX Series and PTX Series routers.

APIs are implemented in Junos based on Protobuf specifications for OpenConfig. These APIs perform configuration, operational state retrieval, and telemetry on Junos routers using gRPC as the transport mechanism.

With client streaming, the client sends a stream of requests to the server instead of a single request. The server typically sends back a single response containing status details and optional trailing metadata. With bidirectional streaming, both client and server send a stream of requests and responses. The client starts the operation by invoking the RPC and the server receives the client metadata, method name, and deadline. The server can choose to send back its initial metadata or wait for the client to start sending requests. The client and server can read and write in any order. The streams operate completely independently.

Junos devices can be managed through API (RPC) prototypes:

- **rpc Capabilities (CapabilityRequest)**

Returns (CapabilityResponse). Allows the client to retrieve the set of capabilities that is supported by the target.

- **rpc Get (GetRequest)**

Returns (GetResponse). Retrieves a snapshot of data from the target.

- **rpc Set (SetRequest)**

Returns (SetResponse). Allows the client to modify the state of data on the target.

- **rpc Subscribe (stream SubscribeRequest)**

Returns (stream SubscribeResponse). Allows a client to request the target to send it values for particular paths within the data tree. These values may be streamed (STREAM) or sent one-off on a long-lived channel (POLL), or sent as a one-off retrieval (ONCE). If a subscription is made for a top-level container with a sample frequency of 0, leaves with ON_CHANGE support are streamed based on events. Other leaves will not be streamed.

Juniper Extension Toolkit (JET) support provides insight to users regarding the status of clients connected to JSD. JET support for gRPC includes expanding the maximum number of clients that can connect to JSD from 8 to 30 (the default remains 5). To specify the maximum number of connections, include the **max-connections** statement at the **[edit system services extension-service request-response grpc]** hierarchy level.

To provide information regarding the status of clients connected to JSD, issue the enhanced **show extension-service client information** command and include the **clients** or **servers** options. The **clients** option displays request-response client information. The **servers** option displays request-response server information.

Enabling Streaming of Telemetry Sensor Information for SR-TE policies (BGP or Static)

Starting with Junos OS Release 18.3R1, OpenConfig support through gRPC and JTI provides continuous statistics streaming via the same sensor irrespective of the route that is active (BGP or static) for a given Segment Routing Traffic Engineering (SR-TE) policy.

This feature provides support for BGP [DRAFT-SRTE] and statically configured SR-TE policies at ingress routers.

To provision the sensor to export data through gRPC streaming, use the **telemetrySubscribe** RPC to specify telemetry parameters. Include the resource path **/mpls/signaling-protocols/segment-routing/** to export these statistics.

In addition to configuring the sensor, you must enable statistics collection through the Junos OS. To do this, include the **statistics** configuration statement at the **[edit protocols source-packet-routing telemetry]** hierarchy level. Optionally, you can limit statistics by including the **no-transit** or **no-ingress** parameter.

See *Configure a Telemetry Sensor in Junos* for instructions on configuring a sensor.

See [“Guidelines for gRPC Sensors \(Junos Telemetry Interface\)”](#) on page 37 for further information about resource paths.

Support for LSP Statistics

You can provision the LSP statistics sensor `/junos/services/label-switched-path/usage/` to monitor per-MPLS LSP statistics. Telemetry data is streamed from Junos devices and exported through JTI to external collectors at configurable intervals through gRPC without involving polling.

Statistics that are streamed are similar to the output displayed by the operational mode command `show mpls lsp bypass statistics`.

For bypass LSPs, the following are exported:

- Bypass LSP originating at the ingress router of the protected LSP.
- Bypass LSP originating at the transit router of the protected LSP.
- Bypass LSP protecting the transit LSP as well as the locally originated LSP.

When the bypass LSP is active, traffic is exported both on the bypass LSP and the ingress (protected) LSP.

You can also specify an LSP name and source IP address at the end of the path: `[name='lsp-name',source='ip-address']`.

To enable statistics for export from the Junos OS, include the `sensor-based-stats` statement at the `[edit protocols mpls]` hierarchy level.

To provision a sensor to export data through gRPC, use the `telemetrySubscribe` RPC to specify telemetry parameters. Streaming telemetry data through gRPC also requires the OpenConfig for Junos OS module. Both OpenConfig and Network Agent packages are bundled into the Junos OS image by default.

See [Table 5 on page 29](#) for the level of LSP sensor support by platform.

Table 5: LSP Sensor Support

Platform	Release Support Started
MX Series routers	?
QFX10000 switches PTX1000 router	Junos OS Release 17.2R1
EX9200 switches	Junos OS Release 17.3R1
MX Series and PTX Series routers	Junos OS Release 17.4R1
QFX5100, QFX5110, and QFX5200 switches	Junos OS Release 18.2R1
QFX5120-48Y and EX4650 switches	Junos OS Release 18.3R1
EX4600 switches	Junos OS Release 18.4R1

Table 5: LSP Sensor Support (continued)

Platform	Release Support Started
PTX10001-20C router	Junos OS Release 19.1R1

Release History Table

Release	Description
19.1R1	Starting with Junos OS Release 19.1R1, MX Series routers operating with MS-MIC and MS-MPC, QFX10002 switches, and PTX10002 routers are also supported.
18.2R1	Starting in Junos OS Release 18.2R1, when an external streaming server, or collector, provisions sensors to export data through gRPC on devices running Junos OS, the sensor configuration is committed to the junos-analytics instance of the ephemeral configuration database, and the configuration can be viewed by using the show ephemeral-configuration instance junos-analytics operational command.
18.1R1	Starting with Junos OS Release 18.1R1, OpenConfig support through Remote Procedure Calls (gRPC) and JT1 is extended to support client streaming and bidirectional streaming of telemetry sensor information on MX Series and PTX Series routers.
18.1R1	Starting with Junos OS Release 18.3R1, OpenConfig support through gRPC and JT1 provides continuous statistics streaming via the same sensor irrespective of the route that is active (BGP or static) for a given Segment Routing Traffic Engineering (SR-TE) policy.
17.4R1	Starting with Junos OS Release 17.4R1, MX2008 routers are supported.
17.4R1	Starting with Junos OS Release 17.4R1, you can export Packet Forwarding Engine traffic statistics through the Junos Telemetry Interface for MX Series and PTX Series routers. Both UDP and gRPC are supported.
17.3R1	Starting with Junos OS Release 17.3R1, Junos Telemetry Interface is supported on the Routing Control and Board (RCB) on PTX3000 routers, QFX5110 switches, and EX4600 and EX9200 switches.
17.2R1	Starting with Junos OS Release 17.2R1, OpenConfig and gRPC are also supported on QFX10000 switches, QFX5200 switches, and PTX1000 routers.
16.1R3	Starting in Junos OS Release 16.1R3, you can use a set of remote procedure call (RPC) interfaces to configure the Junos Telemetry Interface and stream telemetry data using the gRPC framework.
16.1R3	OpenConfig for Junos OS and gRPC are supported only on MPCs on MX Series and on PTX Series routers starting with Junos OS Release 16.1R3.

Related Documentation

- [Installing the Network Agent Package \(Junos Telemetry Interface\) on page 31](#)
- [Release Information for Junos OS with Upgraded FreeBSD](#)
- [Guidelines for gRPC Sensors \(Junos Telemetry Interface\) on page 37](#)

- *statistics*
- *telemetry*

Installing the Network Agent Package (Junos Telemetry Interface)

Starting with Junos OS Release 16.1R3, the Junos Network Agent software package provides a framework to support OpenConfig and gRPC for the Junos Telemetry Interface on MX Series routers and PTX5000 routers. The Network Agent package functions as a gRPC server that terminates the OpenConfig remote procedure call (RPC) interfaces and streams the telemetry data according to the OpenConfig specification. The Junos Network Agent package, which runs on the Routing Engine, implements local statistics collection and reports data to active telemetry stream subscribers.

Starting with Junos OS Release 17.2R1, the Junos Network Agent Package is also supported on QFX10000 switches and QFX5200 switches.

Starting with Junos OS Release 17.3R1, the Junos Network Agent Package is supported on QFX5110 switches and EX9200 switches.

Starting in Junos OS Release 18.3R1, the Junos OS image includes the Network Agent. You do not need to install Network Agent separately. This is true for Junos OS with upgraded FreeBSD and legacy Junos OS.

The Junos Network Agent is available as a separate package only for Junos OS with Upgraded FreeBSD. This package also includes the required YANG models. For other versions of Junos OS, Network Agent functionality is embedded in the software. For more information about Junos OS with Upgraded FreeBSD, see *Release Information for Junos OS with Upgraded FreeBSD*.

Network Agent for Junos OS software package has the following naming conventions:

- **Package Name**—This is **Network-Agent**.
- **Architecture**—This field indicates the CPU architecture of the platforms, such as **x86**.
- **Application Binary Interface (ABI)**—This field indicates the “word length” of the CPU architecture. The value is **32** for 32-bit architectures.
- **Release**—This field indicates the Junos OS release number, such as **16.1R3.16**.
- **Package release and spin number**—This field indicates the package version and spin number, such as **C1.1**.

All Junos Network Agent packages are in tarred and gzipped (**.tgz**) format.



NOTE: Each version of the Network Agent package is supported on a single release of Junos OS only. The Junos OS version supported is identified by the Junos OS release number included in the Network Agent package name.

An example of a valid Network Agent package name is:

- **network-agent-x86-32-16.1R4.12-C1.1.tgz**

Use the 32-bit Network Agent package for both 32-bit and 64-bit versions of Junos OS or Junos OS Evolved.

Before you begin:

- Install Junos OS Release 16.1R3 or later.
- Install the OpenConfig for Junos OS module. Using a Web browser, navigate to the All Junos Platforms software download URL on the Juniper Networks webpage: <https://www.juniper.net/support/downloads/>. From the **Network Management** tab, scroll down to select **OpenConfig**. Select the **Software** tab. Select the **OpenConfig Package (Junos with upgraded FreeBSD)**. For more information, see “[Installing the OpenConfig Package](#)” on page 18.
- Install Secure Sockets Layer (SSL) certificates of authentication on your Juniper Networks device.



NOTE: Only server-based SSL authentication is supported. Client-based authentication is not supported.

To download and install the Network Agent package:

1. Using a Web browser, navigate to the All Junos Platforms software download URL on the Juniper Networks webpage: <https://www.juniper.net/support/downloads/>.
2. Select the name of the Junos OS platform for the software that you want to download.
3. Select the release number (the number of the software version that you want to download) from the **Release** drop-down list to the right of the Download Software page.
4. Select the **Software** tab.
5. In the **Tools** section of the **Software** tab, select the **Junos Network Agent** package for the release.
6. Log in to the Juniper Networks authentication system using the username (generally your e-mail address) and password supplied by a Juniper Networks representative.
7. Download the software to a local host.
8. Copy the software to Juniper Networks device or to your internal software distribution site.

9. Install the new **network-agent** package on the device by issuing the **request system software add *package-name*** from the operational mode:

For example:

```
user@host > request system software add network-agent-x86-32-16.1R3.16-C1.0.tgz
```



NOTE: The command uses the **validate** option by default. This option validates the software package against the current configuration as a prerequisite to adding the software package to ensure that the device reboots successfully. This is the default behavior when the software package being added is a different release.

10. Issue the **show version | grep na\ telemetry** command to verify that the Network Agent package was successfully installed.

```
user@host> show version | grep na\ telemetry
JUNOS na telemetry
[20161109.201405_builder_junos_161_r3]
```

For information about configuring gRPC services on your Juniper Networks device, see [“gRPC Services for Junos Telemetry Interface” on page 33](#).

Release History Table

Release	Description
18.3R1	Starting in Junos OS Release 18.3R1, the Junos OS image includes the Network Agent.
17.3R1	Starting with Junos OS Release 17.3R1, the Junos Network Agent Package is supported on QFX5110 switches and EX9200 switches.
17.2R1	Starting with Junos OS Release 17.2R1, the Junos Network Agent Package is also supported on QFX10000 switches and QFX5200 switches.
16.1R3	Starting with Junos OS Release 16.1R3, the Junos Network Agent software package provides a framework to support OpenConfig and gRPC for the Junos Telemetry Interface on MX Series routers and PTX5000 routers.

Related Documentation

- [Understanding OpenConfig and gRPC on Junos Telemetry Interface on page 21](#)

[gRPC Services for Junos Telemetry Interface](#)

- [Configuring gRPC for the Junos Telemetry Interface on page 34](#)
- [Configuring Bidirectional Authentication for gRPC for Junos Telemetry Interface on page 35](#)

Configuring gRPC for the Junos Telemetry Interface

Starting with Junos OS Release 16.1R3 on MX Series routers and PTX3000 and PTX5000 routers, you can stream telemetry data for various network elements through gRPC, an open source framework for handling remote procedure calls based on TCP. The Junos Telemetry Interface relies on a so-called push model to deliver data asynchronously, which eliminates polling. For all Juniper devices that run a version of Junos OS with upgraded FreeBSD kernel, you must install the Junos Network Agent software package, which provides the interfaces to manage gRPC subscriptions. For Juniper Network devices that run other all other versions of the Junos OS, this functionality is embedded in the Junos OS software. For more information about installing the Junos Network Agent package, see [“Installing the Network Agent Package” on page 31](#).

The Junos Telemetry Interface and gRPC streaming are supported on QFX10000 and QFX5200 switches, and PTX1000 routers starting with Junos OS Release 17.2R1.

The Junos Telemetry Interface and gRPC streaming are supported on QFX5110, EX4600, and EX9200 switches starting with Junos OS Release 17.3R1.

Before you begin:

- Install Junos OS Release 16.1R3 or later on your Juniper Networks device.
- If your Juniper Networks device is running a version of Junos OS with an upgraded FreeBSD kernel, install the Junos Network Agent software package.
- Install the OpenConfig for Junos module. For more information see, [“Installing the OpenConfig Package” on page 18](#).

To configure your system for gRPC services:

1. Specify the API connection setting either as unsecured or as based on Secure Socket Layer (SSL) technology. You can specify only one type of connection.

For example, to set the API connection as unsecured:

```
[edit system services]
user@host# set extension-service request-response grpc
```

For example, to set the API connection based on a SSL:

```
[edit system services]
user@host# set extension-service request-response grpc ssl
```

For an SSL-based connection, you must specify a local-certificate name or you can rely on the default IP address (::) to enable Junos to “listen” for all IPv4 and IPv6 addresses on incoming connections. If you would rather specify an IP address, follow step b. below.

- a. Specify a local certificate-name. The certificate can be any user-defined value from the certificate configuration (not shown here). The certificate name should used in this example is `jsd_certificate`:

```
[edit system services extension-service request-response grpc]
user@host# set ssl local-certificate jsd_certificate
```



NOTE: Enter the name of a certificate you have configured with the local *certificate-name* statement at the [edit security certificates] hierarchy level.

- b. (Optional) Specify an IP address to listen to for incoming connections. for example, 192.0.2.0:

```
[edit system services extension-service request-response grpc]
user@host# set ssl ip-address 192.0.2.0
```



NOTE: If you do not specify an IP address, the default address of :: is used to listen for incoming connections.

2. Specify port 32767 for accepting incoming connections through gRPC.



NOTE: Port 32767 is the required port for gRPC streaming for both unsecured and SSL-based connections.

```
[edit system services extension-service request-response grpc]
user@host# set ssl port 32767
```

- See Also**
- [Understanding OpenConfig and gRPC on Junos Telemetry Interface on page 21](#)
 - [Importing SSL Certificates for Junos XML Protocol Support](#)

Configuring Bidirectional Authentication for gRPC for Junos Telemetry Interface

Starting with Junos OS Release 17.4R1, you can configure bidirectional authentication for gRPC sessions used to stream telemetry data. Previously, only authentication of the server, that is, Juniper device, was supported. Now the external client, that is management station that collects data, can also be authenticated using SSL certificates. The JET service process (*jsd*), which supports application interaction with Junos OS, uses the credentials provided by the external client to authenticate the client and authorize a connection.

Before you begin:

- If your Juniper device is running a version of Junos OS with an upgraded FreeBSD kernel, install the Junos Network Agent software package.

- Install the OpenConfig for Junos module. For more information see, [“Installing the OpenConfig Package” on page 18](#).
- Configure the gRPC server. For more information, see [“Configuring gRPC for the Junos Telemetry Interface” on page 34](#).

To configure authentication for the external client, that is, management station that collects telemetry data streamed from the Juniper device:

1. Enable bidirectional authentication and specify the requirements for a client certificate.

For example, to specify the strongest authentication, which requires a certificate and its validation:

```
[edit system services extension-service request-response grpc ssl]
user@host# set mutual-authentication client-certificate-request
require-certificate-and-verify
```



NOTE: The default is no-certificate. The other options are: request-certificate, request-certificate-and-verify, require-certificate, require-certificate-and-verify.

We recommend that you use no-certificate option in a test environment only.

2. Specify the certificate authority.



NOTE: For the certificate authority, specify a certificate-authority profile you have configured at the [edit security pki ca-profile] hierarchy level. This profile is used to validate the certificate provided by the client.

A digital certificate provides a way of authenticating users through a trusted third-party called a certificate authority (CA). The CA validates the identity of a certificate holder and “signs” the certificate to attest that it has not been forged or altered. For more information, see *Digital Certificates Overview* and *Example: Requesting a CA Digital Certificate*.

For example, to specify a certificate-authority profile named `jsd_certificate`:

```
[edit system services extension-service request-response grpc ssl
mutual-authentication]
user@host# set certificate-authority jsd_certificate
```

3. Verify that an external client can successfully connect with the Juniper device through the `jsd` process and invoke OpenConfig RPCs.

The external client passes username and password credentials as part of metadata in each RPC. The RPC is allowed if valid credentials are used. Otherwise an error message is returned.

See Also • [ssl](#)

Guidelines for gRPC Sensors (Junos Telemetry Interface)

Starting with Junos OS Release 16.1R3, the Junos Telemetry Interface supports gRPC remote procedure calls (gRPC) to provision sensors and to subscribe to and receive telemetry data on MX Series routers and PTX3000 and PTX5000 routers.

Starting with Junos OS Release 17.2R1, QFX10002, QFX10008, and QFX10016 switches, QFX5200 switches, and PTX1000 and PTX10008 routers are also supported.

Starting with Junos OS Release 17.3R1, QFX5110 switches, EX4600, EX4600-VC, and EX9200 switches and the Routing and Control Board (RCB) on PTX3000 routers are also supported.

Starting with Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensors are supported.

Starting with Junos OS Release 18.2R1, PTX10002 routers are also supported.

Starting with Junos OS Release 17.4R1, PTX10016 routers and virtual MX Series (vMX) routers are also supported.

Starting with Junos OS Release 18.1R1, QFX5210-64C switches and QFX5100 switches are also supported.

Starting with Junos OS Release 18.1R1, ON_CHANGE streaming of ARP, ND, and IP sensor information associated with interfaces is supported through gRPC for MX Series routers and PTX Series routers.

Starting with Junos OS Release 18.3R1, ON_CHANGE streaming of LLDP telemetry sensor information is supported through gRPC for MX Series and PTX Series routers.

Starting with Junos OS Release 18.3R1, QFX5120-AY and EX4650 switches are also supported.

Starting with Junos OS Release 18.4R1, EX4600 switches are also supported.

Starting with Junos OS Release 18.4R1, MX480, MX960, MX2010, MX2020, MX2008 and MX-ELM routers are also supported.

Starting with Junos OS Release 19.1R1, MX Series routers operating with MS-MIC and MS-MPC, QFX10002 switches, and PTX10002 routers are also supported.

See [Table 6 on page 38](#) for information about which sensors are supported with gRPC and on which platforms.

See [Table 7 on page 107](#) for a description of supported broadband edge (BBE) gRPC sensors, which are supported on all platforms supporting gRPC unless otherwise noted.

To activate a sensor, use the corresponding resource path. Each resource path enables data streaming for the system resource globally, that is, systemwide. You can also modify each resource path, such as to specify a specific logical or physical interface. For example, to specify a specific interface, include the following at the end of the path:

`[name='interface-name']/`

Supported gRPC Sensors

See [Table 6 on page 38](#) for a description of supported gRPC sensors and [Table 7 on page 107](#) for a description of supported broadband edge (BBE) gRPC sensors, including the subscription path you use to provision the sensors.

Table 6: gRPC Sensors

resource path	Description
<code>/components/component/</code>	<p>Sensor for chassis components.</p> <p>ON_CHANGE notification is triggered if a component (FPC) is inserted or removed or if a component's power is on or off (FPC is online or offline). Instant reporting of such events is handled with this sensor.</p> <p>ON_CHANGE streaming is supported on MX960, MX2010, MX2020, PTX-5000, PTX1000, and PTX10000 routers starting with Junos OS Release 18.4R1.</p> <p>You can also add the following endpoints to the path to stream specific statistics:</p> <ul style="list-style-type: none"> • name • state/id • state/description • state/serial-no • state/part-no • state/type—Identifies the ON_CHANGE event type. Event types are: FRU_ADD, FRU_REMOVE, FRU_POWERON, and FRU_POWEROFF. <p>For more information about ON_CHANGE streaming, see "Understanding OpenConfig and gRPC on Junos Telemetry Interface" on page 21.</p>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/components/component/subcomponents/ subcomponent[name='FPCid:NPUid']/properties/ property/[name=' counter']/state/value</code>	<p>Sensor for packet forwarding engine statistics. The subcomponent name <i>npu-id</i> refers to the number of the packet forwarding engine. This sensor provides visibility into packet forwarding engine errors and drops.</p> <p>Supported on MX Series routers and PTX Series routers starting with Junos OS Release 17.4R1.MX960 MX2010 MX2020 PTX-5000 PTX1000 PTX10000</p> <p>The value for <i>counter</i> is one of the following;</p> <ul style="list-style-type: none"> • lts-hw-input-drops • hwds-normal • hwds-fabric • hwds-info-cell • hwds-timeout • hwds-truncated-key • hwds-bits-to-test • hwds-stack-underflow • hwds-stack-overflow • hwds-inet6-bad-route • hwds-inet-bad-route • hwds-filter-discard • hwds-dlu-not-routable • hwds-data-error • hwds-extended • hwds-invalid-iif • hwds-input-checksum • hwds-output-mtu • lts-input-packets • lts-output-packets • lts-sw-input-control-drops • lts-sw-input-high-drops • lts-sw-input-medium-drops • lts-sw-input-low-drops • lts-sw-output-low-drops

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/components/component/subcomponents/ subcomponent[name='FPCID:CCid']/properties/property/ [name=' counter']/state/value</code>	<p>Sensor for packet forwarding engine statistics. The subcomponent name <i>cc-id</i> refers to the center chip. This sensor provides visibility into packet forwarding engine errors and drops.</p> <p>Supported on MX Series routers and PTX Series routers starting with Junos OS Release 17.4R1.</p> <p>The value for <i>counter</i> is one of the following;</p> <ul style="list-style-type: none"> • <i>ts-fabric-input-pps</i> • <i>ts-fabric-output-pps</i> • <i>ts-fabric-input-packets</i> • <i>ts-fabric-output-packets</i> • <i>lpbk-packets</i> • <i>lpbk-pps</i> • <i>lpbk-bytes</i> • <i>lpbk-pps</i> • <i>lpbk-drop-packets</i> • <i>lpbk-drop-pps</i> • <i>lpbk-drop-bytes</i> • <i>lpbk-drop-bps</i>
<code>/components/component/subcomponents/ subcomponent[name='FPCID']/properties/property/ [name=' counter']/state/value</code>	<p>Sensor for packet forwarding engine statistics. The subcomponent name <i>FPCid</i> refers to the number of the Flexible PIC Concentrator. This sensor provides visibility into packet forwarding engine errors and drops. This sensor pulls CPU counters.</p> <p>Supported on MX Series routers and PTX Series routers starting with Junos OS Release 17.4R1.</p> <p>The value for <i>counter</i> is one of the following;</p> <ul style="list-style-type: none"> • <i>lts-hw-input-drops</i> • <i>lts-input-packets</i> • <i>lts-output-packets</i> • <i>lts-sw-input-control-drops</i> • <i>lts-sw-input-high-drops</i> • <i>lts-sw-input-medium-drops</i> • <i>lts-sw-input-low-drops</i> • <i>lts-sw-output-low-drops</i>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/junos/chassis/gres/</code>	<p>Sensor for graceful Routing Engine switchover (GRES) information.</p> <p>Starting with Junos OS Release 19.1R1, EX9200, EX9251, EX9253, MX Series, and PTX Series are supported.</p> <p>You can also add the following as the end path for <code>/junos/chassis/gres/</code>:</p> <ul style="list-style-type: none"> • configured-state • error-state • gres-time • master-kernel-ready • slave-connect-time • slave-kernel-ready
<code>/junos/chassis/issu/</code>	<p>Sensor for in-service software upgrade (ISSU) information.</p> <p>Starting with Junos OS Release 19.1R1, EX9200, EX9251, EX9253, MX Series, and PTX Series are supported.</p> <p>You can also add the following as the end path for <code>/junos/chassis/issu/</code>:</p> <ul style="list-style-type: none"> • failure-stage • current-issu-stage
<code>/junos/kernel/peer-infra/</code>	<p>Sensor for PFEMAN connection information.</p> <p>Starting with Junos OS Release 19.1R1, EX9200, EX9251, EX9253, MX Series, and PTX Series are supported.</p> <p>You can also add the following as the end path for <code>/junos/kernel/peer-infra/</code>:</p> <ul style="list-style-type: none"> • pfeman-conn-drops • spurious-ppt-wkups
<code>/junos/kernel/record-meta-data/record_time</code>	<p>Sensor for system time at which Routing Engine metadata is created.</p> <p>Starting with Junos OS Release 19.1R1, EX9200, EX9251, EX9253, MX Series, and PTX Series are supported.</p>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/junos/kernel-ifstate</code>	<p>Sensor for Routing Engine ifstate information.</p> <p>Starting with Junos OS Release 19.1R1, EX9200, EX9251, EX9253, MX Series, and PTX Series are supported.</p> <p>You can also add the following as the end path for <code>/junos/kernel-ifstate/</code>:</p> <ul style="list-style-type: none"> • <code>alive-clients-cnt</code> • <code>alive-ifstates-cnt</code> • <code>client-limit-reached</code> • <code>dead-clients-cnt</code> • <code>dead-ifstates-cnt</code> • <code>delayed-unrefs-cnt</code> • <code>delayed-unrefs-max</code> • <code>stuck-clients-cnt</code>
<code>/junos/kernel-ifstate/stats/churn-rate</code>	<p>Sensor for Routing Engine network object churn rate statistics.</p> <p>Starting in Junos OS Release 18.2R1, MX Series and PTX Series switches are supported.</p> <ul style="list-style-type: none"> • <code>overall-churn-rate</code> • <code>route-add-rate</code> • <code>route-change-rate</code> • <code>route-delete-rate</code> • <code>nexthop-add-rate</code> • <code>nexthop-change-rate</code> • <code>nexthop-delete-rate</code>
<code>/junos/kernel-ifstate/stats/peer-consumption-rate</code>	<p>Sensor for Routing Engine network object peer consumption rate statistics.</p> <p>Starting in Junos OS Release 18.2R1, MX Series and PTX Series switches are supported.</p> <ul style="list-style-type: none"> • <code>peer-index</code> • <code>consumption-rate-counter</code> • <code>consumption-route-add-rate</code> • <code>consumption-route-delete-rate</code> • <code>consumption-nexthop-add-rate</code> • <code>consumption-nexthop-change-rate</code> • <code>consumption-nexthop-delete-rate</code>
<code>/junos/kernel-ifstate/stats/record-seq-num</code>	Sequence number of a statistic or record.
<code>/junos/kernel-ifstate/stats/record-time</code>	System time at which a statistic or record is created.

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/junos/kernel-ifstate/stats/vetos-statistics</code>	<p>Sensor for Routing Engine state statistics.</p> <p>Starting in Junos OS Release 18.2R1, MX Series and PTX Series switches are supported.</p> <ul style="list-style-type: none"> • <code>veto-vm-page-count-severe</code> • <code>veto-ifstate-memory</code> • <code>veto-memory-overconsumed</code> • <code>veto-pfe-veto-max-routes</code> • <code>veto-too-many-delayed-unrefs</code> • <code>veto-nh-memory-usage</code> • <code>veto-mbuf-cluster</code> • <code>veto-flabel-space-exhaustion</code> • <code>veto-flabel-space-consumption</code>
<code>/junos/ike-security-associations/ike-security-association/routing-instance [name=' routing-instance-name']</code>	<p>Sensor for Internet Key Exchange (IKE) security statistics.</p> <p>When you configure a subscription request, use the reporting-interval parameter to configure the interval (in seconds) in which statistics are reported.</p> <p>Starting with Junos OS Release 18.1R1, MX Series routers are supported.</p> <ul style="list-style-type: none"> • <code>remote-ip</code> • <code>local-ip</code> • <code>number-ipsec-sa-created</code> • <code>number-ipsec-sa-deleted</code> • <code>number-ipsec-sa-rekey</code> • <code>exchange-type</code> • <code>in-bytes</code> • <code>in-packets</code> • <code>out-bytes</code> • <code>out-packets</code> • <code>delete-payload-received</code> • <code>delete-payload-transmitted</code> • <code>dpd-request-payload-received</code> • <code>dpd-request-payload-transmitted</code> • <code>dpd-response-payload-received</code> • <code>dpd-response-payload-transmitted</code> • <code>dpd-response-payload-missed</code> • <code>dpd-response-payload-maximum-delay</code> • <code>dpd-response-seq-payload-missed</code> • <code>invalid-spi-notify-received</code> • <code>invalid-spi-notify-transmitted</code> • <code>routing-instance</code>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>junos/rpm/probe-results/probe-test-results/</code>	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for probe test results for Real time Performance Monitoring (RPM) statistics. These statistics provide RPM monitoring data results collected by Juniper devices. You can use this information to assure service level agreements, improve network design, and optimize traffic engineering.</p> <p>Starting with Junos OS Release 18.3R1, MX Series routers are supported.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • owner • test-name • target-address • target-url • source-address • destination-interface • probe-type • icmp-id • routing-instance-name • test-size • http-status • loss-thresh-total • loss-thresh-succ • rtt-thresh • rtt-jitter-thresh • rtt-stddev-thresh • igr-thresh • igr-jitter-thresh • igr-stddev-thresh • egr-thresh • egr-jitter-thresh • egr-stddev-thresh • probe-tests-hw-ts-err/invalid-client-recv-ts-cntr • probe-tests-hw-ts-err/invalid-client-nots-cntr • probe-tests-hw-ts-err/invalid-server-send-ts-cntr • probe-tests-hw-ts-err/invalid-server-spent-time-cntr • probe-single-results • probe-single-results/probe-time • probe-single-results/probe-sent-time • probe-single-results/probe-status • probe-single-results/hardware-timestamp-status • probe-single-results/rtt • probe-single-results/egress • probe-single-results/ingress • probe-single-results/round-trip-jitter • probe-single-results/egress-jitter • probe-single-results/round-trip-interarrival-jitter

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none">• probe-single-results/egress-interarrival-jitter• probe-single-results/ingress-interarrival-jitter• probe-test-generic-result• probe-test-generic-results/results-scope• probe-test-generic-results/probes-sent• probe-test-generic-results/probe-responses• probe-test-generic-results/loss-percentage• probe-test-generic-measurements• probe-test-generic-measurements/samples• probe-test-generic-measurements/min-delay• probe-test-generic-measurements/max-delay• probe-test-generic-measurements/avg-delay• probe-test-generic-measurements/jitter-delay• probe-test-generic-measurements/stddev-delay• probe-test-generic-measurements/sum-delay

Table 6: gRPC Sensors (continued)

resource path	Description
/junos/rpm/history-results/history-single-test-results/	<p>Sensor for history results for Real time Performance Monitoring (RPM) statistics. These statistics provide RPM monitoring data results collected by Juniper devices. You can use this information to assure service level agreements, improve network design, and optimize traffic engineering.</p> <p>Starting with Junos OS Release 18.3R1, MX Series routers are supported.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • owner • test-name • target-address • target-url • source-address • destination-interface • probe-type • icmp-id • test-size • http-status • routing-instance-name • loss-thresh-total • loss-thresh-succ • rtt-thresh • rtt-jitter-thresh • rtt-stddev-thresh • igr-thresh • igr-jitter-thresh • igr-stddev-thresh • egr-thresh • egr-jitter-thresh • egr-stddev-thresh • probe-single-results • probe-single-results/probe-time • probe-single-results/probe-sent-time • probe-single-results/probe-status • probe-single-results/hardware-timestamp-status • probe-single-results/rtt • probe-single-results/egress • probe-single-results/ingress • probe-single-results/round-trip-jitter • probe-single-results/egress-jitter • probe-single-results/ingress-jitter • probe-single-results/round-trip-interarrival-jitter • probe-single-results/egress-interarrival-jitter • probe-single-results/ingress-interarrival-jitter

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/junos/rpm/server/</code>	<p>Sensor for server results for Real time Performance Monitoring (RPM) statistics. These statistics provide RPM monitoring data results collected by Juniper devices. You can use this information to assure service level agreements, improve network design, and optimize traffic engineering.</p> <p>Starting with Junos OS Release 18.3R1, MX Series routers are supported.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none">• <code>active-servers</code>• <code>active-servers/protocol</code>• <code>active-servers/port</code>• <code>active-servers/dst-interface</code>
<code>/junos/security/verixec-state</code>	<p>Sensor for Veriexec state information.</p> <p>Starting with Junos OS Release 19.1R1, EX9200, EX9251, EX9253, MX Series, and PTX Series are supported.</p>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/junos/services/label-switched-path/usage/</code>	<p>Sensor for LSP statistics. On MX Series routers only, the following are also supported: bidirectional LSPs for ultimate-hop popping (UHP).</p> <p>Starting with Junos OS Release 17.2R1, QFX10000 switches and PTX1000 routers are also supported.</p> <p>Starting with Junos OS Release 17.3R1, EX9200 switches are also supported.</p> <p>Starting with Junos OS Release 17.4R1 on MX Series and PTX Series routers only, statistics for bypass LSPs are also exported. Previously, only statistics for ingress LSPs were exported.</p> <p>Starting with Junos OS Release 18.2R1, QFX5100, QFX5110, and QFX5200 switches are also supported. .</p> <p>Starting with Junos OS Release 18.3R1, QFX5120-48Y and EX4650 switches are also supported.</p> <p>Starting with Junos OS Release 18.4R1, EX4600 switches are also supported.</p> <p>Starting with Junos OS Release 19.1R1, PTX10001-20C routers are supported for RSVP LSPs only.</p> <p>Starting with Junos OS Release 19.1R1, QFX10002 switches and PTX10002 routers are supported.</p> <p>For bypass LSPs, the following are exported:</p> <ul style="list-style-type: none"> • Bypass LSP originating at the ingress router of the protected LSP. • Bypass LSP originating at the transit router of the protected LSP. • Bypass LSP protecting the transit LSP as well as the locally originated LSP. <p>When the bypass LSP is active, traffic is exported both on the bypass LSP and the ingress (protected) LSP.</p> <p>You can also specify an LSP name and source IP address at the end of the path: <code>[name='lsp-name',source='ip-address']</code></p> <p>NOTE: When you enable a sensor for LSP statistics only, you must also configure the sensor-based-stats statement at the <code>[edit protocols mpls]</code> hierarchy level. MX Series routers should operate in enhanced mode. If not enabled by default, include either the enhanced-ip statement or the enhanced-ethernet statement at the <code>[edit chassis network-services]</code> hierarchy level.</p>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/junos/twamp/client/control-connection/</code>	<p>Sensor for client control connection results for Two-Way Active Management Protocol (TWAMP). TWAMP (described in RFC 5357). Used to measure traffic performance between end-points, you can use this information to assure service level agreements, improve network design, and optimize traffic engineering.</p> <p>Starting with Junos OS Release 18.3R1, MX Series routers are supported.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none">• <code>control-name</code>• <code>client-address</code>• <code>client-port</code>• <code>server-address</code>• <code>server-port</code>• <code>session-count</code>• <code>auth-mode</code>• <code>server-address</code>• <code>server-port</code>• <code>test-session/session-name</code>• <code>test-session/sender-address</code>• <code>test-session/sender-port</code>• <code>test-session/reflector-address</code>• <code>test-session/reflector-port</code>

Table 6: gRPC Sensors (continued)

resource path	Description
/junos/twamp/client/probe-test-results/	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for client probe test results for Two-Way Active Management Protocol (TWAMP). TWAMP (described in RFC 5357) is used to measure traffic performance between end-points. You can use this information to assure service level agreements, improve network design, and optimize traffic engineering.</p> <p>Starting with Junos OS Release 18.3R1, MX Series routers are supported.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • owner • test-name • destination-interface • test-size • server-address • server-port • client-address • client-port • reflector-address • reflector-port • sender-address • sender-port • loss-thresh-total • loss-thresh-succ • rtt-thresh • rtt-jitter-thresh • rtt-stddev-thresh • igr-thresh • igr-jitter-thresh • igr-stddev-thresh • egr-thresh • egr-jitter-thresh • egr-stddev-thresh • probe-tests-hw-ts-err/invalid-client-recv-ts-cntr • probe-tests-hw-ts-err/invalid-client-nots-cntr • probe-tests-hw-ts-err/invalid-server-send-ts-cntr • probe-tests-hw-ts-err/invalid-server-spent-time-cntr • probe-single-results/ • probe-single-results/probe-time • probe-single-results/probe-sent-time • probe-single-results/probe-status • probe-single-results/hardware-timestamp-status • probe-single-results/rtt • probe-single-results/egress • probe-single-results/ingress • probe-single-results/round-trip-jitter

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • probe-single-results/egress-jitter • probe-single-results/ingress-jitter • probe-single-results/round-trip-interarrival-jitter • probe-single-results/egress-interarrival-jitter • probe-single-results/ingress-interarrival-jitter • probe-test-generic-results/ • probe-test-generic-results/results-scope • probe-test-generic-results/probes-sent • probe-test-generic-results/probe-responses • probe-test-generic-results/loss-percentage • probe-test-generic-results/probe-test-rtt • probe-test-generic-results/probe-test-generic-measurements/ • probe-test-generic-results/probe-test-generic-measurements// probe-measurement-type • probe-test-generic-results/probe-test-generic-measurements/samples • probe-test-generic-results/probe-test-generic-measurements/min-delay • probe-test-generic-results/probe-test-generic-measurements/max-delay • probe-test-generic-results/probe-test-generic-measurements/avg-delay • probe-test-generic-results/probe-test-generic-measurements/jitter-delay • probe-test-generic-results/probe-test-generic-measurements/stddev-delay • probe-test-generic-results/probe-test-generic-measurements/sum-delay

Table 6: gRPC Sensors (continued)

resource path	Description
/junos/twamp/client/history-test-results/ history-single-test-results/	<p>Sensor for client history test results for Two-Way Active Management Protocol (TWAMP). TWAMP (described in RFC 5357) is used to measure traffic performance between end-points. You can use this information to assure service level agreements, improve network design, and optimize traffic engineering.</p> <p>Starting with Junos OS Release 18.3R1, MX Series routers are supported.</p> <ul style="list-style-type: none"> • owner • test-name • destination-interface • test-size • server-address • server-port • client-address • client-port • reflector-address • reflector-port • sender-address • sender-port • loss-thresh-total • loss-thresh-succ • rtt-thresh • rtt-jitter-thresh • rtt-stddev-thresh • igr-thresh • igr-jitter-thresh • igr-stddev-thresh • egr-thresh • egr-jitter-thresh • egr-stddev-thresh • probe-single-results/ • probe-single-results/probe-time • probe-single-results/probe-sent-time • probe-single-results/probe-status • probe-single-results/hardware-timestamp-status • probe-single-results/rtt • probe-single-results/egress • probe-single-results/ingress • probe-single-results/round-trip-jitter • probe-single-results/egress-jitter • probe-single-results/ingress-jitter • probe-single-results/round-trip-interarrival-jitter • probe-single-results/egress-interarrival-jitter • probe-single-results/ingress-interarrival-jitter

Table 6: gRPC Sensors (continued)

resource path	Description
/junos/twamp/server/control-connection/	<p>Sensor for control connection results for servers for Two-Way Active Management Protocol (TWAMP). TWAMP (described in RFC 5357) is used to measure traffic performance between end-points. You can use this information to assure service level agreements, improve network design, and optimize traffic engineering.</p> <p>Starting with Junos OS Release 18.3R1, MX Series routers are supported.</p> <ul style="list-style-type: none"> • control-name • client-address • client-port • server-address • server-port • session-count • auth-mode • test-session/ • test-session/session-name • test-session/sender-address • test-session/sender-port • test-session/reflector-address • test-session/reflector-port

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/network-instances/ network-instance[name='instance-name']/mpls/lsp/ constrained-path/container-tunnels/ container-tunnel[name='name']state/</code>	<p>Sensor for container tunnel streaming notifications and normalization status.</p> <p>Starting with Junos OS Release 19.1R1, this sensor is supported on all platforms supporting JTI.</p> <p>The following paths are also supported:</p> <ul style="list-style-type: none"> • <code>name</code> • <code>oper-state</code> • <code>member-count</code> • <code>minimum-lsp-count</code> • <code>maximum-lsp-count</code> • <code>normalize-timer</code> • <code>normalize-threshold</code> • <code>aggregate-bandwidth</code> • <code>sampled-aggregate-bandwidth</code> • <code>max-signaling-bandwidth</code> • <code>min-signaling-bandwidth</code> • <code>splitting-bandwidth</code> • <code>merging-bandwidth</code> • <code>incremental-normalization</code> • <code>failover-normalization</code> • <code>time-to-normalize</code> • <code>sampling/sampling-outlier-cutoff</code> • <code>sampling/sampling-mode</code> • <code>sampling/sampling-percentile</code> • <code>normalization-status</code> which includes <code>normalize-init</code>, <code>normalize-complete</code>, and <code>avoid-normalize</code>. <p><code>normalization-status/normalize-init</code></p> <p><code>normalization-status/normalize-complete</code></p> <p><code>normalization-status/avoid-normalize</code></p>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/network-instances/ network-instance[name='instance-name']/mpls/lsp/ constrained-path/tunnels/tunnel[name='name']/ p2p-tunnel-attributes/p2p-primary-paths/ p2p-primary-path[name='path-name']/</code>	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for LSP events and properties.</p> <p>LSP events and properties are exported for ingress point-to-point LSPs, point-to-multipoint LSPs, bypass LSPs, and dynamically created LSPs.</p> <p>NOTE: Starting with Junos OS Release 17.4R1, telemetry data for LSP events and properties is reported separately for each routing instance. To export data for LSP events and properties, you must now include <code>/network-instances/network-instance[name='instance-name']/</code> in front of all supported paths. .</p> <p>Supported on MX Series and PTX Series routers and QFX10000 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on EX4600 and EX9200 switches and QFX5110 and QFX5200 switches starting with Junos OS Release 17.3R1.</p> <p>Starting with Junos OS Release 18.1R1, QFX5100 switches are also supported.</p> <p>Starting with Junos OS Release 18.3R1, QFX5120-48Y and EX4650 switches are also supported.</p> <p>Starting with Junos OS Release 18.4R1, EX4600 switches are also supported.</p> <p>The following paths are also supported:</p> <ul style="list-style-type: none"> • <code>lsp-instances/state/notify-status/initiated</code> • <code>lsp-instances/state/notify-status/lsp-up</code> • <code>lsp-instances/state/notify-status/lsp-down</code> • <code>lsp-instances/state/notify-status/lp-available</code> • <code>lsp-instances/state/notify-status/lp-unavailable</code> • <code>lsp-instances/state/notify-status/autobw-success</code> • <code>lsp-instances/state/notify-status/autobw-fail</code> • <code>lsp-instances/state/notify-status/patherr-recv</code> • <code>lsp-instances/state/notify-status/tunnel-local-repaired</code> • <code>lsp-instances/state/bandwidth</code> • <code>lsp-instances/state/metric</code> • <code>lsp-instances/state/max-avg-bandwidth</code> • <code>/state/associated-rsvp-sessions/associated-rsvp-session[local-index='index-number']/</code> • <code>state/notify-status</code> • <code>state/notify-status/select-active-path</code> • <code>state/notify-status/deselect-active-path</code> • <code>state/notify-status/change-active-path</code> • <code>state/notify-status/originate-mbb</code> • <code>state/notify-status/cspf-noroute</code> • <code>state/notify-status/cspf-success</code> • <code>state/notify-status/gr-recovery-fail</code> • <code>state/explicit-path-name</code> <p>NOTE: To specify a specific LSP name and source address, include</p>

Table 6: gRPC Sensors (continued)

resource path	Description
	[name='lsp-name',source='address'] after mpls/lsp/constrained-path-tunnels/tunnel/ in any of the supported paths. If do not include a specific LSP name, data is exported for all configured LSPs.
/network-instances/ network-instance[name='instance-name']/mpls/lsp/ constrained-path/tunnels/tunnel[name='name']/ p2p-tunnel-attributes/p2p-primary-paths/ p2p-primary-path[name='path-name'][local-index='local-index']/ state/notify-status	Sensor for self-ping failure. This sensor supports self-ping logs. Starting with Junos OS Release 19.1R1, this sensor is supported on all platforms supporting JT1.
/network-instances/ network-instance[name='instance-name']/mpls/lsp/ constrained-path/tunnels/tunnel[name='name']/ p2p-tunnel-attributes/p2p-primary-paths/ p2p-primary-path[name='path-name'][local-index='local-index']/ state/reason/	Sensor that indicates the reason for a self-ping failure. Starting with Junos OS Release 19.1R1, this sensor is supported on all platforms supporting JT1.
/network-instances/ network-instance[name='instance-name']/mpls/ signaling-protocols/rsvp-te/sessions/session/state/ notify-status	<p>Starting with Junos OS Release 17.4R1, telemetry data for LSP events and properties is reported separately for each routing instance.</p> <p>Supported on MX Series and PTX Series routers and QFX10000 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on EX4600 and EX9200 switches and QFX5110 and QFX5200 switches starting with Junos OS Release 17.3R1.</p> <p>Starting with Junos OS Release 18.1R1, QFX5100 switches are also supported.</p> <p>Starting with Junos OS Release 18.3R1, QFX5120-48Y and EX4650 switches are also supported.</p> <p>Starting with Junos OS Release 18.4R1, EX4600 switches are also supported.</p> <p>The following paths are also supported:</p> <ul style="list-style-type: none"> • detour-up • detour-down • patherr-recv • patherr-recv/admission_control_failure • patherr-recv/session_preeempted • patherr-recv/bad_loose_route • patherr-recv/bad_strict_route • patherr-recv/label_allocation_failure • patherr-recv/non_rsvp_capable_router • patherr-recv/ttl_expired • patherr-recv/routing_loop_detected • patherr-recv/requested_bandwidth_unavailable • patherr-recv/ttl_expired • pathmtu-change

Table 6: gRPC Sensors (continued)

resource path	Description
/junos/npu-memory/junos/system/linecard/npu/memory/	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for network processing unit (NPU) memory, NPU memory utilization, and total memory available for each memory type.</p> <p>Supported on QFX10000 switches and PTX1000 routers starting with Junos OS Release 17.2R1.</p> <p>Supported on EX9200 switches starting with Junos OS Release 17.3R1.</p> <p>NOTE: Starting with Junos Release 17.4R1, FPC1 and FCP2 on PTX Series routers export data for NPU memory and NPU memory utilization. Previously, this sensor was supported only on FPC 3.</p> <p>Starting with Junos OS Release 18.3R1, EX4650 switches are supported.</p> <p>Starting with Junos OS Release 19.1R1, QFX10002 switches and PTX10002 routers are supported.</p> <p>The OpenConfig path is <code>/components/component[name="FPC<fpc-id>:NPU<npu-id>"] /properties/property/</code></p> <p>You can also add the following to the end of the path to stream specific statistics for NPU memory:</p> <ul style="list-style-type: none"> <code>[name="mem-util-<memory-name>-size"]/value</code> <code>[name="mem-util-<memory-name>-bytes-allocated"]/value</code> <code>[name="mem-util-<memory-name>-utilization"]/value</code> <code>[name="mem-util-<partition-name>-<app-name>-allocation-count"]/value</code> <code>[name="mem-util-<partition-name>-<app-name>-bytes-allocated"]/value</code> <code>[name="mem-util-<partition-name>-<app-name>-free-count"]/value</code> <p>You can add the following to the end of the path to stream specific statistics for NPU utilization:</p> <ul style="list-style-type: none"> <code>[name="util-<memory-name>-average-util"]>/value</code> <code>[name="util-<memory-name>-highest-util"]>/value</code> <code>[name="util-<memory-name>-lowest-util"]>/value</code> <code>[name="util-<memory-name>-average-cache-hit-rate"]>/value</code> <code>[name="util-<memory-name>-lowest-cache-hit-rate"]>/value</code> <code>[name="util-<packet-identifier>-rate"]>/value</code> <p>You can also export the following statistics for NPU memory for PTX routers only</p> <ul style="list-style-type: none"> <code>pfe_name</code> <code>combined_pool_name</code> <code>combined_size</code> <code>combined_usage_cnt</code> <code>combined_utilization</code> <code>global_pool_name</code> <code>global_usage_cnt</code> <code>global_alloc_cnt</code>

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • <code>global_free_cnt</code> • <code>local_pool_name</code> • <code>local_usage_cnt</code> • <code>local_alloc_cnt</code> • <code>local_free_cnt</code>
<code>/junos/system/linecard/node-slicing/af-fab-stats/</code>	<p>Sensor to export abstracted fabric (AF) interface-specific load-balancing and fabric queue statistics. This sensor is only supported for in node virtualization configurations on MX routers with an AF Interface as the connecting link between guest network functions (GNFs). The sensor also reports aggregated statistics across all AF interfaces hosted on a source packet forwarding engine of local guest GNFs along with the fabric statistics for all traffic ingressing from and egressing to the fabric from that the packet forwarding engine.</p> <p>Supported on MX480, MX960, MX2010, MX2020, MX2008 and MX-ELM routers with Junos OS Release 18.4R1.</p>
<code>/junos/system/linecard/cpu/memory/</code>	<p>Sensor for CPU memory.</p> <p>NOTE: On PTX Series routers, FPC1 and FPC2 are not supported.</p> <p>Supported on QFX10000 switches and PTX1000 routers starting with Junos OS Release 17.2R1.</p> <p>Supported on EX9200 switches starting with Junos OS Release 17.3R1.</p> <p>Supported on QFX5100, QFX5110, and QFX5200 switches starting with Junos OS Release 18.2R1.</p> <p>Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.</p> <p>Supported on EX4600 switches starting with Junos OS Release 18.4R1.</p> <p>Supported on QFX10002 switches and PTX10002 routers starting with Junos OS Release 19.1R1.</p> <p>You can also include the following to end of the resource path for CPU memory:</p> <ul style="list-style-type: none"> • <code>[name="mem-util-<i><memory-name></i>-size"]/value</code> • <code>[name="mem-util-<i><memory-name></i>-bytes-allocated"]/value</code> • <code>[name="mem-util-<i><memory-name></i>-utilization"]/value</code> • <code>[name="mem-util-<i><memory-name></i>-<i><app-name></i>-allocations"]/value</code> • <code>[name="mem-util-<i><memory-name></i>-<i><app-name></i>-frees"]/value</code> • <code>[name="mem-util-<i><memory-name></i>-<i><app-name></i>-allocations-failed"]/value</code>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/junos/system/linecard/interface/</code>	<p>Packet Forwarding Engine sensor for physical interface traffic.</p> <p>NOTE: For PTX Series routers, for a specific interface, queue statistics are exported for each line card. For MX series routers, interface queue statistics are exported only from the slot on which an interface is configured.</p> <p>For Aggregated Ethernet interfaces, statistics are exported for the member physical interfaces. You must aggregate the counters at the destination server, or collector.</p> <p>If a physical interface is administratively down or operationally down, interface counters are not exported.</p> <p>Issuing an operational clear command, such as clear interfaces statistics all, does not reset statistics exported by the line card.</p> <p>Supported on PTX Series routers starting with Junos OS Release 15.1F3. Supported on MX Series routers starting with Junos OS Release 15.1F5.</p> <p>Supported on QFX10000 switches and PTX1000 routers starting with Junos OS Release 17.2R1.</p> <p>Supported on EX9200 switches, QFX5110 switches, and MX150 routers starting with Junos OS Release 17.3R1.</p> <p>Supported on QFX5100, QFX5110, and QFX5200 switches starting with Junos OS Release 18.2R1.</p> <p>Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.</p> <p>Supported on EX4600 switches Starting with Junos OS Release 18.4R1.</p> <p>Supported on QFX10002 switches and PTX10002 routers starting with Junos OS Release 19.1R1.</p>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/junos/system/linecard/interface/logical/usage</code>	<p>Packet Forwarding Engine sensor for logical interface statistics.</p> <p>NOTE: If a logical interface is operationally down, interface statistics continue to be exported.</p> <p>Issuing an operational clear command, such as clear interfaces statistics all, does not reset statistics exported by the line card.</p> <p>NOTE: Locally injected packets from the Routing Engine are not exported.</p> <p>Supported in Junos OS Release 15.1F5.</p> <p>Supported QFX10000 switches starting with on Junos OS Release 17.2R1.</p> <p>Supported on EX9200 switches, QFX5110 switches, and MX150 routers starting with Junos OS Release 17.3R1.</p> <p>Supported on QFX5100, QFX5110, and QFX5200 switches starting with Junos OS Release 18.2R1.</p> <p>Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.</p> <p>Supported on EX4600 switches starting with Junos OS Release 18.4R1.</p>
<code>/junos/system/linecard/optical</code>	<p>Sensor for optical alarms. Configure this sensor for et-type-fpc/pic/port (100-Gigabit Ethernet) interfaces.</p> <p>Supported on ACX6360 Universal Metro, MX Series, and PTX Series routers with a CFP2-DCO optics module starting with Junos OS Release 18.3R1. This module provides a high-density, long-haul OTN transport solution with MACSec capability.</p>
<code>/junos/system/linecard/otn</code>	<p>Sensor for G.709 optical transport network (OTN) alarms. Configure this sensor on ot-type-fpc/pic/port interfaces.</p> <p>Supported on ACX6360 Universal Metro, MX Series, and PTX Series routers with a CFP2-DCO optics module starting with Junos OS Release 18.3R1. This module provides a high-density, long-haul OTN transport solution with MACSec capability.</p>
<code>/junos/system/linecard/qmon-sw/</code>	<p>Sensor for congestion and latency monitoring statistics.</p> <p>Supported on QFX5100, QFX5110, and QFX5200 switches starting with Junos OS Release 18.2R1.</p> <p>Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.</p> <p>Supported on EX4600 switches starting with Junos OS Release 18.4R1.</p>

Table 6: gRPC Sensors (continued)

resource path	Description
<p>/network-instances/network-instance/protocols/protocol/bgp/</p> <p>NOTE: Starting with Junos OS Release 17.4R1 on MX Series and PTX Series routers, you can provision Junos Telemetry Interface sensors to export data for BGP routing tables (RIBs) for IPv4 and IPv6 routes.</p> <p>For BGP routing table paths, the /network-instances/network-instance/ path is not supported.</p> <p>Each address family supports exporting data for five different tables, a main routing table, and four per-neighbor tables:</p> <ul style="list-style-type: none"> • local-rib— main BGP routing table for the main routing instance. • adj-rib-in-pre— NLRI updates received from the neighbor before any local input policy filters have been applied. • adj-rib-in-post— routes received from the neighbor eligible for best-path selection after local input policy filters have been applied. • adj-rib-out-pre— routes eligible for advertising to the neighbor before output policy filters have been applied. • adj-rib-out-post— routes eligible for advertising to the neighbor after output policy filters have been applied. <p>Use the following paths to export data for each BGP routing table. You can specify to export data either for IPv4 or IPv6 for each table:</p> <ul style="list-style-type: none"> • /bgp-rib/afi-safis/afi-safi/ipv4-unicast/loc-rib/ • /bgp-rib/afi-safis/afi-safi/ipv6-unicast/loc-rib/ • /bgp-rib/afi-safis/afi-safi/ipv4-unicast/neighbors/neighbor/adj-rib-in-pre/ • /bgp-rib/afi-safis/afi-safi/ipv6-unicast/neighbors/neighbor/adj-rib-in-pre/ • /bgp-rib/afi-safis/afi-safi/ipv4-unicast/neighbors/neighbor/adj-rib-in-post/ • /bgp-rib/afi-safis/afi-safi/ipv6-unicast/neighbors/neighbor/adj-rib-in-post/ • /bgp-rib/afi-safis/afi-safi/ipv4-unicast/neighbors/neighbor/adj-rib-out-pre/ • /bgp-rib/afi-safis/afi-safi/ipv6-unicast/neighbors/neighbor/adj-rib-out-pre/ • /bgp-rib/afi-safis/afi-safi/ipv4-unicast/neighbors/neighbor/adj-rib-out-post/ • /bgp-rib/afi-safis/afi-safi/ipv6-unicast/neighbors/neighbor/adj-rib-out-post/ 	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for BGP peer information.</p> <p>Supported on QFX10000 switches and QFX5200 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on PTX1000 routers, EX4600 and EX9200 switches, and QFX5110 switches starting with Junos OS Release 17.3R1.</p> <p>Starting with Junos OS Release 18.1R1, QFX5100 switches are also supported.</p> <p>Starting with Junos OS Release 18.3R1, QFX5120-48Y and EX4650 switches are also supported.</p> <p>NOTE: Starting with Junos OS Release 17.3R1, telemetry data streamed through gRPC for BGP peers is reported separately for each configured routing instance.</p> <p>If your Juniper Network device is running Junos OS Release 17.3R1 or later, you must prepend the following to the beginning of any path you specify to stream statistics for BGP, with the exception of paths for routing tables: <code>/network-instances/network-instance[name_'instance-name']/protocols/protocol/</code></p> <p>Starting with Junos OS Release 17.3R1, the following paths are also supported:</p> <ul style="list-style-type: none"> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safis/afi-safi/state/prefixes/accepted</code> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safis/afi-safi/state/prefixes/rejected</code> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safis/afi-safi/state/active</code> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safis/afi-safi/state/queues/output</code> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safis/afi-safi/state/queues/input</code> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/snmp-peer-index</code> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/state/ImportEval</code> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/state/ImportEvalPending</code> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/state/messages/received/notification</code> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/state/messages/sent/notification</code> <code>/network-instances/network-instance/protocols/protocol/bgp/transport/state/remote-port</code> <code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/state/supported-capabilities</code> <p>NOTE: For all the following paths, with the exception of paths for routing tables, if your Juniper Networks device is running Junos OS Release 17.3R1 or later, you must prepend the following in front of the path: <code>/network-instances/network-instance[name_'instance-name']/protocols/protocol/</code></p>

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>You can also include the following at the end path to <code>/network-instances/network-instance[name_'instance-name']/protocols/protocol/bgp/neighbors/neighbor/</code>:</p> <ul style="list-style-type: none"> • <code>state/session-state</code> • <code>state/messages/sent/update</code> • <code>state/messages/received/update</code> • <code>transport/state/local-address</code> • <code>transport/state/remote-address</code> • <code>state/peer-as</code> • <code>afi-safis/afi-safi/state/prefix-limit/state/max-prefixes</code> • <code>afi-safis/afi-safi/state/active</code> • <code>state/session-status</code> • <code>state/session-admin-status</code> • <code>state/session-established-transitions</code> • <code>state/interface-error</code> • <code>state/prefix-limited-exceeded</code> • <code>state/last-established</code> • <code>established-transitions</code> <p>You can also include the following at the end path to <code>/network-instances/network-instance[name_'instance-name']/protocols/protocol/bgp/global/</code>:</p> <ul style="list-style-type: none"> • <code>afi-safis/afi-safi/state/total-prefixes</code> <p>You can also include the following at the end path to <code>/network-instances/network-instance[name_'instance-name']/protocols/protocol/bgp/peer-groups/peer-group[name_'peer-group-name']/</code>:</p> <ul style="list-style-type: none"> • <code>afi-safis/afi-safi/add-paths/eligible-prefix-policy</code> • <code>state/peer-count/</code> <p>NOTE: For paths that export data for BGP routing tables, which are supported starting with Junos OS Release 17.4R1, you can append the following to each of the paths:</p>

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • /num-routes • /routes/route/prefix • /routes/route/attributes • /routes/route/attributes/origin • /routes/route/attributes/as-path • /routes/route/attributes/next-hop • /routes/route/attributes/med • /routes/route/attributes/local-pref • /routes/route/attributes/atomic-aggr • /routes/route/attributes/aggregator/as • /routes/route/attributes/aggregator/as4 • /routes/route/attributes/aggregator/address • /routes/route/ext-attributes/ • /routes/route/ext-attributes/community • /routes/route/ext-attributes/originator-id • /routes/route/ext-attributes/cluster-list • /routes/route/ext-attributes/extended-community • /routes/route/ext-attributes/aigp • /routes/route/ext-attributes/path-id • /routes/route/ext-attributes/unknown-attribute • /routes/route/ext-attributes/unknown-attribute/attr-type • /routes/route/ext-attributes/unknown-attribute/attr-len • /routes/route/ext-attributes/unknown-attribute/attr-value • /routes/route/last-modified-date • /routes/route/last-update-received • /routes/route/valid-route • /routes/route/invalid-reason • /routes/route/best-path

Table 6: gRPC Sensors (continued)

resource path	Description
/junos/task-memory-information/	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for memory utilization for routing protocol task.</p> <p>Supported on QFX10000 switches and QFX5200 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on PTX1000 routers, EX4600 and EX9200 switches and QFX5110 switches starting with Junos OS Release 17.3R1.</p> <p>Starting with Junos OS Release 18.1R1, QFX5100 switches are also supported.</p> <p>Starting with Junos OS Release 18.3R1, QFX5120-48Y and EX4650 switches are also supported.</p> <p>You can also include the following at the end path to <code>/junos/task-memory-information/</code>:</p> <ul style="list-style-type: none"> <code>task-memory-overall-report/task-size-block-list/task-size-block/tsb-size</code> <code>task-memory-overall-report/task-size-block-list/task-size-block/tsb-alloc-bytes</code> <code>task-memory-overall-report/task-size-block-list/task-size-block/tsb-allocs</code> <code>task-memory-overall-report/task-size-block-list/task-size-block/tsb-max-allocs</code> <code>task-memory-overall-report/task-size-block-list/task-size-block/tsb-max-bytes</code> <code>task-memory-overall-report/task-size-block-list/task-size-block/tsb-free-bytes</code> <code>task-memory-overall-report/task-memory-total-bytes</code> <code>task-memory-overall-report/task-memory-total-max-bytes</code> <code>task-memory-information/task-memory-overall-report/task-memory-total-free-bytes</code> <code>task-memory-allocator-report/task-block-list/task-block/tb-name</code> <code>task-memory-allocator-report/task-block-list/task-block/tb-size</code> <code>task-memory-allocator-report/task-block-list/task-block/tb-alloc-size</code> <code>task-memory-allocator-report/task-block-list/task-block/tb-alloc-blocks</code> <code>task-memory-allocator-report/task-block-list/task-block/tb-alloc-bytes</code> <code>task-memory-allocator-report/task-block-list/task-block/tb-max-alloc-blocks</code> <code>task-memory-allocator-report/task-lite-page-list/task-lite-page/tlp-name</code> <code>task-memory-allocator-report/task-lite-page-list/task-lite-page/tlp-alloc-bytes</code> <code>task-memory-allocator-report/task-memory-total-bytes</code> <code>task-memory-information/task-memory-allocator-report/task-memory-total-max-bytes</code> <code>task-memory-malloc-usage-report/task-malloc-list/task-malloc/tm-name</code> <code>task-memory-malloc-usage-report/task-malloc-list/task-malloc/tm-allocs</code> <code>task-memory-malloc-usage-report/task-malloc-list/task-malloc/tm-alloc-bytes</code> <code>task-memory-malloc-usage-report/task-malloc-list/task-malloc/tm-max-allocs</code> <code>task-memory-malloc-usage-report/task-malloc-list/task-malloc/tm-max-alloc-bytes</code> <code>task-memory-malloc-usage-report/task-malloc-list/task-malloc/tm-function-calls</code> <code>task-memory-malloc-usage-report/task-memory-total-bytes</code> <code>task-memory-malloc-usage-report/task-memory-total-max-bytes</code> <code>task-memory-max-dynamic-allocs</code> <code>task-memory-bss-bytes</code> <code>task-memory-max-bss-bytes</code> <code>task-memory-page-data-bytes</code>

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none">• task-memory-max-page-data-bytes• task-memory-dir-bytes• task-memory-max-dir-bytes• task-memory-total-bytes-in-use• task-memory-total-bytes-percent

Table 6: gRPC Sensors (continued)

resource path	Description
/junos/system/linecard/firewall/	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for firewall filter counters and policer counters. Each line card reports counters separately.</p> <p>Supported on QFX10000 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on PTX1000 routers and EX9200 switches starting with Junos OS Release 17.3R1.</p> <p>Supported on QFX5100, QFX5110, and QFX5200 switches starting with Junos OS Release 18.2R1.</p> <p>Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.</p> <p>Supported on EX4600 switches starting with Junos OS Release 18.4R1.</p> <p>NOTE: Hierarchical policer statistics are collected for MX Series routers only. Traffic-class counter statistics are collected for PTX Series routers and QFX10000 switches only.</p> <p>Firewall counters are exported even if the interface to which the firewall filter is attached is operationally down.</p> <p>The following OpenConfig paths are supported:</p> <ul style="list-style-type: none"> • <code>junos/firewall/firewall-stats/[name='filter-name']/timestamp</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/memory-usage/[name='memory-type']/allocated</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/counter-stats/[name='counter-name']/packets</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/counter-stats/[name='counter-name']/bytes</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/policer-stats/[name='policer-name']/out-of-spec-packets</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/policer-stats/[name='policer-name']/out-of-spec-bytes</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/policer-stats/[name='policer-name']/offered-packets</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/policer-stats/[name='policer-name']/offered-bytes</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/policer-stats/[name='policer-name']/transmitted-packets</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/policer-stats/[name='policer-name']/transmitted-bytes</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/hierarchical-policer-stats/[name='hierarchical-policer-name']/premium-packets (MX Series only)</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/hierarchical-policer-stats/[name='hierarchical-policer-name']/premium-bytes (MX Series only)</code> • <code>/junos/firewall/firewall-stats/[name='filter-name']/hierarchical-policer-stats/[name='hierarchical-policer-name']/aggregate-packets (MX Series only)</code>

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none">• <code>/junos/firewall/firewall-stats/[name='filter-name']/hierarchical-policer-stats/[name='hierarchical-policer-name']/aggregate-bytes</code> (MX Series only)

Table 6: gRPC Sensors (continued)

resource path	Description
/interfaces/interface/	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for physical interface traffic.</p> <p>NOTE: For PTX Series routers, for a specific interface, queue statistics are exported for each line card. For MX series routers, interface queue statistics are exported only from slot on which an interface is configured.</p> <p>For Aggregated Ethernet interfaces, statistics are exported for the member physical interfaces. You must aggregate the counters at the destination server, or collector.</p> <p>If a physical interface is administratively down or operationally down, interface counters are not exported.</p> <p>Only fields with a non-zero value are exported.</p> <p>Supported on QFX10000 switches and PTX1000 routers starting with Junos OS Release 17.2R1.</p> <p>Supported on EX9200 switches and MX150 routers starting with Junos OS Release 17.3R1.</p> <p>Starting with Junos OS Release 18.1R1, QFX5100 switches are also supported.</p> <p>Starting with Junos OS Release 18.3R1, QFX5120-48Y and EX4650 switches are also supported.</p> <p>Starting with Junos OS Release 18.4R1, EX4600 switches are also supported.</p> <p>Starting with Junos OS Release 18.3R1, when a subscription is made to /interfaces on MX, EX, QFX, PTX, and ACX platforms, traffic and queue statistics are delivered in two separate sensors. This can reduce the reap time for non-queue data for platforms supporting Virtual Output Queues (VOQ), such as PTX Series routers.</p> <p>The two sensors are:</p> <ul style="list-style-type: none"> • /junos/system/linecard/interface/traffic/ exports all fields except queue statistics. • /junos/system/linecard/interface/queue/ exports queue statistics. <p>NOTE: End paths supporting ON_CHANGE streaming are indicated.</p> <p>The following paths are also supported:</p> <ul style="list-style-type: none"> • /interfaces/interface[name='interface-name']/state/parent_ae_name • /interfaces/interface[name='interface-name']/state/admin-status ON_CHANGE streaming supported • /interfaces/interface[name='interface-name']/state/counters/carrier-transitions • /interfaces/interface[name='interface-name']/state/last-change • /interfaces/interface[name='interface-name']/state/high-speed • /interfaces/interface[name='interface-name']/state/counters/out-octets • /interfaces/interface[name='interface-name']/state/counters/out-unicast-pkts • /interfaces/interface[name='interface-name']/state/counters/out-multicast-pkts • /interfaces/interface[name='interface-name']/state/counters/out-broadcast-pkts • /interfaces/interface[name='interface-name']/state/counters/out-errors

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • /interfaces/interface[name='interface-name']/state/counters/in-octets • /interfaces/interface[name='interface-name']/state/counters/in-unicast-pkts • /interfaces/interface[name='interface-name']/state/counters/in-multicast-pkts • /interfaces/interface[name='interface-name']/state/ • /interfaces/interface[name='interface-name']/state/counters/in-broadcast-pkts • /interfaces/interface[name='interface-name']/state/counters/in-errors • /interfaces/interface[name='interface-name']/state/in-pause-pkts • /interfaces/interface[name='interface-name']/state/out-pause-pkts • /interfaces/interface[name='interface-name']/state/counters/in-queue[queue-number=queue_number]/ • /interfaces/interface[name='interface-name']/state/counters/in-queue[queue-number=queue_number]/pkts • /interfaces/interface[name='interface-name']/state/counters/in-queue[queue-number=queue_number]/bytes • /interfaces/interface[name='interface-name']/state/counters/in-queue[queue-number=queue_number]/tail-drop-pkts • /interfaces/interface[name='interface-name']/state/counters/in-queue[queue-number=queue_number]/rl-drop-pkts • /interfaces/interface[name='interface-name']/state/counters/in-queue[queue-number=queue_number]/rl-drop-bytes • /interfaces/interface[name='interface-name']/state/counters/in-queue[queue-number=queue_number]/avg-buffer-occupancy • /interfaces/interface[name='interface-name']/state/counters/in-queue[queue-number=queue_number]/cur-buffer-occupancy • /interfaces/interface[name='interface-name']/state/counters/in-queue[queue-number=queue_number]/peak-buffer-occupancy • /interfaces/interface[name='interface-name']/state/counters/in-queue[queue-number=queue_number]/allocated-buffer-size • /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/pkts • /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/bytes • /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/tail-drop-pkts • /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/rl-drop-pkts • /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/rl-drop-bytes • /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/red-drop-pkts • /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/red-drop-bytes • /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/avg-buffer-occupancy • /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/cur-buffer-occupancy • /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/peak-buffer-occupancy

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none">• /interfaces/interface[name='interface-name']/state/counters/out-queue[queue-number=queue_number]/allocated-buffer-size• /interfaces/interface[name='interface-name']/state/description ON_CHANGE streaming supported• /interfaces/interface[name='interface-name']/state/enabled• /interfaces/interface[name='interface-name']/state/ifindex• /interfaces/interface[name='interface-name']/state/last-change• /interfaces/interface[name='interface-name']/state/mtu• /interfaces/interface[name='interface-name']/state/name• /interfaces/interface[name='interface-name']/state/oper-status ON_CHANGE streaming supported• /interfaces/interface[name='interface-name']/state/type

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/interfaces/interface/subinterfaces//interfaces/ interface[name='interface-name']/subinterfaces/ subinterface[index='unit']</code>	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for logical interface traffic.</p> <p>NOTE: If a logical interface is operationally down, interface statistics continue to be exported.</p> <p>NOTE: Locally injected packets from the Routing Engine are not exported.</p> <p>Supported on QFX10000 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on PTX1000 routers and EX9200 switches starting with Junos OS Release 17.3R1.</p> <p>Starting with Junos OS Release 18.1R1, QFX5100 switches are also supported.</p> <p>Starting with Junos OS Release 18.3R1, QFX5120-48Y and EX4650 switches are also supported.</p> <p>Starting with Junos OS Release 18.4R1, EX4600 switches are also supported.</p> <p>NOTE: End paths supporting ON_CHANGE streaming are indicated.</p> <p>The following paths are also supported:</p> <ul style="list-style-type: none"> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/name</code> ON_CHANGE streaming supported. This value does not change with an event, but will be streamed on event creation and deletion. <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/ifindex</code> ON_CHANGE streaming supported. This value does not change with an event, but will be streamed on event creation and deletion. <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/index</code> ON_CHANGE streaming supported. This value does not change with an event, but will be streamed on event creation and deletion. <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/snmp_index</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/admin_status</code> ON_CHANGE streaming supported <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/oper_status</code> ON_CHANGE streaming supported <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/last_change</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/description</code> ON_CHANGE streaming supported <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/enabled</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/counters/in_cdotets</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/counters/in_unicast_pkts</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/counters/in_broadcast_pkts</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/counters/in_multicast_pkts</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/counters/in_discards</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/counters/in_errors</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/counters/in_unknown_protos</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/counters/out_cdotets</code> <code>/interfaces/interface[name='interface-name']/subinterfaces/subinterface[index='unit']/state/counters/out_unicast_pkts</code>

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • <code>/interfaces/interface[name=interface-name]/subinterfaces/subinterface[index=unit]/state/counters/out/broadcast_pkts</code> • <code>/interfaces/interface[name=interface-name]/subinterfaces/subinterface[index=unit]/state/counters/out/multicast_pkts</code> • <code>/interfaces/interface[name=interface-name]/subinterfaces/subinterface[index=unit]/state/counters/out/discards</code> • <code>/interfaces/interface[name=interface-name]/subinterfaces/subinterface[index=unit]/state/counters/out_gross</code> • <code>/interfaces/interface[name=interface-name]/subinterfaces/subinterface[index=unit]/state/counters/last_clear</code>
<code>/junos/system/linecard/optics/</code>	<p>Sensor for various optical interface performance metrics, such as transmit and receive power levels.</p> <p>Supported on QFX10000 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on PTX1000 routers and EX9200 switches starting with Junos OS Release 17.3R1.</p> <p>Supported on EX4650 switches starting with Junos OS Release 18.3R1.</p>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/junos/rsvp-interface-information/</code>	<p>Sensor for events and properties for RSVP interfaces.</p> <p>NOTE: For 100 RSVP logical interfaces, configure a sampling interval equal to 60 seconds. For 200 RSVP logical interfaces, configure a sampling interval equal to 180 seconds.</p> <p>Supported on QFX10000 switches and QFX5200 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on PTX1000 routers, QFX5110 switches, and EX4600 and EX9200 switches starting with Junos OS Release 17.3R1.</p> <p>Supported on QFX5100 switches starting with Junos OS Release 18.1R1.</p> <p>Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.</p> <p>Supported on EX4600 switches starting with Junos OS Release 18.4R1.</p> <p>You can also add the following to the end path for <code>/junos/rsvp-interface-information/</code>:</p> <ul style="list-style-type: none"> • <code>active-count</code> • <code>rsvp-interface/interface-name</code> • <code>rsvp-interface/index</code> • <code>rsvp-interface/rsvp-status</code> • <code>rsvp-interface/authentication-flag</code> • <code>rsvp-interface/aggregate-flag</code> • <code>rsvp-interface/ack-flag</code> • <code>rsvp-interface/protect-flag</code> • <code>rsvp-interface/hello-interval</code> • <code>rsvp-interface/interface-address</code> • <code>message-statistics/rsvp-message</code> • <code>rsvp-interface/message-statistics/messages-sent</code> • <code>rsvp-interface/message-statistics/messages-received</code> • <code>rsvp-interrface/message-statistics/messages-sent-5seconds</code> • <code>rsvp-interface/message-statistics/messages-received-5seconds</code> • <code>rsvp-interface/rsvp-telink/active-reservation</code> • <code>rsvp-interface/rsvp-telink/preemption-count</code> • <code>rsvp-interface/rsvp-telink/update-threshold</code> • <code>rsvp-interface/rsvp-telink/subscription</code> • <code>rsvp-interface/rsvp-telink/static-bandwidth</code> • <code>rsvp-interface/rsvp-telink/available-bandwidth</code> • <code>rsvp-interface/rsvp-telink/reserved-bandwidth/bandwidth-priority</code> • <code>rsvp-interface/rsvp-telink/reserved-bandwidth/total-reserved-bandwidth</code>

Table 6: gRPC Sensors (continued)

resource path	Description
/components/	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for operational state of Routing Engines, power supply modules, Switch Fabric Boards, Control Boards, Switch Interface Boards, Modular Interface Cards, and Physical Interface Cards.</p> <p>NOTE:</p> <p>Supported on QFX10000 switches and QFX5200 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on EX9200 switches and MX150 routers starting with Junos OS Release 17.3R1.</p> <p>Supported on QFX5100 switches starting with Junos OS Release 18.1R1.</p> <p>Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.</p> <p>Supported on EX4600 switches starting with Junos OS Release 18.4R1.</p> <p>You can also add the following to each of the paths:</p> <ul style="list-style-type: none"> • name • cidx • version • part_number • serial_number • description • clei_code • model • vendor_name • properties/property/state • properties/property/state_offline_reason (MX Series only) • properties/property/power_usage • properties/property/power_maximum • properties/property/temperature_intake • properties/property/temperature_exhaust_a (not supported on PTX1000 and PTX3000 routers) • properties/property/temperature_exhaust_b (not supported on PTX1000 and PTX3000 routers) • properties/property/temperature_exhaust (not supported on PTX1000 and PTX5000 routers) • properties/property/cpu_utilization_total • properties/property/memory_dram_used • properties/property/memory_utilization_heap • properties/property/memory_utilization_buffer • properties/property/uptime <p>The following paths are also supported only for Routing Engine statistics:</p> <ul style="list-style-type: none"> • properties/property/mastership-state • properties/property/mastership-priority

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • <code>properties/property/temperature-cpu</code> • <code>properties/property/memory-dram-installed</code> • <code>properties/property/cpu-utilization-user</code> • <code>properties/property/cpu-utilization-background</code> • <code>properties/property/cpu-utilization-kernel</code> • <code>properties/property/cpu-utilization-idle</code> • <code>properties/property/reboot-reason</code> <p>The following paths are also supported for power modules:</p> <ul style="list-style-type: none"> • <code>properties/property/power-zone-upper-capacity</code> • <code>properties/property/power-zone-upper-maximum</code> • <code>properties/property/power-zone-upper-allocated</code> • <code>properties/property/power-zone-upper-remaining</code> • <code>properties/property/power-zone-upper-usage</code> • <code>properties/property/power-zone-lower-capacity</code> • <code>properties/property/power-zone-lower-maximum</code> • <code>properties/property/power-zone-lower-allocated</code> • <code>properties/property/power-zone-lower-remaining</code> • <code>properties/property/power-zone-lower-usage</code> • <code>properties/property/power-zone-0-capacity</code> • <code>properties/property/power-zone-0-maximum</code> • <code>properties/property/power-zone-0-allocated</code> • <code>properties/property/power-zone-0-remaining</code> • <code>properties/property/power-zone-0-usage</code> • <code>properties/property/power-zone-1-capacity</code> • <code>properties/property/power-zone-1-maximum</code> • <code>properties/property/power-zone-1-allocated</code> • <code>properties/property/power-zone-1-remaining</code> • <code>properties/property/power-zone-1-usage</code> • <code>properties/property/power-system-capacity</code> • <code>properties/property/power-system-allocated</code> • <code>properties/property/power-system-remaining</code> • <code>properties/property/power-system-usage</code> • <code>properties/property/temperature-ambient</code> <p>The following paths are supported for either Switch Fabric Board or Control Boards or both:</p>

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • <code>properties/property/temperature-zone-0-intake</code> (SFB only) • <code>properties/property/temperature-zone-0-intake-a</code> (both SFB and CB) • <code>properties/property/temperature-zone-1-intake-b</code> (both SFB and CB) • <code>properties/property/temperature-zone-0-exhaust</code> (SFB only) • <code>properties/property/temperature-zone-1-exhaust</code> (SFB only) • <code>properties/property/temperature-zone-0-intake-c</code> (CB only) • <code>properties/property/temperature-zone-0-exhaust-a</code> (CB only) • <code>properties/property/temperature-zone-1-exhaust-b</code> (CB only)
<code>/lacp/</code>	<p>Sensor for operational state of aggregated Ethernet interfaces configured with the Link Aggregation Control Protocol.</p> <p>Supported on QFX10000 switches and QFX5200 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on PTX1000 routers and EX9200 switches starting with Junos OS Release 17.3R1.</p> <p>Supported on QFX5100 switches starting with Junos OS Release 18.1R1.</p> <p>Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.</p> <p>Supported on EX4600 switches starting with Junos OS Release 18.4R1.</p> <p>You can also add the following to the end of the path for <code>/lacp/</code>:</p> <ul style="list-style-type: none"> • <code>state/system-priority</code> • <code>interfaces/interface[name='aggregate-interface-name']/state/</code> • <code>interfaces/interface[name='aggregate-interface-name']/members/member[interface='interface-name']/state/</code> • <code>interfaces/interface[name='aggregate-interface-name']/members/member[interface='interface-name']/state/counters/</code> • <code>interfaces/interface[name='aggregate-interface-name']/members/member[interface='interface-name']/state/port-num</code> • <code>interfaces/interface[name='aggregate-interface-name']/members/member[interface='interface-name']/state/partner-port-num</code> • <code>interfaces/interface[name='aggregate-interface-name']/members/member[interface='interface-name']/state/mux-state</code>

Table 6: gRPC Sensors (continued)

resource path	Description
---------------	-------------

/lldp/

Table 6: gRPC Sensors (continued)

resource path	Description
	Sensor for operational state of Ethernet interfaces enabled with the Link Layer Discovery Protocol.
	Supported on QFX10000 switches and QFX5200 switches starting with Junos OS Release 17.2R1.
	Supported on PTX1000 routers and EX9200, EX4600, and QFX5110 switches starting with Junos OS Release 17.3R1.
	Supported on QFX5100 switches starting with Junos OS Release 18.1R1.
	Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.
	Supported on EX4600 switches starting with Junos OS Release 18.4R1..
	ON_CHANGE streaming is supported on MX Series and PTX Series routers, starting with Junos OS Release 18.3R1.
	You can also add the following to the end of the path for <code>/lldp/</code> :
	NOTE: End paths supporting ON_CHANGE streaming are indicated.
	<ul style="list-style-type: none"> • state/ • state/enabled ON_CHANGE streaming supported • state/hello-timer ON_CHANGE streaming supported • state/system-name ON_CHANGE streaming supported • state/system-description ON_CHANGE streaming supported • state/chassis-id ON_CHANGE streaming supported • state/chassis-id-type ON_CHANGE streaming supported • state/loc-port-id-type • interfaces/interface[name='interface-name']/state/ • interfaces/interface[name='interface-name']/state/counters/ • interfaces/interface[name='interface-name']/state/enabled ON_CHANGE streaming supported • interfaces/interface[name='interface-name']/state/name ON_CHANGE streaming supported • interfaces/interface[name='interface-name']/neighbors/ • interfaces/interface[name='interface-name']/neighbors/neighbor/capabilities ON_CHANGE streaming supported • interfaces/interface[name='interface-name']/neighbors/neighbor/state/chassis-id ON_CHANGE streaming supported. This resource path does not change

Table 6: gRPC Sensors (continued)

resource path	Description
	with an event, but will be streamed on creation and deletion.
	<ul style="list-style-type: none"> • interfaces/interface[name='interface-name']/neighbors/neighbor/state/chassis-id-type ON_CHANGE streaming supported. This resource path does not change with an event, but will be streamed on creation and deletion. • interfaces/interface[name='interface-name']/neighbors/neighbor/state/port-id ON_CHANGE streaming supported • interfaces/interface[name='interface-name']/neighbors/neighbor/state/port-id-type ON_CHANGE streaming supported • interfaces/interface[name='interface-name']/neighbors/neighbor/state/port-description ON_CHANGE streaming supported • interfaces/interface[name='interface-name']/neighbors/neighbor/state/system-name ON_CHANGE streaming supported. This resource path does not change with an event, but will be streamed on creation and deletion. • interfaces/interface[name='interface-name']/neighbors/neighbor/state/system-description ON_CHANGE streaming supported • interfaces/interface[name='interface-name']/neighbors/neighbor/state/management-address ON_CHANGE streaming supported • interfaces/interface[name='interface-name']/neighbors/neighbor/state/management-address-type ON_CHANGE streaming supported

Table 6: gRPC Sensors (continued)

resource path	Description
<pre> /mpls/lsp/constrained-path/tunnels/ tunnel[name='foo-name',source='foo-source']/ p2p-tunnel-attributes/ p2p-primary-paths[name='foo-path']/ lsp-instances[index='local-index']/state/notify-status </pre>	<p>Sensor to export events for ingress point-to-point LSPs, point-to-multipoint LSPs, bypass LSPs, and dynamically created LSPs.</p> <p>ON_CHANGE support for LSP events is only activated when the reporting interval is set to 0 in the subscription request.</p> <p>This sensor is supported on indicated platforms up to and including Junos OS Release 17.3R1. See the following resource paths for LSP support in Junos OS Release 17.4R1 and higher:</p> <ul style="list-style-type: none"> <code>/network-instances/network-instance[name='instance-name']/mpls/lsp/constrained-path/tunnels/tunnel/p2p-tunnel-attributes/p2p-primary-paths/p2p-primary-path</code> <code>/network-instances/network-instance[name='instance-name']/mpls/signaling-protocols/rsvp-te/sessions/session/state/notify-status</code> <p>Supported on PTX Series routers, MX Series switches, and QFX10002, QFX10008, and QFX10016 switches starting with Junos OS Release 17.2R1.</p> <p>The following events are exported under this resource path:</p> <ul style="list-style-type: none"> INITIATED CONCLUDED_UP CONCLUDED_TORN_DOWN PROTECTION_AVAILABLE PROTECTION_UNAVAILABLE AUTOBW_SUCCESS AUTOBW_FAIL TUNNEL_LOCAL_REPAIRED PATHERR_RECEIVED <ul style="list-style-type: none"> ADMISSION_CONTROL_FAILURE SESSION_PREEMPTED BAD_LOOSE_ROUTE BAD_STRICT_ROUTE LABEL_ALLOCATION_FAILURE ROUTING_LOOP_DETECTED REQUESTED_BANDWIDTH_UNAVAILABLE

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/mpls/lsp/constrained-path/tunnels/ tunnel[name='foo-name',source='foo-source']/ p2p-tunnel-attributes/ p2p-primary-paths[name='foo-path']/state/notify-status</code>	<p>Sensor to export events for ingress point-to-point LSPs, point-to-multipoint LSPs, bypass LSPs, and dynamically created LSPs.</p> <p>ON_CHANGE support for LSP events is only activated when the reporting interval is set to 0 in the subscription request.</p> <p>This sensor is supported on indicated platforms up to and including Junos OS Release 17.3R1. See the following resource paths for LSP support in Junos OS Release 17.4R1 and higher:</p> <ul style="list-style-type: none"> <code>/network-instances/network-instance[name='instance-name']/mpls/lsp/constrained-path/tunnels/tunnel/p2p-tunnel-attributes/p2p-primary-paths/p2p-primary-path</code> <code>/network-instances/network-instance[name='instance-name']/mpls/signaling-protocols/rsvp-te/sessions/session/state/notify-status</code> <p>Supported on PTX Series routers, MX Series switches, and QFX10002, QFX10008, and QFX10016 switches starting with Junos OS Release 17.2R1.</p> <p>The following events are exported under this resource path:</p> <ul style="list-style-type: none"> • DESELECT_ACTIVE_PATH • CHANGE_ACTIVE_PATH • SELECT_ACTIVE_PATH • ORIGINATE_MBB • CSPF_NO_ROUTE • CSPF_SUCCESS • RESTART_RECOVERY_FAIL
<code>/mpls/lsp/constrained-path/tunnels/ tunnel[name='foo-name',source='foo-source']/ p2p-tunnel-attributes/ p2p-primary-paths[name='foo-path']/state/name</code>	<p>Sensor to export the path name for ingress point-to-point LSPs, point-to-multipoint LSPs, bypass LSPs, and dynamically created LSPs.</p> <p>This sensor is supported on indicated platforms up to and including Junos OS Release 17.3R1. See the following resource paths for LSP support in Junos OS Release 17.4R1 and higher:</p> <ul style="list-style-type: none"> <code>/network-instances/network-instance[name='instance-name']/mpls/lsp/constrained-path/tunnels/tunnel/p2p-tunnel-attributes/p2p-primary-paths/p2p-primary-path</code> <code>/network-instances/network-instance[name='instance-name']/mpls/signaling-protocols/rsvp-te/sessions/session/state/notify-status</code> <p>Supported on PTX Series routers, MX Series switches, and QFX10002, QFX10008, and QFX10016 switches starting with Junos OS Release 17.2R1.</p>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/mpls/lsp/constrained-path/tunnels/ tunnel[name='foo-name',source='foo-source']/ p2p-tunnel-attributes/ p2p-primary-paths[name='foo-path']/ lsp-instances[index='local-index']/state/</code>	<p>Sensor to export LSP properties for ingress point-to-point LSPs, point-to-multipoint LSPs, bypass LSPs, and dynamically created LSPs</p> <p>Supported on PTX Series routers, MX Series switches, and QFX10002, QFX10008, and QFX10016 switches starting with Junos OS Release 17.2R1.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • bandwidth • metric • max-average-bandwidth • explicit-route-objects • record-route-objects
<code>/mpls/lsp/signaling-protocols/rsvp-te/sessions/ session[local-index='foo-index']/state/notify-status</code>	<p>Sensor to export statistics for ingress point-to-point LSPs, point-to-multipoint LSPs, bypass LSPs, and dynamically created LSPs.</p> <p>ON_CHANGE support for LSP events is only activated when the reporting interval is set to 0 in the subscription request.</p> <p>Supported on PTX Series routers, MX Series switches, and QFX10002, QFX10008, and QFX10016 switches starting with Junos OS Release 17.2R1.</p> <p>The following events are exported under this resource path:</p> <ul style="list-style-type: none"> • PATHERR_RECEIVED <ul style="list-style-type: none"> • TTL_EXPIRED • NON_RSVP_CAPABLE_ROUTER • RESVTEAR_RECEIVED • PATH_MTU_CHANGE

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/network-instances/network-instance/mpls/signaling-protocols/rsvp-te/sessions/session/state/notify-status</code>	<p>Supported on Junos OS Release through 17.4R1 and higher.</p> <p>Sensor to export events for ingress point-to-point LSPs, point-to-multipoint LSPs, bypass LSPs, and dynamically created LSPs.</p> <p>ON_CHANGE support for LSP events is only activated when the reporting interval is set to 0 in the subscription request.</p> <p>Supported on PTX Series routers, MX Series switches, and QFX10002, QFX10008, and QFX10016 switches starting with Junos OS Release 17.2R1.</p> <p>The following events are exported under this resource path:</p> <ul style="list-style-type: none"> • DETOUR-UP • DETOUR-DOWN • PATHERR-RECV • PATHERR-RECV/ADMISSION_CONTROL_FAILURE • PATHERR-RECV/SESSION_PREEMPTED • PATHERR-RECV/BAD_LOOSE_ROUTE • PATHERR-RECV/BAD_STRICT_ROUTE • PATHERR-RECV/LABEL_ALLOCATION_FAILURE • PATHERR-RECV/NON_RSVP_CAPABLE_ROUTER • PATHERR-RECV/TTL_EXPIRED • PATHERR-RECV/ROUTING_LOOP_DETECTED • PATHERR-RECV/REQUESTED_BANDWIDTH_UNAVAILABLE • PATHMTU-CHANGE
<code>/mpls/signaling-protocols/segment-routing/</code>	<p>Sensor for traffic statistics for both ingress IP traffic and transit MPLS traffic..</p> <p>Supported on MX Series and PTX Series routers starting with Junos OS Release 18.3R1.</p> <p>The following end points are also supported and specify BGP Segment Routing traffic Engineering (SR-TE) transit statistics:</p> <ul style="list-style-type: none"> • <code>/sr-te-bsid-policies/sr-te-bsid-policy[binding-sid='80001', to-address='foo-to' color='foo-color']/state/counters[name='oc-xxx']/packets</code> • <code>/sr-te-bsid-policies/sr-te-bsid-policy[binding-sid='80001', to-address='foo-to' color='foo-color']/state/counters[name='oc-xxx']/bytes</code> <p>The following end points are also supported and specify BGP Segment Routing traffic Engineering (SR-TE) ingress statistics:</p> <ul style="list-style-type: none"> • <code>/sr-te-ip-policies/sr-te-ip-policy[to-address='foo-to' color='foo-color']/state/counters[name='oc-xxx']/packets</code> • <code>/sr-te-ip-policies/sr-te-ip-policy[to-address='foo-to' color='foo-color']/state/counters[name='oc-xxx']/bytes</code> <p>In addition to configuring the sensor, you must enable statistics collection using the statistics statement at the <code>[[edit protocols source-packet-routing telemetry statistics]</code> hierarchy level.</p>

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/arp-information/</code>	<p>Sensor for Address Resolution Protocol (ARP) statistics.</p> <p>Supported on QFX10000 and QFX5200 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on PTX1000 routers, EX9200 switches, and MX150 routers starting with Junos OS Release 17.3R1.</p> <p>Supported on QFX5100 switches starting with Junos OS Release 18.1R1.</p> <p>Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.</p> <p>Supported on EX4600 switches starting with Junos OS Release 18.4R1.</p> <p>You can also add the following to the end path for <code>/arp-information/</code></p> <ul style="list-style-type: none"> • <code>ipv4</code> • <code>ipv4/neighbors</code> • <code>ipv4/neighbors/neighbor</code> • <code>ipv4/neighbors/neighbor/ip</code> • <code>ipv4/neighbors/neighbor/link-layer-address</code> • <code>pv4/neighbors/neighbor/origin</code> • <code>ipv4/neighbors/neighbor/host-name</code> • <code>ipv4/neighbors/neighbor/rtb-id</code> • <code>ipv4/neighbors/neighbor/state</code> • <code>ipv4/neighbors/neighbor/expiry</code> • <code>ipv4/neighbors/neighbor/ispublish</code> • <code>ipv4/neighbors/neighbor/interface-name</code> • <code>ipv4/neighbors/neighbor/logical-router-id</code>

Table 6: gRPC Sensors (continued)

resource path	Description
/interfaces/interface[name='interface-name']/	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for Routing Engine internal interfaces.</p> <p>NOTE: On MX Series routers, you can specify the following interfaces: fxp0, em0, and em1</p> <p>On PTX Series routers, you can specify the following interfaces: em0, ixlv0, ixlv1</p> <p>On PTX Series routers with dual Routing Engines, you can specify the following interfaces: em0, ixgbe0, ixgbe1</p> <p>Support on PTX1000 routers starting with Junos OS Release 17.3R1.</p> <p>The following end paths are also supported:</p> <ul style="list-style-type: none"> • interfaces/interface/state/type • /interfaces/interface/state/mtu • /interfaces/interface/state/name • /interfaces/interface/state/description • /interfaces/interface/state/enabled • /interfaces/interface/state/ifindex • /interfaces/interface/state/admin-status • /interfaces/interface/state/oper-status • /interfaces/interface/state/last-change • /interfaces/interface/state/speed • /interfaces/interface/state/counters/in-octets • /interfaces/interface/state/counters/in-unicast-pkts • /interfaces/interface/state/counters/in-broadcast-pkts • /interfaces/interface/state/counters/in-multicast-pkts • /interfaces/interface/state/counters/in-discards • /interfaces/interface/state/counters/in-errors • /interfaces/interface/state/counters/in-unknown-protos • /interfaces/interface/state/counters/out-octets • /interfaces/interface/state/counters/out-unicast-pkts • /interfaces/interface/state/counters/out-broadcast-pkts • /interfaces/interface/state/counters/out-multicast-pkts • /interfaces/interface/state/counters/out-discards • /interfaces/interface/state/counters/out-errors • /interfaces/interface/state/counters/last-clear • /interfaces/interface/state/counters/in-pkts • /interfaces/interface/state/counters/in-sec-pkts • /interfaces/interface/state/counters/in-sec-octets • /interfaces/interface/state/counters/in-pause-pkts • /interfaces/interface/state/counters/out-pkts • /interfaces/interface/state/counters/out-sec-pkts • /interfaces/interface/state/counters/out-sec-octets • /interfaces/interface/state/counters/out-pause-pkts

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • /interfaces/interface/state/counters/in-drops • /interfaces/interface/state/counters/in-frame-errors • /interfaces/interface/state/counters/in-runs • /interfaces/interface/state/counters/in-lchan-errors • /interfaces/interface/state/counters/in-l-mismatch-errors • /interfaces/interface/state/counters/in-fifo-errors • /interfaces/interface/state/counters/in-giants • /interfaces/interface/state/counters/in-resource-errors • /interfaces/interface/state/counters/out-drops • /interfaces/interface/state/counters/carrier-transitions • /interfaces/interface/state/counters/mtu-errors • /interfaces/interface/state/counters/out-resource-errors • /interfaces/interface/subinterfaces/subinterface/index • /interfaces/interface/subinterfaces/subinterface/state/index • /interfaces/interface/subinterfaces/subinterface/state/name • /interfaces/interface/subinterfaces/subinterface/state/description • /interfaces/interface/subinterfaces/subinterface/state/enabled • /interfaces/interface/subinterfaces/subinterface/state/ifindex • /interfaces/interface/subinterfaces/subinterface/state/admin-status • /interfaces/interface/subinterfaces/subinterface/state/oper-status • /interfaces/interface/subinterfaces/subinterface/state/last-change • /interfaces/interface/subinterfaces/subinterface/state/counters/in-pkts • /interfaces/interface/subinterfaces/subinterface/state/counters/in-octets • /interfaces/interface/subinterfaces/subinterface/state/counters/in-unicast-pkts • /interfaces/interface/subinterfaces/subinterface/state/counters/in-broadcast-pkts • /interfaces/interface/subinterfaces/subinterface/state/counters/in-multicast-pkts • /interfaces/interface/subinterfaces/subinterface/state/counters/in-discards • /interfaces/interface/subinterfaces/subinterface/state/counters/in-errors • /interfaces/interface/subinterfaces/subinterface/state/counters/in-unknown-protos • /interfaces/interface/subinterfaces/subinterface/state/counters/out-octets • /interfaces/interface/subinterfaces/subinterface/state/counters/out-unicast-pkts • /interfaces/interface/subinterfaces/subinterface/state/counters/out-broadcast-pkts • /interfaces/interface/subinterfaces/subinterface/state/counters/out-multicast-pkts • /interfaces/interface/subinterfaces/subinterface/state/counters/out-discards • /interfaces/interface/subinterfaces/subinterface/state/counters/out-errors • /interfaces/interface/subinterfaces/subinterface/state/counters/last-clear • /interfaces/interface/subinterfaces/subinterface/state/counters/out-pkts

Table 6: gRPC Sensors (continued)

resource path	Description
<code>/nd6-information/</code>	<p>Sensor for Network Discovery Protocol (NDP) table state.</p> <p>Supported on QFX10000 and QFX5200 switches starting with Junos OS Release 17.2R1.</p> <p>Supported on PTX1000 routers, EX9200 switches, and MX150 routers starting with Junos OS Release 17.3R1.</p> <p>Supported on QFX5100 switches starting with Junos OS Release 18.1R1.</p> <p>Supported on QFX5120-48Y and EX4650 switches starting with Junos OS Release 18.3R1.</p> <p>Supported on EX4600 switches starting with Junos OS Release 18.4R1.</p> <p>You can also add the following to the end path for nd6-information/</p> <ul style="list-style-type: none"> • <code>ipv6</code> • <code>ipv6/neighbors</code> • <code>ipv6/neighbors/neighbor</code> • <code>ipv6/neighbors/neighbor/ip</code> • <code>ipv6/neighbors/neighbor/link-layer-address</code> • <code>ipv6/neighbors/neighbor/origin</code> • <code>ipv6/neighbors/neighbor/isrouter</code> • <code>ipv6/neighbors/neighbor/state</code> • <code>ipv6/neighbors/neighbor/rtb-id</code> • <code>ipv6/neighbors/neighbor/issecure</code> • <code>ipv6/neighbors/neighbor/ispublish</code> • <code>ipv6/neighbors/neighbor/expiry</code> • <code>ipv6/neighbors/neighbor/interface-name</code> • <code>ipv6/neighbors/neighbor/logical-router-id</code>
<code>/ipv6-ra/</code>	Sensor for NDP router-advertisement statistics.
<code>/junos/system/linecard/packet/usage/</code>	<p>Sensor for Packet Forwarding Engine Statistics. This sensor exports statistics for counters and provides visibility into Packet Forwarding Engine error and drop statistics.</p> <p>This sensor is supported starting on MX Series and PTX Series routers starting with Junos OS Release 17.4R1.</p>

Table 6: gRPC Sensors (continued)

resource path	Description
/network-instances/network-instance/protocols/protocol/isis/levels/level/	
/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensor for IS-IS routing protocol statistics. Statistics are exported separately for each routing instance.</p> <p>To specify a routing-instance name:</p> <p><code>/network-instances/network-instance[name_'instance-name']/protocols/protocol/isis/levels/level/</code></p> <p><code>/network-instances/network-instance[name_'instance-name']/protocols/protocol/isis/interfaces/interface/levels/level/</code></p> <p>NOTE: This sensor is supported on MX Series and PTX Series routers starting with Junos OS Release 17.4R1.</p> <p>The following paths are also supported:</p> <ul style="list-style-type: none"> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/lsp/received</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/lsp/processed</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/lsp/dropped</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/lsp/sent</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/lsp/retransmit</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/iih/received</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/iih/processed</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/iih/dropped</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/iih/sent</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/iih/retransmit</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/psnp/received</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/psnp/processed</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/psnp/dropped</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/psnp/sent</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/psnp/retransmit</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/cnsp/received</code> <code>/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/cnsp/processed</code> <code>/network-instances/network-instance/protocols/protocol/</code>

Table 6: gRPC Sensors (continued)

resource path	Description
	isis/interfaces/interface/levels/level/packet-counters/cnsp/dropped
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/packet-counters/cnsp/sent
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/corrupted-lsps
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/database-overloads
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/manual-address-drop-from-area
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/exceeded-max-seq-nums
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/seq-num-skips
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/own-lsp-purges
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/id-len-mismatch
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/part-changes
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/max-area-address-mismatches
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/auth-fails
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/spf-runs
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/auth-type-fails
	• /network-instances/network-instance/protocols/protocol/isis/levels/level/system-level-counters/state/lsp-errors
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/circuit-counters/state/adj-changes
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/circuit-counters/state/adj-number
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/circuit-counters/state/auth-fails
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/circuit-counters/state/auth-type-fails
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/circuit-counters/state/id-field-len-mismatches
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/circuit-counters/state/lan-dis-changes
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/circuit-counters/state/max-area-address-mismatch
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/circuit-counters/state/rejected-adj
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/system-id
	• /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/dis-system-id

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/local-extended-system-id • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/neighbor-extended-system-id • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/adjacency-state • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/neighbor-circuit-type • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/neighbor-ipv4-address • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/neighbor-ipv6-address • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/neighbor-snpa • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/levels/level/adjacencies/adjacency/state/priority • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/remaining-hold-time • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/restart-status • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/restart-support • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/restart-suppress • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/up-time • /network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/adjacencies/adjacency/state/nlpid • /network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/adjacencies/adjacency/state/area-address • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/topologies • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/multi-topology • /network-instances/network-instance/protocols/protocol/isis/interfaces/interfaces/levels/level/adjacencies/adjacency/state/adjacency-type • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/state/ipv4-prefix • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/state/up-down • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/state/s-bit • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/state/metric

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/subtlvs/subtlv/flags/state/flags • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/subtlvs/subtlv/flags/state/ipv4-source-router-id • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/subtlvs/subtlv/ipv6-source-router-id/state/ipv6-source-router-id • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/subtlvs/subtlv/flags/state/tag64 • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/subtlvs/subtlv/flags/state/tag32 • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/undefined-subtlvs/undefined-subtlv/state/type • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/undefined-subtlvs/undefined-subtlv/state/length • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/undefined-subtlvs/undefined-subtlv/state/value • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/subtlvs/subtlv/prefix-sid/sid/state/value • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/subtlvs/subtlv/flags/state/flags • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/extended-ipv4-reachability/prefixes/prefix/subtlvs/subtlv/flags/state/algorithm • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/state/ipv6-prefix • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/state/up-down • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/state/s-bit • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/state/x-bit • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/state/metric

Table 6: gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/state/ipv6-prefix • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/subtlvs/subtlv/ipv4-source-router-id/state/ipv4-source-router-id • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/subtlvs/subtlv/ipv6-source-router-id/state/ipv6-source-router-id • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/subtlvs/subtlv/tag64/state/tag64 • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/subtlvs/subtlv/tag64/state/tag32 • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/undefined-subtlvs/undefined-subtlv/state/type • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/undefined-subtlvs/undefined-subtlv/state/length • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/undefined-subtlvs/undefined-subtlv/state/value • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/subtlvs/subtlv/prefix-sid/sid/state/value • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/subtlvs/subtlv/prefix-sid/sid/state/flags • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/ipv6-reachability/prefixes/prefix/subtlvs/subtlv/prefix-sid/sid/state/algorithm • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/router-capabilities/router-capability/state/flags • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/tlvs/tlv/router-capabilities/router-capability/state/rtr-id • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/undefined-tlvs/undefined-tlv/state/type • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/undefined-tlvs/undefined-tlv/state/length • /network-instances/network-instance/protocols/protocol/isis/levels/level/link-state-database/lsp/undefined-tlvs/undefined-tlv/state/value

Table 6: gRPC Sensors (continued)

resource path	Description
/junos/services/segment-routing/interface/ingress/usage/	
/junos/services/segment-routing/interface/egress/usage/	
/junos/services/segment-routing/sid/usage/	

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>Sensors for aggregate segment routing traffic with IS-IS.</p> <p>This sensor is supported on MX Series and PTX5000 routers starting with Junos OS Release 17.4R1.</p> <p>Statistics are exported separately for each routing instance.</p> <p>The first path exports inbound traffic. The second path exports outbound traffic. The third path exports inbound segment routing traffic for each segment identifier.</p> <p>NOTE: When you enable a sensor for segment routing statistics, you must also configure the sensor-based-stats statement at the [edit protocols isis source-packet-routing] hierarchy level. MX Series and PTX Series routers must also operate in enhanced mode. On MX Series routers, if not enabled by default, configure either the enhanced-ip statement or the enhanced-ethernet statement at the [edit chassis network-services] hierarchy level. On PTX Series routers, configure the enhanced-mode statement at the [edit chassis network-services] hierarchy level.</p> <p>NOTE: Currently, MPLS labels correspond only to only one instance, instance 0. Since each SID corresponds to a single instance_identifier, no aggregation is required to be done by the collector. The instance_identifier is stamped as 0.</p> <p>The following OpenConfig paths are supported:</p> <ul style="list-style-type: none"> /network-instances/network-instance/mpls/signaling-protocols/segment-routing/interfaces/interface/state/in-pkts /network-instances/network-instance/mpls/signaling-protocols/segment-routing/interfaces/interface/state/in-octets /network-instances/network-instance/mpls/signaling-protocols/segment-routing/interfaces/interface/state/out-octets /network-instances/network-instance/mpls/signaling-protocols/segment-routing/interfaces/interface/state/out-pkts /network-instances/network-instance/mpls/aggregate-sid-counters/aggregate-sid-counter/state/in-octets /network-instances/network-instance/mpls/aggregate-sid-counters/aggregate-sid-counter/state/in-pkts /network-instances/network-instance/mpls/aggregate-sid-counters/aggregate-sid-counter/state/out-octets /network-instances/network-instance/mpls/aggregate-sid-counters/aggregate-sid-counter/state/out-pkts /network-instances/network-instance/mpls/interfaces/interface/sid-counters/sid-counter/state/in-octets /network-instances/network-instance/mpls/interfaces/interface/sid-counters/sid-counter/state/in-pkts /network-instances/network-instance/mpls/interfaces/interface/sid-counters/sid-counter/state/out-octets /network-instances/network-instance/mpls/interfaces/interface/sid-counters/sid-counter/state/out-pkts /network-instances/network-instance/mpls/interfaces/interface/sid-counters/sid-counter/forwarding-classes/forwarding-class/state/

Table 6: gRPC Sensors (continued)

resource path	Description
	<p>in-octets</p> <ul style="list-style-type: none"> • /network-instances/network-instance/mpls/interfaces/interface/sid-counters/sid-counter/forwarding-classes/forwarding-class/state/in-pkts • /network-instances/network-instance/mpls/interfaces/interface/sid-counters/sid-counter/forwarding-classes/forwarding-class/state/out-octets • /network-instances/network-instance/mpls/interfaces/interface/sid-counters/sid-counter/forwarding-classes/forwarding-class/state/out-pkts

Table 7: Broadband Edge gRPC Sensors

resource path	Description
/junos/system/subscriber-management/aaa/accounting-statistics/	<p>Sensor that tracks accounting statistics by means of a protocol exchange with accounting servers.</p> <p>You can also add the following to the end path for /junos/system/subscriber-management/aaa/accounting-statistics/:</p> <ul style="list-style-type: none"> • acct-req-received • acct-req-timeout • acct-resp-failure • acct-resp-success • acct-req-start • acct-req-interim • acct-req-stop • acct-resp-total • acct-resp-start • acct-resp-interim • acct-resp-stop • acct-resp-total

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/aaa/ address-assignment-statistics/ logical-system-routing-instances/ logical-system-routing-instance/pools/pool</code>	<p>For Authentication, Authorization, and Accounting, this sensor tracks address pool utilization.</p> <p>The resource path can be refined to select a logical system routing instance by using a logical system routing instance filter:</p> <pre>/aaa/address-assignment-statistics/logical-system-routing-instances/ logical-system-routing-instance [lsri-name=' lsName:riName']/pools/ pool[pool-name=' poolName']</pre> <p>The resource path can be refined to select a specific pool by using a pool filter:</p> <pre>/junos/system/subscriber-management/aaa/address-assignment-statistics/ logical-system-routing-instances/logical-system-routing-instance/pools/ pool[pool-name=' poolName']</pre> <p>The resource path can be refined to select both a logical routing instance and a pool by using a logical system routing instance filter and a pool filter:</p> <pre>/junos/system/subscriber-management/aaa/address-assignment-statistics/ logical-system-routing-instances/logical-system-routing-instance/[lsri-name=' lsName:riName']/pools/pool[pool-name=' poolName']</pre> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • pool-name • out-of-memory • out-of-address • address-total • address-in-use • address-usage-percent • linked-pool-name—The next address pool in the chain of linked pools. If there is no next address pool, the value is empty. • linked-pool-head—The first address pool in a chain of linked pools. If this pool is not part of a linked address pool, the value is empty.
<code>/junos/system/subscriber-management/access-network/ ancc/adaptee</code>	<p>Sensors that track statistics associated with Access Node Control Protocol (ANCP) adapter.</p> <p>mapped-dynamic-subscriber-count—Number of ANCP subscribers mapped to dynamic interfaces by ANCP adapter.</p>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/access-network/ancp/protocol</code>	<p>Sensors that track statistics associated with ANCP protocol.</p> <p>establishing-neighbor-count—Number of neighbors in the process of establishing adjacency.</p> <p>established-neighbor-count—Number of neighbors in the process of establishing adjacency</p> <p>total-neighbor-count—Total number of neighbors in all states.</p> <p>mapped-static-subscriber-count—Number of ANCP subscribers mapped to static interfaces by ANCP protocol.</p> <p>port-up-count—Total number of port ups received.</p> <p>port-down-count —Total number of port downs received.</p>
<code>/junos/system/subscriber-management/aaa/authentication-statistics/</code>	<p>Sensors that track authentication, authorization, and accounting (AAA) authentication, pre-authentication, and re-authentication statistics.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>req-received</code> • <code>req-accepted</code> • <code>req-rejected</code> • <code>req-challenge</code> • <code>req-timeout</code> • <code>pre-authen-req-received</code> • <code>pre-authen-req-accepted</code> • <code>pre-authen-req-rejected</code> • <code>pre-authen-req-challenge</code> • <code>pre-authen-req-timeout</code> • <code>re-authen-req-received</code> • <code>re-authen-req-accepted</code> • <code>re-authen-req-rejected</code> • <code>re-authen-req-internal-errors</code> • <code>re-authen-req-challenge</code> • <code>re-authen-req_timeout</code>
<code>/junos/system/subscriber-management/aaa/dynamic-request-statistics/</code>	<p>Sensor tracks dynamic request statistics from AAA server-initiated requests, including Change of Authorization (CoA) and RADIUS-initiated Disconnect (RID).</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>dynamic-req-received</code> • <code>dynamic-req-success</code> • <code>dynamic-req-error</code> • <code>dynamic-req-silently-drop</code>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/aaa/radius-servers/radius-server/response-time/</code>	<p>Sensor for RADIUS server response time statistics for a specific server.</p> <p>A request sent to the RADIUS server is counted as a message sent. Similarly, a response to the request is counted as a message received. A timeout during the measurement interval does not impact the minimum, average, or maximum response time statistics, but the event is counted as a no response.</p> <p>The delay measurements are made over a 60-second measurement interval. The reporting interval can be as much as 59 seconds out of phase with the measurement interval. At reporting time, the values from the last update interval are reported. The response time values are not aligned with the reporting interval.</p> <p>The resource path can be refined to select a specific RADIUS server by adding a server address filter to the resource path:</p> <p><code>/junos/system/subscriber-management/aaa/radius-servers/radius-server[server-address='radius/pv4Address']/response-time/</code></p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>one-minute-minimum-response-time</code> • <code>one-minute-average-response-time</code> • <code>one-minute-maximum-response-time</code> • <code>one-minute-messages-sent</code> • <code>one-minute-messages-received</code> • <code>one-minute-messages-no-response</code>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/aaa/ radius-servers/radius-server/statistics/</code>	

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<p>Sensor for RADIUS server statistics for a specific server.</p> <p>The resource path can be refined to select a specific RADIUS server by adding a server address filter to the resource path:</p> <pre>/junos/system/subscriber-management//aaa/radius-servers/ radius-server[server-address='radius/pv4Address']/statistics/</pre> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • server-address • server-last-rtt • auth-access-requests • auth-rollover-requests • auth-retransmissions • auth-access-accepts • auth-access-rejects • auth-access-challenges • auth-malformed-responses • auth-bad-authenticators • auth-req-pending • auth-request-timeouts • auth-unknown-responses • auth-packets-dropped • preauth-access-requests • preauth-rollover-requests • preauth-retransmissions • preauth-access-accepts • preauth-access-rejects • preauth-access-challenges • preauth-malformed-responses • preauth-bad-authenticators • preauth-req-pending • preauth-request-timeouts • preauth-unknown-responses • preauth-packets-dropped • acct-start-requests • acct-interim-requests • acct-stop-requests • acct-rollover-requests • acct-retransmissions • acct-start-responses • acct-interim-responses • acct-stop-responses • acct-malformed-responses • acct-bad-authenticators

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • acct-req-pending • acct-request-timeouts • acct-unknown-responses • acct-packets-dropped
/junos/system/subscriber-management/client-protocols/ dhcp/v4/routing-instances/routing-instance/relay/ bindings/	<p>Sensor for DHCPv4 relay binding state statistics.</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance name:</p> <p>/junos/system/subscriber-management/client-protocols/dhcp/v4/ routing-instances/routing-instance[name=' <i>routing-instance-name</i>']/relay/ bindings/</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • binding-state-v4relay-binding • binding-state-v4relay-init • binding-state-v4relay-bound • binding-state-v4relay-selecting • binding-state-v4relay-requesting • binding-state-v4relay-renew • binding-state-v4relay-release • binding-state-v4relay-restoring

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance/relay/servers/server/response-time</code>	<p>Sensor for DHVPv4 server delay. The sensor periodically measures the minimum, average, and maximum delay or response time from the upstream DHCP server(s), as seen by the relay.</p> <p>DHCP relay does not track the state of the server. The no-response statistics are the difference between the messages sent and received during the measurement interval.</p> <p>The delay measurements are made over a 60-second measurement interval. Because the reporting interval can be as much as 59 seconds out of phase with the measurement interval, there is no design to align the response time values with the reporting interval.</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance filter to the resource path:</p> <p><code>/junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[name='routing-instance-name']/relay/servers/server/response-time</code></p> <p>The resource path can be refined to select a specific DHCP server by adding a server filter to the resource path:</p> <p><code>/junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance/relay/servers/server[server-ip='server-ip']/response-time</code></p> <p>The resource path can be refined to select a specific DHCP server in a specific routing instance by adding both a routing instance filter and a server filter to the resource path:</p> <p><code>/junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[name='routing-instance-name']/relay/servers/server[server-ip='server-ip']/response-time</code></p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>one-minute-minimum-response-time</code> • <code>one-minute-average-response-time</code> • <code>one-minute-maximum-response-time</code> • <code>one-minute-messages-sent</code> • <code>one-minute-messages-received</code> • <code>one-minute-messages-no-response</code>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/client-protocols/ dhcp/v4/routing-instances/routing-instance/server/ bindings/</code>	<p>Sensor for DHCPv4 server binding state statistics.</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance filter to the resource path:</p> <p><code>/junos/system/subscriber-management/client-protocols/dhcp/v4/ routing-instances/routing-instance[name='routing-instance-name']/server/ bindings/</code></p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>binding-state-v4server-binding</code> • <code>binding-state-v4server-init</code> • <code>binding-state-v4server-bound</code> • <code>binding-state-v4server-selecting</code> • <code>binding-state-v4server-requesting</code> • <code>binding-state-v4server-renew</code> • <code>binding-state-v4server-release</code> • <code>binding-state-server-restoring</code>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/client-protocols/ dhcp/v4/routing-instances/routing-instance/server/ statistics/</code>	

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<p>Sensor for DHCPv4 telemetry for server statistics for a specific routing-instance.</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance filter to the resource path:</p> <pre>/junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[ri-name='routing-instance-name']/server/statistics/</pre> <p>For example, the following resource path defines server statistics for the default:n000015k routing instance: /junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[ri-name='n000015k']/server/statistics</p> <p>In Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensor /junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[ri-name=' routing-instance-name'] /server/statistics/ the only value supported for <i>routing-instance-name</i> is default.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • dropped-v4server-total • dropped-v4server-bad-hware • dropped-v4server-bootp-pkt • dropped-v4server-bad-bootp-opcode • dropped-v4server-bad-options • dropped-v4server-bad-address • dropped-v4server-no-address • dropped-v4server-no-interface-cfg • dropped-v4server-no-local-address • dropped-v4server-short-pkt • dropped-v4server-no-bad-send • dropped-v4server-no-option60 • dropped-v4server-no-option82 • dropped-v4server-authentication • dropped-v4server-dynamic-profile • dropped-v4server-no-license • dropped-v4server-no-bad-dhcp-opcode • dropped-v4server-no-options • dropped-v4server-hop-limit • dropped-v4server-ttl-expired • dropped-v4server-bad_udp-checksum • dropped-v4server-inactive-vlan • dropped-v4server-era-start-ailed • dropped-v4server-client-lookup • dropped-v4server-lease-time-violation • offer-delayed • offer-delay-in-progress

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • offer-delay-total • msg-recv-v4server-boot-request • msg-recv-v4server-decline • msg-recv-v4server-discover • msg-recv-v4server-inform • msg-recv-v4server-release • msg-recv-v4server-request • msg-recv-v4server-renew • msg-recv-v4server-rebind • msg-recv-v4server-lease-query • msg-recv-v4server-bulklease-query • msg-sent-v4server-boot-reply • msg-sent-v4server-offer • msg-sent-v4server-boot-ack • msg-sent-v4server-nak • msg-sent-v4server-force-renew • msg-sent-v4server-unassigned • msg-sent-v4server-unknown • msg-sent-v4server-active • msg-sent-v4server-query-done
/junos/system/subscriber-management/client-protocols/dhcp/v4/	<p>Sensor for DHCPv4 telemetry.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • dropped-total • dropped-bad-read • dropped-ip-header • dropped-short-packet • dropped-no-interface • dropped-no-routing-instance • dropped-no-memory • dropped-recovery-in-progress • era-inflight-count • era-reported-failures • era-reported-successes

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/client-protocols/ dhcp/v4/routing-instances/routing-instance/server/ statistics/</code>	

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<p>Sensor for DHCPv4 server statistics</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance name:</p> <p><code>/junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[ri-name='routing-instance-name']/server/statistics/</code></p> <p>For example, the following resource path defines server statistics for the default:n000015k routing instance: <code>/junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[ri-name='n000015k']/server/statistics</code></p> <p>In Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensor <code>/junos/system/subscriber-management/client-ancpinstance[ri-name='routing-instance-name']/server/statistics/</code> the only value supported for <code>routing-instance-name</code> is default.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • dropped-v4server-total • dropped-v4server-bad-hware • dropped-v4server-bootp-pkt • dropped-v4server-bad-bootp-opcode • dropped-v4server-bad-options • dropped-v4server-bad-address • dropped-v4server-no-address • dropped-v4server-no-interface-cfg • dropped-v4server-no-local-address • dropped-v4server-short-pkt • dropped-v4server-no-bad-send • dropped-v4server-no-option60 • dropped-v4server-no-option82 • dropped-v4server-authentication • dropped-v4server-dynamic-profile • dropped-v4server-no-license • dropped-v4server-no-bad-dhcp-opcode • dropped-v4server-no-options • dropped-v4server-hop-limit • dropped-v4server-ttl-expired • dropped-v4server-bad_udp-checksum • dropped-v4server-inactive-vlan • dropped-v4server-era-start-ailed • dropped-v4server-client-lookup • dropped-v4server-lease-time-violation • offer-delayed • offer-delay-in-progress • offer-delay-total

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • msg-recv-v4server-boot-request • msg-recv-v4server-decline • msg-recv-v4server-discover • msg-recv-v4server-inform • msg-recv-v4server-release • msg-recv-v4server-request • msg-recv-v4server-renew • msg-recv-v4server-rebind • msg-recv-v4server-lease-query • msg-recv-v4server-bulklease-query • msg-sent-v4server-boot-reply • msg-sent-v4server-offer • msg-sent-v4server-boot-ack • msg-sent-v4server-nak • msg-sent-v4server-force-renew • msg-sent-v4server-unassigned • msg-sent-v4server-unknown • msg-sent-v4server-active • msg-sent-v4server-query-done

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/client-protocols/ dhcp/v4/routing-instances/routing-instance/relay/ statistics/</code>	

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<p>Sensor for DHVPv4 relay binding state statistics.</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance filter to the resource path:</p> <pre>/junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[ri-name='routing-instance-name']/relay/statistics/</pre> <p>For example, the following resource path defines relay statistics for the default:n000015k routing instance: /junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[ri-name='n000015k']/relay/statistics</p> <p>In Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensor /junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[ri-name='routing-instance-name']/relay/statistics/ the only value supported for the value <i>routing-instance-name</i> is default.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • dropped-v4relay-total • dropped-v4relay-bad-hardware • dropped-v4relay-bootp-packet • dropped-v4relay-bad-bootp-opcode • dropped-v4relay-bad-options • dropped-v4relay-bad-address • dropped-v4relay-no-address • dropped-v4relay-no-interface-cfg • dropped-v4relay-no-local-address • dropped-v4relay-short-packet • dropped-v4relay-bad-send • dropped-v4relay-option-60 • dropped-v4relay-relay-option • dropped-v4relay-option-82 • dropped-v4relay-authentication • dropped-v4relay-dynamic-profile • dropped-v4relay-dynamic-profile • dropped-v4relay-license • dropped-v4relay-bad-dhcp-opcode • dropped-v4relay-no-options • dropped-v4relay-hop-limit • dropped-v4relay-ttl-expired • dropped-v4relay-bad-udp-checksum • dropped-v4relay-inactive-vlan • dropped-v4relay-era-start-failed • dropped-v4relay-client-lookup • dropped-v4relay-proxy-no-server-addr • dropped-v4relay-lease-time-violation

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> dropped-v4relay-leasequery-repl-no-circuitid dropped-v4relay-leasequery-repl-with-error-code dropped-v4relay-leasequery-repl-with-query-term dropped-v4relay-older-leasequery-reply dropped-v4relay-abort-leasequery-reply-proc dropped-v4relay-during-leasequery-reply dropped-v4relay-relay-source-no-lpbk-interface v4relay-bootp-request-rcvd msg-recv-v4relay-decline msg-recv-v4relay-discover msg-recv-v4relay-inform msg-recv-v4relay-release msg-recv-v4relay-request msg-recv-v4relay-leaseactive msg-recv-v4relay-leaseunassigned msg-recv-v4relay-leaseunknown msg-recv-v4relay-leasequerydone v4relay-bootp-reply-rcvd msg-recv-v4relay-offer msg-recv-v4relay-ack msg-recv-v4relay-nak msg-recv-v4relay-forcerenew v4relay-bootp-reply-sent msg-sent-v4relay-offer msg-sent-v4relay-ack msg-sent-v4relay-nak msg-sent-v4relay-forcerenew msg-sent-v4relay-leasequery msg-sent-v4relay-bulkleasequery v4relay-bootp-request-sent msg-sent-v4relay-decline msg-sent-v4relay-discover msg-sent-v4relay-inform msg-sent-v4relay-release msg-sent-v4relay-request v4relay-bootp-forwarded-total v4relay-bootp-request-fwd v4relay-bootp-reply-fwd

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/client-protocols/dhcp/v6/</code>	<p>Sensor for DHCPv6 statistics.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>era-inflight-count</code> • <code>era-reported-failures</code> • <code>era-reported-successes</code>
<code>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance/relay/bindings/</code>	<p>Sensor for DHCPv6 relay binding state statistics.</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance name:</p> <p><code>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[name='routing-instance-name']/relay/bindings/</code></p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>binding-state-v6relay-binding</code> • <code>binding-state-v6relay-init</code> • <code>binding-state-v6relay-bound</code> • <code>binding-state-v6relay-selecting</code> • <code>binding-state-v6relay-requesting</code> • <code>binding-state-v6relay-renew</code> • <code>binding-state-v6relay-release</code> • <code>binding-state-relay-restoring</code>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
/junos/system/management/protocols/dhcp/v6/relay/servers/server/response-time	<p>Sensor for DHVPv6 server delay. The sensor periodically measures the minimum, average, and maximum delay or response time from the upstream DHCP server(s), as seen by the relay.</p> <p>DHCP relay does not track the state of the server. The no-response statistics are the difference between the messages sent and received during the measurement interval.</p> <p>The delay measurements are made over a 60-second measurement interval. Because the reporting interval can be as much as 59 seconds out of phase with the measurement interval, there is no design to align the response time values with the reporting interval.</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance filter to the resource path:</p> <pre>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[name='routing-instance-name']/relay/servers/server/response-time</pre> <p>The resource path can be refined to select a specific DHCP server by adding a server address filter to the resource path:</p> <pre>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance/relay/servers/server[server-ip='server-ip']/response-time</pre> <p>The resource path can be refined to select a specific DHCP server in a specific routing instance by adding both a routing instance filter and a server filter to the resource path:</p> <pre>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[name='routing-instance-name']/relay/servers/server[server-ip='server-ip']/response-time</pre> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • one-minute-minimum-response-time • one-minute-average-response-time • one-minute-maximum-response-time • one-minute-messages-sent • one-minute-messages-received • one-minute-messages-no-response

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
/junos/system/subscriber-management/client-protocols/ dhcp/v6/routing-instances/routing-instance/server/ bindings/	<p>Sensor for DHVPv6 binding state statistics.</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance filter to the resource path:</p> <p>/junos/system/subscriber-management/client-protocols/dhcp/v6/ routing-instances/routing-instance[name=' <i>routing-instance-name</i>']/server/ bindings/</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • binding-state-v6server-binding • binding-state-v6server-init • binding-state-v6server-bound • binding-state-v6server-selecting • binding-state-v6server-requesting • binding-state-v6server-renew • binding-state-v6server-release • binding-state-server-restoring

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/client-protocols/ dhcp/v6/routing-instances/routing-instance/server/ statistics/</code>	

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<p>Sensor for DHCPv6 server statistics.</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance filter to the resource path:</p> <pre>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[ri-name='routing-instance-name']/server/statistics/</pre> <p>For example, the following resource path defines server statistics for the default:n000015k routing instance: <code>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[ri-name='n000015k']/server/statistics</code></p> <p>In Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensor <code>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[ri-name='routing-instance-name']/server/statistics</code> the only value supported for <code>routing-instance-name</code> is <code>default</code>.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • dropped-v6server-total • dropped-v6server-no-routing-instance • dropped-v6server-bad-send • dropped-v6server-short-packet • dropped-v6server-bad-msgtype • dropped-v6server-bad-options • dropped-v6server-bad-srcaddress • dropped-v6server-relay-hop-count • dropped-v6server-bad-udp-checksum • dropped-v6server-no-client-id • dropped-v6server-strict-reconfigure • dropped-v6server-option-18 • dropped-v6server-authentication{ • dropped-v6server-dynamic-profile • dropped-v6server-license • dropped-v6server-inactive-vlan • dropped-v6server-era-start-failed • dropped-v6server-client-lookup • dropped-v6server-lease-time-violation • advertise-delayed • advertise-queued • advertise-total • msg-recv-v6server-dhcpv6-decline • msg-recv-v6server-dhcpv6-solicit • msg-recv-v6server-dhcpv6-information-request • msg-recv-v6server-dhcpv6-release • msg-recv-v6server-dhcpv6-request • msg-recv-v6server-dhcpv6-confirm

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none">• msg-recv-v6server-dhcpv6-renew• msg-recv-v6server-dhcpv6-rebind• msg-recv-v6server-dhcpv6-relay-forw• msg-recv-v6server-dhcpv6-leasequery• msg-sent-v6server-advertise• msg-sent-v6server-reply• msg-sent-v6server-logical_nak• msg-sent-v6server-reconfigure• msg-sent-v6server-relay-repl• msg-sent-v6server-leasequery-repl• msg-sent-v6server-leasequery-data• msg-sent-v6server-leasequery-done

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/client-protocols/ dhcp/v6/routing-instances/routing-instance/relay/ statistics/</code>	

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<p>Sensor for DHVPv6 relay statistics.</p> <p>The resource path can be refined to select a specific routing instance by adding a routing instance filter to the resource path:</p> <pre>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[ri-name='routing-instance-name']/relay/statistics/</pre> <p>For example, the following resource path defines relay statistics for the default:n000015k routing instance: /junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[ri-name='n000015k']/relay/statistics</p> <p>In Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensor /junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[ri-name='routing-instance-name']/relay/statistics the only value supported for <i>routing-instance-name</i> is default.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • dropped-v6relay-total • dropped-v6relay-no-safd • dropped-v6relay-no-routing-instance • dropped-v6relay-bad-send • dropped-v6relay-short-packet • dropped-v6relay-bad-msgtype • dropped-v6relay-bad-options • dropped-v6relay-bad-srcaddress • dropped-v6relay-relay-hop-count • dropped-v6relay-bad-udp-checksum • dropped-v6relay-no-client-id • dropped-v6relay-strict-reconfigure • dropped-v6relay-relay-option • dropped-v6relay-option-18 • dropped-v6relay-option-37 • dropped-v6relay-authentication • dropped-v6relay-dynamic-profile • dropped-v6relay-license • dropped-v6relay-inactive-vlan • dropped-v6relay-era-start-failed • dropped-v6relay-client-lookup • dropped-v6relay-lease-time-violation • dropped-v6relay-leasequery-repl-no-client-data • dropped-v6relay-leasequery-repl-no-interfaceid • dropped-v6relay-leasequery-repl-with-client-link • dropped-v6relay-leasequery-repl-no-relay-data • dropped-v6relay-leasequery-repl-with-hop-cnt • dropped-v6relay-leasequery-repl-with-error-code

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> dropped-v6relay-leasequery-repl-with-query-term dropped-v6relay-older-leasequery-reply dropped-v6relay-abort-leasequery-reply-proc dropped-v6relay-during-leasequery-reply dropped-v6relay-relay-source-no-lpbk-interface msg-recv-v6relay-decline msg-recv-v6relay-solicit msg-recv-v6relay-information-request msg-recv-v6relay-release msg-recv-v6relay-request msg-recv-v6relay-confirm msg-recv-v6relay-renew msg-recv-v6relay-rebind msg-recv-v6relay-relay-forw msg-recv-v6relay-leasequery-repl msg-recv-v6relay-leasequery-data msg-recv-v6relay-leasequery-done msg-recv-v6relay-advertise msg-recv-v6relay-reply msg-recv-v6relay-reconfigure msg-recv-v6relay-relay-repl msg-recv-v6relay-leasequery msg-sent-v6relay-reply msg-sent-v6relay-reconfigure msg-sent-v6relay-relay-repl msg-sent-v6relay-leasequery msg-sent-v6relay-decline msg-sent-v6relay-solicit msg-sent-v6relay-information-request msg-sent-v6relay-release msg-sent-v6relay-request msg-sent-v6relay-confirm msg-sent-v6relay-renew msg-sent-v6relay-rebind msg-sent-v6relay-relay-forw msg-sent-v6relay-leasequery-repl msg-sent-v6relay-leasequery-data msg-sent-v6relay-leasequery-done v6relay-fwd-total v6relay-fwd-request v6relay-fwd-reply

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/client-protocols/l2tp/summary/</code>	<p>Sensor for L2TP telemetry information.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>l2tp-stats-total-tunnels</code> • <code>l2tp-stats-total-sessions</code> • <code>l2tp-stats-control-rx-packets</code> • <code>l2tp-stats-control-rx-bytes</code> • <code>l2tp-stats-control-tx-packets</code> • <code>l2tp-stats-control-tx-bytes</code> • <code>l2tp-era-type-icrq-inflight-count</code> • <code>l2tp-era-type-icrq-reported-successes</code> • <code>l2tp-era-type-icrq-reported-failures</code> • <code>l2tp-era-type-sccrq-inflight-count</code> • <code>l2tp-era-type-sccrq-reported-successes</code> • <code>l2tp-era-type-sccrq-reported-failures</code>
<code>/junos/system/subscriber-management/client-protocols/ppp/statistics/</code>	<p>Sensors for PPP telemetry information.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>ppp-stats-total-subscriber-sessions</code> • <code>ppp-stats-sessions-disable-phase</code> • <code>ppp-stats-sessions-establish-phase</code> • <code>ppp-stats-sessions-network-phase</code> • <code>ppp-stats-sessions-authenticate-phase</code>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/client-protocols/pppoe/statistics/</code>	<p>Sensors for PPPoE counts.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>padi-packets-sent</code> • <code>padi-packets-received</code> • <code>pado-packets-sent</code> • <code>pado-packets-received</code> • <code>padr-packets-sent</code> • <code>padr-packets-received</code> • <code>pads-packets-sent</code> • <code>pads-packets-received</code> • <code>padt-packets-sent</code> • <code>padt-packets-received</code> • <code>service-error-sent</code> • <code>service-error-received</code> • <code>ac-error-sent</code> • <code>ac-error-received</code> • <code>generic-error-sent</code> • <code>generic-error-received</code> • <code>malformed-packets-received</code> • <code>unknown-packets-received</code> • <code>era-inflight-count</code> • <code>era-reported-successes</code> • <code>era-reported-failures</code>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber_management/ dynamic-interfaces/interface-sets/meta-data/ interface-set[container-id='container-id-value']/</code>	<p>Sensor for subscriber interface-set information.</p> <p>This sensor is supported on MX Series routers starting with Junos OS Release 18.4R1.</p> <p>ON-CHANGE streaming is supported.</p> <p>The following end paths are supported:</p> <ul style="list-style-type: none"> • cos-egress-tcp-name—The egress traffic control profile associated with this interface-set. • cos-egress-tcp-remainder-name—The egress remainder traffic control profile associated with this interface-set. • interface-set-name—The name of the interface-set as supplied by AAA or as constructed by the topology relationship (ACI string or interface stacking). • interface-set-type—The type of interface-set (determines structure of interface-set-name). • device-name—The name of the underlying device or port (e.g. ge-1/0/0 or ae1). This leaf is empty if the interface-set-type is not a physical interface-set type. • tag—The outer VLAN tag. The value is 0 if interface-set-type is not a VLAN type. • ctag—The inner VLAN tag. The value is 0 if interface-set-type is not a VLAN type.
<code>/junos/system/subscriber_management/ dynamic-interfaces/interface-sets/meta-data/ interface[sid-id='sid-value']/</code>	<p>Sensor for subscriber interface information.</p> <p>ON-CHANGE streaming is supported.</p> <p>The following end paths are supported:</p> <ul style="list-style-type: none"> • interface-index—The system assigned interface index for the interface. • session-type—The type of client session (e.g VLAN, DHCP, PPPoE). • user-name—The login name for this interface and session. • profile-name—The name of the client profile used to create the interface. • underlying-interface-name—The name of the associated underlying interface. • cvlan-tag—The innermost VLAN tag value associated with the interface. • svlan-tag—The outermost VLAN tag value associated with the interface.

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber_management/ dynamic-interfaces/interface-sets/meta-data/ interface[sid-id='sid-value']/</code>	<p>Sensor for actual accounting statistics for dynamic subscriber interfaces.</p> <p>ON-CHANGE streaming is supported.</p> <p>The following end paths are supported:</p> <ul style="list-style-type: none"> • ip-in-packets-The number of actual transit IPv4 & IPv6 packets received by the interface. • ip-out-packets-The number of actual transit IPv4 & IPv6 packets sent to the interface. • ip-in-bytes-The number of actual transit IPv4 & IPv6 bytes received by the interface. • ip-out-bytes-The number of actual transit IPv4 & IPv6 bytes received by the interface. • ipv6-in-packets-The number of actual transit IPv6 packets received by the interface. • ipv6-out-packets-The number of actual transit IPv6 packets sent to the interface. • ipv6-in-bytes-The number of actual transit IPv6 bytes received by the interface. • ipv6-out-bytes-The number of actual transit IPv6 bytes sent to the interface.
<code>/junos/system/subscriber_management/ dynamic-interfaces/interfaces/queue-statistics/ interface[sid-id='sid-value']/fpcs/fpc[slot='slot-value']/ queues/queue/[queue-no='queue-no-value']/</code>	<p>Sensor for queue statistics for dynamic interfaces.</p> <p>ON-CHANGE streaming is supported.</p> <p>The following end paths are supported:</p> <ul style="list-style-type: none"> • transmitted-packets-The number of actual transit IPv4 & IPv6 packets received by the interface. • transmitted-bytes-Total bytes enqueued for this queue. • dropped-packets-Total packets dropped (because of RED, rate-limited, tail-drop, etc.) for the queue. • dropped-bytes-Total bytes dropped (because of RED, rate-limited, tail-drop, etc.) for the queue.
<code>/junos/system/subscriber_management/ dynamic-interfaces/interface-sets/queue-statistics/ interface-set[container-id='container-id-value']/fpcs/ fpc[slot='slot-value']/queues/queue/ [queue-no='queue-no-value']/</code>	<p>Sensor for queue statistics for dynamic interface-sets.</p> <p>ON-CHANGE streaming is supported.</p> <p>The following end paths are supported:</p> <ul style="list-style-type: none"> • transmitted-packets-The number of actual transit IPv4 & IPv6 packets received by the interface. • transmitted-bytes-Total bytes enqueued for this queue. • dropped-packets-Total packets dropped (because of RED, rate-limited, tail-drop, etc.) for the queue. • dropped-bytes-Total bytes dropped (because of RED, rate-limited, tail-drop, etc.) for the queue.

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/infra/resource-monitor/chassis</code>	<p>Sensor for chassis resource statistics.</p> <p>The crossing of chassis thresholds maintained by the resource monitor can be incremented. For each threshold, a count is maintained of rising and falling threshold crossings. As the consumed resource exceeds the threshold, the threshold exceeded count is incremented. As the consumed resource drops below the threshold, the threshold nominal count is incremented.</p> <p>Unless limits are configured using configured-subscriber-limit, configured and current limit counts will not be visible.</p> <p>The following end paths are supported for chassis threshold crossing statistics:</p> <ul style="list-style-type: none">• subscriber-limit-exceeded• subscriber-limit-nominal• configured-subscriber-limit• current-subscriber-count

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/infra/resource-monitor/fpcs/fpc/statistics/</code>	<p>Sensor for FPC resource statistics, including statistics for throttled sessions due to exceeding the line card load threshold (as measured by the routing engine to FPC round trip delay).</p> <p>The resource path can be refined to select a specific slot by adding a slot number filter to the resource path:</p> <p><code>/junos/system/subscriber-management/infra/resource-monitor/fpcs/fpc[slot='slot number']/statistics/</code></p> <p>Using the slot number filter, the crossing of FPC thresholds maintained by the resource monitor can be incremented. For each threshold, a count is maintained of rising and falling threshold crossings. As the consumed resource exceeds the threshold, the threshold exceeded count is incremented. As the consumed resource drops below the threshold, the threshold nominal count is incremented.</p> <p>Unless limits are configured using configured-subscriber-limit, configured and current limit counts will not be visible.</p> <p>The following end paths are supported for FPC threshold crossing statistics:</p> <ul style="list-style-type: none"> • mem-heap-exceeded • mem-heap-nominal • subscriber-limit-exceeded • subscriber-limit-nominal • configured-subscriber-limit • current-subscriber-count <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • heap-memory-used • client-session-denied-count • service-session-denied-count • rtt-throttled-sub-count-client • rtt-throttled-sub-count-client

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/infra/resource-monitor/fpcs/fpc/statistics/pfes/pfe</code>	<p>Sensor for FPC resource statistics at the Packet Forwarding Engine level. Periodically tracks line card statistics and Packet Forwarding Engine statistics.</p> <p>The resource path can be refined to select a specific Packet Forwarding Engine by adding a Packet forwarding Engine filter to the resource path:</p> <p><code>/junos/system/subscriber-management/infra/resource-monitor/fpcs/fpc/statistics/pfes/pfe[pfe-no=' pfe number']/</code></p> <p>The resource path can be refined to select a specific Packet Forwarding Engine by adding a slot number filter to the resource path:</p> <p><code>/junos/system/subscriber-management/infra/resource-monitor/fpcs/fpc[slot=' slot number']/statistics/pfes/pfe[pfe-no=' pfe number']/</code></p> <p>Using the slot number filter, the crossing of packet forwarding engine thresholds maintained by the resource monitor can be incremented. For each threshold, a count is maintained of rising and falling threshold crossings. As the consumed resource exceeds the threshold, the threshold exceeded count is incremented. As the consumed resource drops below the threshold, the threshold nominal count is incremented.</p> <p>The following end paths are supported for packet forwarding threshold crossing statistics:</p> <ul style="list-style-type: none"> • <code>mem-ift-exceeded</code> • <code>mem-ift-nominal</code> • <code>mem-expansion-exceeded</code> • <code>mem-expansion-nominal</code> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>pfe-no</code> • <code>filter-memory-used</code> • <code>ift-memory-used</code> • <code>expansion-memory-used</code> • <code>nh-memory</code>
<code>/junos/system/subscriber-management/infra/resource-monitor/rsmon-infra/fpcs/fpc[slot=' slot number']/</code>	<p>Sensor for FPC resource statistics.</p> <p>Using the slot number filter, the crossing of FPC thresholds maintained by the resource monitor can be incremented. For each threshold, a count is maintained of rising and falling threshold crossings. As the consumed resource exceeds the threshold, the threshold exceeded count is incremented. As the consumed resource drops below the threshold, the threshold nominal count is incremented.</p> <p>The following end paths are supported for FPC threshold crossing statistics:</p> <ul style="list-style-type: none"> • <code>delay-round-trip-exceeded</code> • <code>delay-round-trip-nominal</code>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<pre>/junos/system/subscriber-management/infra/ resource-monitor/fpcs/fpc [slot=' slot number']/ statistics/pfes/pfe[pfe-no=' pfe number']/sched-blocks/ sched-block[sblock-no=' schedBlockNumber']/</pre>	<p>Sensor for counts of CoS utilization threshold crossing events above (exceeded) and below (nominal).</p> <p>For each threshold, a count is maintained of rising and falling threshold crossings. As the consumed resource exceeds the threshold, the threshold exceeded count is incremented. As the consumed resource drops below the threshold, the threshold nominal count is incremented.</p> <p>The following end paths are supported for CoS utilization threshold crossing statistics:</p> <ul style="list-style-type: none"> • cos-utilization-exceeded • cos-utilization-nominal <p>The following end paths are supported for statistical data:</p> <ul style="list-style-type: none"> • queues-max • queues-allocated
<pre>/junos/system/subscriber-management/infra/ resource-monitor/fpcs/fpc [slot=' slot number']/pics/ pic[pic-no=' pic number']/</pre>	<p>Sensor for PIC threshold crossing.</p> <p>For each threshold, a count is maintained of rising and falling threshold crossings. As the consumed resource exceeds the threshold, the threshold exceeded count is incremented. As the consumed resource drops below the threshold, the threshold nominal count is incremented.</p> <p>Unless limits are configured using configured-subscriber-limit, configured and current limit counts will not be visible.</p> <p>The following end paths are supported for PIC threshold crossing statistics:</p> <ul style="list-style-type: none"> • subscriber-limit-exceeded • subscriber-limit-nominal • configured-subscriber-limit • current-subscriber-count
<pre>/junos/system/subscriber-management/infra/ resource-monitor/fpcs/fpc [slot=' slot number']/pics/ pic[pic-no=' pic number']/ports/port[port-no=' port number']/</pre>	<p>Sensor for port threshold crossing.</p> <p>For each threshold, a count is maintained of rising and falling threshold crossings. As the consumed resource exceeds the threshold, the threshold exceeded count is incremented. As the consumed resource drops below the threshold, the threshold nominal count is incremented.</p> <p>Unless limits are configured using configured-subscriber-limit, configured and current limit counts will not be visible.</p> <p>The following end paths are supported for port utilization threshold crossing statistics:</p> <ul style="list-style-type: none"> • subscriber-limit-exceeded • subscriber-limit-nominal • configured-subscriber-limit • current-subscriber-count

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/infra/network/dhcp/</code>	<p>Sensor for network stack DHCP. Periodically tracks packets processed by the BBE network stack to and from the DHCP application.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>rx-packet-cnt</code> • <code>era-drops</code> • <code>rx-no-connection</code> • <code>rx-malformed-cnt</code> • <code>rx-no-if-cnt</code> • <code>rx-ifl-invalid</code> • <code>rx-send-failed</code> • <code>tx-packet-cnt</code> • <code>packets-transmitted</code> • <code>tx-malformed-cnt</code> • <code>tx-null-pkt</code> • <code>tx-no-if-cnt</code> • <code>tx-no-iff-cnt</code> • <code>tx-no-rtt-cnt</code> • <code>tx-arp-failed</code> • <code>tx_arp_failed</code> • <code>tx-if-invalid</code> • <code>tx-send-failed</code> • <code>rx-while-not-connected</code>
<code>/junos/system/subscriber-management/infra/network/dvlan/</code>	<p>Sensor for network stack dynamic VLAN. Periodically maintains a count of the number of packets received that triggered dynamic VLAN interface creations.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>rx-packet-cnt</code>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/infra/network/io/</code>	<p>Sensor for network stack IO. Periodically provides basic network stack input and output and tracks network stack packet statistics.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>l2-rx-packets-cnt</code> • <code>l2-rx-packets-failed</code> • <code>l2-rx-malformed-cnt</code> • <code>l2-rx-ifd-invalid</code> • <code>l2-rx-ifl-invalid</code> • <code>l2-rx-no-iff-cnt</code> • <code>l2-rx-if-create-failed</code> • <code>l2-bbe-io-rcv-l3-unknown-address-family</code> • <code>l2-rx-unsupported-inet-protocol</code> • <code>l2-rx-unsupported-inet6-protocol</code> • <code>l2-rx-unsupported-udp-protocol</code> • <code>l2-rx-unsupported-punt-af</code> • <code>l2-rx-v4-data-path-punt-pkt</code> • <code>l2-rx-v4-data-path-punt-pkt-drop</code> • <code>l2-rx-v6-data-path-punt-pkt</code> • <code>l2-rx-v6-data-path-punt-pkt-drop</code> • <code>l2-tx-packets-cnt</code> • <code>l2-tx-malformed-cnt</code> • <code>l2-tx-no-ifd-cnt</code> • <code>l2-tx-ifl-invalid</code> • <code>l2-bbe-io-send-tx-failed</code> • <code>l2-bbe-io-send-tx-failed-partial</code> • <code>l2-tx-v4-out-error-local-intf</code> • <code>l2-tx-v6-out-error-local-intf</code> • <code>l3-rx-packet-cnt</code> • <code>l3-rx-unsupported-protocol</code> • <code>l3-tx-packet-cnt</code> • <code>l3-tx-send-failed</code> • <code>l3-tx-v4-kernel-forward</code> • <code>l3-tx-v4-kernel-forward-drops</code> • <code>l3-tx-v6-kernel-forward</code> • <code>l3-tx-v6-kernel-forward-drops</code>
<code>/junos/system/subscriber-management/infra/network/dvlan/</code>	<p>Sensor for network stack dynamic VLAN. Periodically maintains a count of the number of packets received that triggered dynamic VLAN interface creations.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • <code>rx-packet-cnt</code>

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
/junos/system/subscriber-management/infra/network/l2tp/	

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<p>Sensor network stack L2TP. Periodically tracks L2TP packets processed by the BBE network stack to and from the L2TP application.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • rx-cnt • rx-pkt-cnt • ppp-rx-pkt-cnt • tx-pkt-cnt • ppp-rx-lcp-conf-req-count • ppp-rx-lcp-conf-ack-count • ppp-rx-lcp-conf-nack-count • ppp-rx-lcp-term-req-count • ppp-rx-lcp-term-ack-count • ppp-rx-lcp-echo-req-count • ppp-rx-lcp-echo-resp-count • ppp-rx-pap-req-count • ppp-rx-pap-ack-count • ppp-rx-pap-nack-count • ppp-rx-chap-challenge-count • ppp-rx-chap-resp-count • ppp-rx-chap-success-count • ppp-rx-chap-fail-count • ppp-rx-ipcp-conf-req-count • ppp-rx-ipcp-conf-ack-count • ppp-rx-ipcp-conf-nack-count • rx-malformed-cnt • ppp-rx-unknown-protocol • rx-msg-cnt • rx-msg-processd-cnt • rx-msg-err • rx-invalid-msg-cnt • tx-cnt • ppp-tx-lcp-conf-req-count • ppp-tx-lcp-conf-ack-count • ppp-tx-lcp-conf-nack-count • ppp-tx-lcp-echo-req-count • ppp-tx-lcp-echo-resp-count • ppp-tx-lcp-term-req-count • ppp-tx-lcp-term-ack-count • ppp-tx-pap-req-count • ppp-tx-pap-ack-count • ppp-tx-pap-nack-count • ppp-tx-chap-challenge-count

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none">• ppp-tx-chap-resp-count• ppp-tx-chap-success-count• ppp-tx-chap-fail-count• ppp-tx-ipcp-conf-req-count• ppp-tx-ipcp-conf-ack-count• ppp-tx-ipcp-conf-nack-count• ppp-tx-unknown-protocol• tx-pkt-send-failed• tx-pkt-err• tx-msg-cnt• tx-msg-err

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/infra/network/ ppp/</code>	

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<p>Sensor network stack PPP. Periodically tracks PPP packets processed by the BBE network stack to and from the PPP application.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> rx-network-pkt-cnt rx-plugin-pkt-cnt rx-lcp-conf-req-cnt rx-lcp-conf-ack-cnt rx-lcp-conf-nack-cnt rx-lcp-conf-rej-cnt rx-lcp-term-req-cnt rx-lcp-term-ack-cnt rx-lcp-code-rej-cnt rx-lcp-protocol-rej-cnt rx-lcp-echo-req-cnt rx-lcp-echo-reply-cnt rx-pap-req-cnt rx-pap-ack-cnt rx-pap-nack-cnt rx-chap-challenge-cnt rx-chap-resp-cnt rx-chap-success-cnt rx-chap-failure-cnt rx-ipcp-req-cnt rx-ipcp-ack-cnt rx-ipcp-nack-cnt rx-ipv6cp-req-cnt rx-ipv6cp-ack-cnt rx-ipv6cp-nack-cnt rx-malformed-cnt rx-no-if-cnt rx-unsupported tx-cnt tx-lcp-conf-req-cnt tx-lcp-conf-ack-cnt tx-lcp-conf-nack-cnt tx-lcp-echo-req-cnt tx-lcp-echo-reply-cnt tx-lcp-term-req-cnt tx-lcp-term-ack-cnt tx-pap-req-cnt tx-pap-ack-cnt tx-pap-nack-cnt

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
	<ul style="list-style-type: none"> • tx-chap-challenge-cnt • tx-chap-resp-cnt • tx-chap-success-cnt • tx-chap-failure-cnt • tx-ipcp-req-cnt • tx-ipcp-ack-cnt • tx-ipcp-nack-cnt • tx-ipv6cp-req-cnt • tx-ipv6cp-ack-cnt • tx-ipv6cp-nack-cnt • tx-unknown-pkt-cnt • tx-send-failed • tx-malformed-cnt
/junos/system/subscriber-management/infra/network/pppoe/	<p>Sensor for network stack PPPoE statistics. PPPoE packets processed by the BBE network stack to and from the PPPoE application are tracked.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • rx-cnt • rx-padi-cnt • rx-padr-cnt • rx-ppp-cnt • rx-malformed-cnt • rx-no-if-cnt • rx-unsupported • rx-padi-era-discards • tx-cnt • tx-send-failed
/junos/system/subscriber-management/infra/sdb/statistics/client-type/	<p>Sensor for session database resources session counts by client type.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none"> • dhcp-client-count • vlan-client-count • ppp-client-count • pppoe-client-count • l2tp-client-count • static-client-count • vpls-pw-client-count • mlppp-client-count • essm-client-count • total-client-count

Table 7: Broadband Edge gRPC Sensors (continued)

resource path	Description
<code>/junos/system/subscriber-management/infra/sdb/statistics/state/</code>	<p>Sensor for session database resources tracking session counts by state.</p> <p>The following end paths are also supported for the resource path:</p> <ul style="list-style-type: none">• <code>init-state-count</code>• <code>configured-state-count</code>• <code>active-state-count</code>• <code>terminating-state-count</code>• <code>terminated-state-count</code>• <code>total-state-count</code>

Release History Table

Release	Description
19.1R1	Starting with Junos OS Release 19.1R1, MX Series routers operating with MS-MIC and MS-MPC, QFX10002 switches, and PTX10002 routers are also supported.
18.4R1	Starting with Junos OS Release 18.4R1, MX480, MX960, MX2010, MX2020, MX2008 and MX-ELM routers are also supported.
18.3R1	Starting with Junos OS Release 18.3R1, ON_CHANGE streaming of LLDP telemetry sensor information is supported through gRPC for MX Series and PTX Series routers.
18.3R1	Starting with Junos OS Release 18.3R1, QFX5120-AY and EX4650 switches are also supported.
18.3R1	Starting with Junos OS Release 18.4R1, EX4600 switches are also supported.
18.2R1	Starting with Junos OS Release 18.2R1, PTX10002 routers are also supported.
18.1R1	Starting with Junos OS Release 18.1R1, QFX5210-64C switches and QFX5100 switches are also supported.
18.1R1	Starting with Junos OS Release 18.1R1, ON_CHANGE streaming of ARP, ND, and IP sensor information associated with interfaces is supported through gRPC for MX Series routers and PTX Series routers.
17.4R1	Starting with Junos OS Release 17.4R1, PTX10016 routers and virtual MX Series (vMX) routers are also supported.
17.3R1	Starting with Junos OS Release 17.3R1, QFX5110 switches, EX4600, EX4600-VC, and EX9200 switches and the Routing and Control Board (RCB) on PTX3000 routers are also supported.
17.3R1	Starting with Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensors are supported.
17.3R1	In Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensor <code>/junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[ri-name='routing-instance-name']/server/statistics/</code> the only value supported for <i>routing-instance-name</i> is default .
17.3R1	In Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensor <code>/junos/system/subscriber-management/client-ancpinstance[ri-name='routing-instance-name']/server/statistics/</code> the only value supported for <i>routing-instance-name</i> is default .
17.3R1	In Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensor <code>/junos/system/subscriber-management/client-protocols/dhcp/v4/routing-instances/routing-instance[ri-name='routing-instance-name']/relay/statistics/</code> the only value supported for the value <i>routing-instance-name</i> is default .
17.3R1	In Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensor <code>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[ri-name='routing-instance-name']/server/statistics</code> the only value

	supported for <i>routing-instance-name</i> is default .
17.3R1	In Junos OS Release 17.3R1, broadband edge (BBE) gRPC sensor <code>/junos/system/subscriber-management/client-protocols/dhcp/v6/routing-instances/routing-instance[ri-name='routing-instance-name']/relay/statistics</code> the only value supported for <i>routing-instance-name</i> is default .
17.2R1	Starting with JunosOS Release 17.2R1, QFX10002, QFX10008, and QFX10016 switches, QFX5200 switches, and PTX1000 and PTX10008 routers are also supported.
16.1R3	Starting with Junos OS Release 16.1R3, the Junos Telemetry Interface supports gRPC remote procedure calls (gRPC) to provision sensors and to subscribe to and receive telemetry data on MX Series routers and PTX3000 and PTX5000 routers.

- Related Documentation**
- [Understanding OpenConfig and gRPC on Junos Telemetry Interface on page 21](#)

CHAPTER 3

OpenConfig to Junos Mapping

- Mapping OpenConfig BGP Commands to Junos Configuration on page 155
- Mapping OpenConfig Interface Commands to Junos Configuration on page 170
- Mapping OpenConfig LLDP Commands to Junos Configuration on page 175
- Mapping OpenConfig Local Routing Commands to Junos Configuration on page 176
- Mapping OpenConfig MPLS Commands to Junos Configuration on page 177
- Mapping OpenConfig Network Instance Commands to Junos Operation on page 186
- Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 188
- Mapping OpenConfig VLAN Commands to Junos Configuration on page 192

Mapping OpenConfig BGP Commands to Junos Configuration



NOTE: See “OpenConfig Data Model Version” on page 14 topic to understand the data models supported version and its Junos OS release for Juniper Networks MX Series, PTX Series, and QFX Series.

Table 8 on page 155 to Table 22 on page 168 show the mapping of OpenConfig BGP commands with the relevant configuration in Junos.

Table 8: Global BGP Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <code>/network-instances/network-instance/protocols/protocol/bgp/global</code>		
As	<code>/config/as</code>	<code>set routing-options autonomous-system as_number</code>
Router-ID	<code>/config/router-id</code>	<code>set routing-options router-id router-id</code>

Table 8: Global BGP Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Confederation	/confederation/config/identifier /confederation/config/member-as	set routing-options confederation confederation_as set routing-options confederation members value
Always-Compare-MED	/route-selection-options/config/always-compare-med	set protocols bgp path-selection always-compare-med
Ignore-AS-Path-Length	/route-selection-options/config/ignore-as-path-length	set protocols bgp path-selection as-path-ignore
Enable-AIGP	/route-selection-options/config/enable-aigp	set protocols bgp family family aigp
Ignore-NextHop-IGP-Metric	/route-selection-options/config/ignore-next-hop-igp-metric	Not supported
Dynamic-Neighbor-Prefixes	/dynamic-neighbor-prefixes/dynamic-neighbor-prefix/config/prefix /dynamic-neighbor-prefixes/dynamic-neighbor-prefix/config/peer-group	set protocols bgp group group allow ip address
Graceful-Restart	/graceful-restart/config/enabled /graceful-restart/config/restart-time /graceful-restart/config/stale-routes-time /graceful-restart/config/helper-only	set protocols bgp graceful-restart disable set protocols bgp graceful-restart restart-time restart -time set protocols bgp graceful-restart stale-routes-time stale- routes -time

Table 9: AFI-SAFI Configuration

Command Name	OpenConfig Command Path	Junos Configuration
	<p>Command path prefix:</p> <ul style="list-style-type: none"> Global—<code>/network-instances/network-instance/protocols/protocol/bgp/global/afi-safi/afi-safi</code> Peer-Group—<code>/network-instances/network-instance/protocols/protocol/bgp/peer-groups/peer-group/afi-safi/afi-safi</code> Neighbors—<code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safi/afi-safi</code> <p>Set the values for address family: <code>protocol/bgp/global/afi-safi/afi-safi/<afi-safi-name>/<family-type>/config</code></p> <hr/> <p>Where, afi-safi-name is one of the following:</p> <ul style="list-style-type: none"> IPV4_LABELLED_UNICAST Labeled IPv4 unicast (AFI,SAFI = 1,4) IPV4_MULTICAST Base identify type for IPv4 multicast address family IPV4_UNICAST IPv4 unicast (AFI,SAFI = 1,1) IPV6_LABELLED_UNICAST Labeled IPv6 unicast (AFI,SAFI = 2,4) IPV6_MULTICAST Base identify type for IPv6 multicast address family IPV6_UNICAST IPv6 unicast (AFI,SAFI = 2,1) L2VPN_EVPN BGP MPLS Based Ethernet VPN (AFI,SAFI = 25,70) L2VPN_VPLS BGP-signalled VPLS (AFI,SAFI = 25,65) L3VPN_IPV4_MULTICAST Multicast IPv4 MPLS L3VPN (AFI,SAFI = 1,129) L3VPN_IPV4_UNICAST Unicast IPv4 MPLS L3VPN (AFI,SAFI = 1,128) L3VPN_IPV6_MULTICAST Multicast IPv6 MPLS L3VPN (AFI,SAFI = 2,129) L3VPN_IPV6_UNICAST Unicast IPv6 MPLS L3VPN (AFI,SAFI = 2,128) <hr/>	

Table 9: AFI-SAFI Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
	<p>Where, family-type is one of the following:</p> <ul style="list-style-type: none"> • ipv4-labeled-unicast IPv4 Labeled Unicast configuration options • ipv4-unicast IPv4 unicast configuration options • ipv6-labeled-unicast IPv6 Labeled Unicast configuration options • ipv6-unicast IPv6 unicast configuration options • l2vpn-evpn BGP EVPN configuration options • l2vpn-vpls BGP-signalled VPLS configuration options • l3vpn-ipv4-multicast Multicast IPv4 L3VPN configuration options • l3vpn-ipv4-unicast Unicast IPv4 L3VPN configuration options • l3vpn-ipv6-multicast Multicast IPv6 L3VPN configuration options • l3vpn-ipv6-unicast Unicast IPv6 L3VPN configuration options 	
AFI-SAFI	<code>/config/afi-safi-name</code> <code>/config/enabled</code>	<code>set protocols bgp family <i>family</i></code>
Add-Path: Send	<code>/add-paths/config/send</code>	<code>set protocols bgp group <i>group-name</i> family <i>family</i> add-path send path-count <i>number</i></code>
Add-Paths: Receive	<code>/add-paths/config/receive</code>	<code>set protocols bgp group <i>group-name</i> family <i>family</i> add-path receive</code>
Add-Paths: Send-Max	<code>/add-paths/config/send-max</code> NOTE: You must set send-max to non-zero value before setting send to true. If not, you will receive an error message to set the correct values.	<code>set protocols bgp group <i>group-name</i> family <i>family</i> add-path send path-count <i>path-count</i></code>
Add-Paths: Eligible Prefix Policy	<code>/add-paths/config/eligible-prefix-policy</code>	<code>set protocols bgp group <i>group-name</i> family <i>family</i> add-path send prefix-policy <i>policy</i></code>
Always-Compare-MED	<code>/route-selection-options/config/always-compare-med</code>	<code>set protocols bgp path-selection always-compare-med</code>
Ignore-AS-Path-Length	<code>/route-selection-options/config/ignore-as-path-length</code>	<code>set protocols bgp path-selection as-path-ignore</code>
Enable-AIGP	<code>/route-selection-options/config/enable-aigp</code>	<code>set protocols bgp family <i>family</i> aigp</code>
Use-Multiple-Paths: Maximum-Paths	<code>/use-multiple-paths/ebgp/config/maximum-paths</code> <code>/use-multiple-paths/ibgp/config/maximum-paths</code>	<code>set chassis maximum-ecmp <num-next-hops></code>

Table 9: AFI-SAFI Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Use-Multiple-Paths: Allow-Multiple-AS	/use-multiple-paths/ebgp/config/allow-multiple-as	set protocols bgp group <i>group-name</i> multipath multiple-as

Table 10: AFI-SAFI IPv4-Unicast Prefix-Limit Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <ul style="list-style-type: none"> Global—/network-instances/network-instance/protocols/protocol/bgp/global/afi-safi/afi-safi-name/<afi-safi-name>/ipv4-unicast Peer-Group—/network-instances/network-instance/protocols/protocol/bgp/peer-groups/peer-group/afi-safi/afi-safi-name/<afi-safi-name>/ipv4-unicast Neighbors—/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safi/afi-safi-name/<afi-safi-name>/ipv4-unicast 		
Send-Default-Route	/config/send-default-route	Not supported
Max-Prefixes	/prefix-limit/config/max-prefixes	set protocols bgp family inet unicast accepted-prefix-limit maximum <i>maximum</i>
Prevent-Teardown	/prefix-limit/config/prevent-teardown	set protocols bgp family <i>family</i> prefix-limit teardown
Shutdown-Threshold-PCT	/prefix-limit/config/shutdown-threshold-pct	set protocols bgp family inet unicast accepted-prefix-limit teardown <i>limit-threshold</i>
Restart-Timer	/prefix-limit/config/restart-timer	set protocols bgp family inet unicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>

Table 11: AFI-SAFI IPv6-Unicast Prefix-Limit Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <ul style="list-style-type: none"> Global—/network-instances/network-instance/protocols/protocol/bgp/global/afi-safi/afi-safi-name/<afi-safi-name>/ipv6-unicast Peer-Group—/network-instances/network-instance/protocols/protocol/bgp/peer-groups/peer-group/afi-safi/afi-safi-name/<afi-safi-name>/ipv6-unicast Neighbors—/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safi/afi-safi-name/<afi-safi-name>/ipv6-unicast 		
Send-Default-Route	/config/send-default-route	Not supported
Max-Prefixes	/prefix-limit/config/max-prefixes	set protocols bgp family inet6 unicast accepted-prefix-limit maximum <i>maximum</i>
Prevent-Teardown	/prefix-limit/config/prevent-teardown	set protocols bgp family <i>family</i> prefix-limit teardown
Shutdown-Threshold-PCT	/prefix-limit/config/shutdown-threshold-pct	set protocols bgp family inet6 unicast accepted-prefix-limit teardown <i>limit-threshold</i>
Restart-Timer	/prefix-limit/config/restart-timer	set protocols bgp family inet6 unicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>

Table 12: AFI-SAFI IPv4-Lbl-Unicast Prefix-Limit Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <ul style="list-style-type: none"> Global—/network-instances/network-instance/protocols/protocol/bgp/global/afi-safi/afi-safi-name/<afi-safi-name>/ipv4-labelled-unicast/prefix-limit Peer-Group—/network-instances/network-instance/protocols/protocol/bgp/peer-groups/peer-group/afi-safi/afi-safi-name/<afi-safi-name>/ipv4-labelled-unicast/prefix-limit Neighbors—/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safi/afi-safi-name/<afi-safi-name>/ipv4-labelled-unicast/prefix-limit 		

Table 12: AFI-SAFI IPv4-Lbl-Unicast Prefix-Limit Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Max-Prefixes	/config/max-prefixes	set protocols bgp family inet labeled-unicast accepted-prefix-limit maximum <i>maximum</i>
Prevent-Teardown	/config/prevent-teardown	set protocols bgp family <i>family</i> prefix-limit teardown
Shutdown-Threshold-PCT	/config/shutdown-threshold-pct	set protocols bgp family inet labeled-unicast accepted-prefix-limit teardown <i>limit-threshold</i>
Restart-Timer	/config/restart-timer	set protocols bgp family inet labeled-unicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>

Table 13: AFI-SAFI IPv6-Lbl-Unicast Prefix-Limit Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <ul style="list-style-type: none"> Global—/network-instances/network-instance/ protocols/protocol/bgp/global/afi-safi/ afi-safi-name/<afi-safi-name>/ipv6-labelled-unicast/ prefix-limit Peer-Group—/network-instances/network-instance/ protocols/protocol/bgp/peer-groups/ peer-group/afi-safi/afi-safi-name/<afi-safi-name>/ ipv6-labelled-unicast/prefix-limit Neighbors—/network-instances/network-instance/ protocols/protocol/bgp/neighbors/ neighbor/afi-safi/afi-safi-name/<afi-safi-name>/ ipv6-labelled-unicast/prefix-limit 		
Max-Prefixes	/config/max-prefixes	set protocols bgp family inet6 labeled-unicast accepted-prefix-limit maximum <i>maximum</i>
Prevent-Teardown	/config/prevent-teardown	set protocols bgp family <i>family</i> prefix-limit teardown
Shutdown-Threshold-PCT	/config/shutdown-threshold-pct	set protocols bgp family inet6 labeled-unicast accepted-prefix-limit teardown <i>limit-threshold</i>
Restart-Timer	/config/restart-timer	set protocols bgp family inet6 labeled-unicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>

Table 14: AFI-SAFI L3VPN-IPv4-Ucast Prefix-Limit Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <ul style="list-style-type: none"> Global—<code>/network-instances/network-instance/protocols/protocol/bgp/global/afi-safi/afi-safi-name/<afi-safi-name>/l3vpn-ipv4-unicast/prefix-limit</code> Peer-Group—<code>/network-instances/network-instance/protocols/protocol/bgp/peer-groups/peer-group/afi-safi/afi-safi-name/<afi-safi-name>/l3vpn-ipv4-unicast/prefix-limit</code> Neighbors—<code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safi/afi-safi-name/<afi-safi-name>/l3vpn-ipv4-unicast/prefix-limit</code> 		
Max-Prefixes	<code>/config/max-prefixes</code>	<code>set protocols bgp family inet-vpn unicast accepted-prefix-limit maximum <i>maximum</i></code>
Prevent-Teardown	<code>/config/prevent-teardown</code>	<code>set protocols bgp family <i>family</i> prefix-limit teardown</code>
Shutdown-Threshold-PCT	<code>/config/shutdown-threshold-pct</code>	<code>set protocols bgp family inet-vpn unicast accepted-prefix-limit teardown <i>limit-threshold</i></code>
Restart-Timer	<code>/config/restart-timer</code>	<code>set protocols bgp family inet-vpn unicast accepted-prefix-limit teardown <i>idle-timeout timeout</i></code>

Table 15: AFI-SAFI L3VPN-IPv6-Ucast Prefix-Limit Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <ul style="list-style-type: none"> Global—<code>/network-instances/network-instance/protocols/protocol/bgp/global/afi-safi/afi-safi-name/<afi-safi-name>/l3vpn-ipv6-unicast/prefix-limit</code> Peer-Group—<code>/network-instances/network-instance/protocols/protocol/bgp/peer-groups/peer-group/afi-safi/afi-safi-name/<afi-safi-name>/l3vpn-ipv6-unicast/prefix-limit</code> Neighbors—<code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safi/afi-safi-name/<afi-safi-name>/l3vpn-ipv6-unicast/prefix-limit</code> 		
Max-Prefixes	<code>/config/max-prefixes</code>	<code>set protocols bgp family inet6-vpn unicast accepted-prefix-limit maximum <i>maximum</i></code>

Table 15: AFI-SAFI L3VPN-IPv6-Ucast Prefix-Limit Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Prevent-Teardown	/config/prevent-teardown	set protocols bgp family <i>family</i> prefix-limit teardown
Shutdown-Threshold-PCT	/config/shutdown-threshold-pct	set protocols bgp family inet6-vpn unicast accepted-prefix-limit teardown <i>limit-threshold</i>
Restart-Timer	/config/restart-timer	set protocols bgp family inet6-vpn unicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>

Table 16: AFI-SAFI L3VPN-IPv4-Mcast Prefix-Limit Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <ul style="list-style-type: none"> Global—/network-instances/network-instance/ protocols/protocol/bgp/global/afi-safi/ afi-safi-name/<afi-safi-name>/ l3vpn-ipv4-multicast/prefix-limit Peer-Group—/network-instances/network-instance/ protocols/protocol/bgp/peer-groups/ peer-group/afi-safi/afi-safi-name/<afi-safi-name>/ l3vpn-ipv4-multicast/prefix-limit Neighbors—/network-instances/network-instance/ protocols/protocol/bgp/neighbors/ neighbor/afi-safi/afi-safi-name/<afi-safi-name>/ l3vpn-ipv4-multicast/prefix-limit 		
Max-Prefixes	/config/max-prefixes	set protocols bgp family inet-vpn multicast accepted-prefix-limit maximum <i>maximum</i>
Prevent-Teardown	/config/prevent-teardown	set protocols bgp family <i>family</i> prefix-limit teardown
Shutdown-Threshold-PCT	/config/shutdown-threshold-pct	set protocols bgp family inet-vpn multicast accepted-prefix-limit maximum <i>maximum</i>
Restart-Timer	/config/restart-timer	set protocols bgp family inet-vpn multicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>

Table 17: AFI-SAFI L3VPN-IPv6-Mcast Prefix-Limit Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <ul style="list-style-type: none"> Global—<code>/network-instances/network-instance/protocols/protocol/bgp/global/afi-safi/afi-safi-name/<afi-safi-name>/l3vpn-ipv6-multicast/prefix-limit</code> Peer-Group—<code>/network-instances/network-instance/protocols/protocol/bgp/peer-groups/peer-group/afi-safi/afi-safi-name/<afi-safi-name>/l3vpn-ipv6-multicast/prefix-limit</code> Neighbors—<code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safi/afi-safi-name/<afi-safi-name>/l3vpn-ipv6-multicast/prefix-limit</code> 		
Max-Prefixes	<code>/config/max-prefixes</code>	<code>set protocols bgp family inet6-vpn multicast accepted-prefix-limit maximum <i>maximum</i></code>
Prevent-Teardown	<code>/config/prevent-teardown</code>	<code>set protocols bgp family <i>family</i> prefix-limit teardown</code>
Shutdown-Threshold-PCT	<code>/config/shutdown-threshold-pct</code>	<code>set protocols bgp family inet6-vpn multicast accepted-prefix-limit teardown <i>limit-threshold</i></code>
Restart-Timer	<code>/config/restart-timer</code>	<code>set protocols bgp family inet6-vpn multicast accepted-prefix-limit teardown <i>idle-timeout timeout</i></code>

Table 18: AFI-SAFI L2VPN-VPLS Prefix-Limit Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <ul style="list-style-type: none"> Global—<code>/network-instances/network-instance/protocols/protocol/bgp/global/afi-safi/afi-safi-name/<afi-safi-name>/l2vpn-vpls/prefix-limit</code> Peer-Group—<code>/network-instances/network-instance/protocols/protocol/bgp/peer-groups/peer-group/afi-safi/afi-safi-name/<afi-safi-name>/l2vpn-vpls/prefix-limit</code> Neighbors—<code>/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safi/afi-safi-name/<afi-safi-name>/l2vpn-vpls/prefix-limit</code> 		
Max-Prefixes	<code>/config/max-prefixes</code>	<code>set protocols bgp family l2vpn signaling accepted-prefix-limit maximum <i>maximum</i></code>

Table 18: AFI-SAFI L2VPN-VPLS Prefix-Limit Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Prevent-Teardown	/config/prevent-teardown	set protocols bgp family <i>family</i> prefix-limit teardown
Shutdown-Threshold-PCT	/config/shutdown-threshold-pct	set protocols bgp family l2vpn signaling accepted-prefix-limit teardown <i>limit-threshold</i>
Restart-Timer	/config/restart-timer	set protocols bgp family l2vpn signaling accepted-prefix-limit teardown idle-timeout <i>timeout</i>

Table 19: AFI-SAFI L2VPN-EVPN Prefix-Limit Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <ul style="list-style-type: none"> Global—/network-instances/network-instance/protocols/protocol/bgp/global/afi-safi/afi-safi-name/<afi-safi-name>/l2vpn-evpn/prefix-limit Peer-Group—/network-instances/network-instance/protocols/protocol/bgp/peer-groups/peer-group/afi-safi/afi-safi-name/<afi-safi-name>/l2vpn-evpn/prefix-limit Neighbors—/network-instances/network-instance/protocols/protocol/bgp/neighbors/neighbor/afi-safi/afi-safi-name/<afi-safi-name>/l2vpn-evpn/prefix-limit 		
Max-Prefixes	/config/max-prefixes	set protocols bgp family evpn signaling accepted-prefix-limit maximum <i>maximum</i>
Prevent-Teardown	/config/prevent-teardown	set protocols bgp family <i>family</i> prefix-limit teardown
Shutdown-Threshold-PCT	/config/shutdown-threshold-pct	set protocols bgp family evpn signaling accepted-prefix-limit teardown <i>limit-threshold</i>
Restart-Timer	/config/restart-timer	set protocols bgp family evpn signaling accepted-prefix-limit teardown idle-timeout <i>timeout</i>

Table 20: Peer-Group Configuration

Command Name	OpenConfig Command Path	Junos Configuration
	Command path prefix: /network-instances/network-instance/ protocols/protocol/bgp/peer-groups/ peer-group	
Peer-Group-Name	/config/peer-group-name	set protocols bgp group <i>group-name</i>
Peer-AS	/config/peer-as	set protocols bgp group <i>group-name</i> peer-as <i>peer-as</i>
Peer-Type	/config/peer-type	set protocols bgp group <i>group-name</i> type <external internal>
Auth-Password	/config/auth-password	set protocols bgp group <i>group-name</i> authentication-key <i>authentication-key</i>
Remove-Private-AS	/config/remote-private-as	set protocols bgp group <i>group-name</i> remove-private all set protocols bgp group <i>group-name</i> remove-private all replace
Route-Flap-Damping	/config/route-flap-damping	set protocols bgp group <i>group-name</i> damping
Send-Community	/config/send-community	Not supported
Description	/config/description	set protocols bgp group <i>group-name</i> description <i>description</i>
Timers: Connect-Retry	/timers/config/connect-retry	set protocols bgp group <i>group-name</i> connect-retry-interval <i>connect-retry</i>
Timers: Hold-Time	/timers/config/hold-time	set protocols bgp group <i>group-name</i> hold-time <i>hold-time</i>
Timers: Keepalive-Interval	/timers/config/keepalive-interval	Not supported
Timers: Minimum-Advertisement-Interval	/timers/config/minimum-advertisement-interval	set protocols bgp group <i>group-name</i> out-delay <i>out-delay</i>
Timers: Send-Update-Delay	/timers/config/send-update-delay	Not supported
Transport: TCP-MSS	/transport/config/tcp-mss	set protocols bgp group <i>group-name</i> tcp-mss <i>tcp-mss</i>
Transport: MTU-Discovery	/transport/config/mtu-discovery	set protocols bgp group <i>group-name</i> mtu-discovery
Transport: Passive-Mode	/transport/config/passive-mode	set protocols bgp group <i>group-name</i> passive

Table 20: Peer-Group Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Transport: Local-Address	/transport/config/local-address	set protocols bgp group <i>group-name</i> local-address <i>local-address</i>
Error-Handling: Treat-AS-Withdraw	/error-handling/config/treat-as-withdraw	set protocols bgp group <i>group-name</i> bgp-error-tolerance
Logging-Options: Log-Neighbor-State-Changes	/logging-options/config/ log-neighbor-state-changes	set protocols bgp group <i>group-name</i> log-updown
EBGP-Multihop: MultiHop-TTL	/ebgp-multihop/config/multihop-ttl	set protocols bgp group <i>group-name</i> multihop ttl <i>ttl</i>
Route-Reflector: Route-Reflector-Cluster-ID	/route-reflector/config/route-reflector-cluster-id	set protocols bgp group <i>group-name</i> cluster <i>cluster</i>
Route-Reflector: Route-Reflector-Client	/route-reflector/config/route-reflector-client	set protocols bgp group <i>group-name</i> no-client-reflect
AS-Path-Options: Allow-Own-AS	/as-path-options/config/allow-own-as	set protocols bgp group <i>group-name</i> local-as loops <i>loops</i>
AS-Path-Options: Replace-Peer-AS	/as-path-options/config/replace-peer-as	set protocols bgp group <i>group-name</i> as-override
AS-Path-Options: Disable-Peer-As-Filter	/as-path-options/config/disable-peer-as-filter	set protocols bgp group <i>group-name</i> advertise-peer-as
AFI-SAFI	/afi-safis/afi-safi/	Supported. See Table 9 on page 157 to Table 19 on page 165
Graceful-Restart	/graceful-restart/config/	Supported. See Table 8 on page 155 .
Apply-Policy	/apply-policy/	Supported. See Table 21 on page 167 .

Table 21: Peer-Group Apply-Policy Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: /network-instances/network-instance/ protocols/protocol/bgp/peer-groups/ peer-group/apply-policy		
Import-Policies	/import-policies	set protocols bgp import <i>value</i>
Default-Import-Policy	/default-import-policy	

Table 21: Peer-Group Apply-Policy Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Export-Policies	/export-policies	set protocols bgp export value
Default-Export-Policy	/default-export-policy	

Table 22: Neighbors Configuration

Command Name	OpenConfig Command Path	Junos Configuration
	Command path prefix: /network-instances/network-instance/ protocols/protocol/bgp/neighbors/ neighbor	
Neighbor-Address	/config/neighbor-address	set protocols bgp group <i>group-name</i> neighbor <i>address</i>
Peer-AS	/config/peer-as	set protocols bgp group <i>group-name</i> neighbor <i>address</i> peer-as <i>peer-as</i>
Peer-Type	/config/peer-type	set protocols bgp group <i>group-name</i> type < <i>external internal</i> >
Auth-Password	/config/auth-password	set protocols bgp group <i>group-name</i> neighbor <i>address</i> authentication-key <i>authentication-key</i>
Remove-Private-AS	/config/remote-private-as	set protocols bgp group <i>group-name</i> neighbor <i>address</i> remove-private all set protocols bgp group <i>group-name</i> neighbor <i>address</i> remove-private all replace
Route-Flap-Damping	/config/route-flap-damping	set protocols bgp group <i>group-name</i> neighbor <i>address</i> damping
Send-Community	/config/send-community	Not supported
Description	/config/description	set protocols bgp group <i>group-name</i> neighbor <i>address</i> description
Peer-Group	/config/peer-group	set protocols bgp group <i>group-name</i> neighbor <i>address</i>
Timers – Connect-Retry	/timers/config/connect-retry	set protocols bgp group <i>group-name</i> neighbor <i>address</i> connect-retry-interval
Timers – Hold-Time	/timers/config/hold-time	set protocols bgp group <i>group-name</i> neighbor <i>address</i> hold-time <i>hold-time</i>

Table 22: Neighbors Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Timers - Keepalive-Interval	/timers/config/keepalive-interval	Not supported
Timers – Minimum-Advertisement-Interval	/timers/config/minimum-advertisement-interval	set protocols bgp group <i>group-name</i> neighbor <i>address</i> out-delay <i>out-delay</i>
Timers - Send-Update-Delay	/timers/config/send-update-delay	Not supported
Transport – TCP-MSS	/transport/config/tcp-mss	set protocols bgp group <i>group-name</i> neighbor <i>address</i> tcp-mss <i>tcp-mss</i>
Transport – MTU-Discovery	/transport/config/mtu-discovery	set protocols bgp group <i>group-name</i> neighbor <i>address</i> mtu-discovery
Transport – Passive-Mode	/transport/config/passive-mode	set protocols bgp group <i>group-name</i> neighbor <i>address</i> passive
Transport – Local-Address	/transport/config/local-address	set protocols bgp group <i>group-name</i> neighbor <i>address</i> local-address <i>local-address</i>
Error-Handling – Treat-AS-Withdraw	/error-handling/config/treat-as-withdraw	set protocols bgp group <i>group-name</i> neighbor <i>address</i> bgp-error-tolerance
Logging-Options – Log-Neighbor-State-Changes	/logging-options/config /log-neighbor-state-changes	set protocols bgp group <i>group-name</i> neighbor <i>address</i> log-updown
EBGP-Multihop – Multihop-TTL	/ebgp-multihop/config/multihop-ttl	set protocols bgp group <i>group-name</i> neighbor <i>address</i> multihop ttl <i>ttl</i>
Route-Reflector – Route-Reflector-Cluster-ID	/route-reflector/config/route-reflector-cluster-id	set protocols bgp group <i>group-name</i> neighbor <i>address</i> cluster <i>cluster</i>
Route-Reflector – Route-Reflector-Client	/route-reflector/config/route-reflector-client	set protocols bgp group <i>group-name</i> neighbor <i>address</i> no-client-reflect
AS-Path-Options – Allow-Own-AS	/as-path-options/config/allow-own-as	set protocols bgp group <i>group-name</i> neighbor <i>address</i> local-as loops <i>loops</i>
AS-Path-Options – Replace-Peer-AS	/as-path-options/config/replace-peer-as	set protocols bgp group <i>group-name</i> neighbor <i>address</i> as-override
AS-Path-Options – Disable-Peer-As-Filter	/as-path-options/config/disable-peer-as-filter	set protocol bgp group <i>group-name</i> neighbor <i>address</i> advertise-peer-as
AFI-SAFI	/afi-safis/afi-safi/	Supported. See Table 9 on page 157 to Table 19 on page 165
Graceful-Restart	/graceful-restart/config/	Supported. See Table 8 on page 155 .

Table 22: Neighbors Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Apply-Policy	/apply-policy/	Supported. See Table 23 on page 170 .

Table 23: Neighbors Apply-Policy Configuration

Command Name	OpenConfig Command Path	Junos Configuration
	Command path prefix: /network-instances/network-instance/protocols/ protocol/bgp/neighbors/neighbor/apply-policy	
Import-Policies	/import-policies	set protocols bgp import value
Default-Import-Policy	/default-import-policy	
Export-Policies	/export-policies	set protocols bgp export value
Default-Export-Policy	/default-export-policy	

Related Documentation

- [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 188](#)
- [Mapping OpenConfig Interface Commands to Junos Configuration on page 170](#)
- [Mapping OpenConfig LLDP Commands to Junos Configuration on page 175](#)
- [Mapping OpenConfig Local Routing Commands to Junos Configuration on page 176](#)
- [Mapping OpenConfig MPLS Commands to Junos Configuration on page 177](#)

Mapping OpenConfig Interface Commands to Junos Configuration



NOTE: See “[OpenConfig Data Model Version](#)” on [page 14](#) topic to understand the data models supported version and its Junos OS release for Juniper Networks MX Series, PTX Series, and QFX Series.

[Table 24 on page 171](#) to [Table 31 on page 174](#) shows the mapping of OpenConfig interface commands to the relevant configuration in Junos.

Table 24: VRRP Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Virtual Router ID	ifa/vrrp/vrrp-group/config/virtual-router-id	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> vrrp-group <i>virtual-router-id</i> set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> vrrp-inet6-group <i>virtual-router-id</i>
Virtual Address	ifa/vrrp/vrrp-group/config/virtual-address	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> vrrp-group <i>virtual-router-id</i> virtual-address <i>address</i> set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> vrrp-inet6-group <i>virtual-router-id</i> virtual-inet6-address
VRRP Priority	ifa/vrrp/vrrp-group/config/priority	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> vrrp-group <i>virtual-router-id</i> priority set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> vrrp-inet6-group <i>virtual-router-id</i> priority
VRRP Preempt	ifa/vrrp/vrrp-group/config/preempt	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> vrrp-group <i>virtual-router-id</i> preempt set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> vrrp-inet6-group <i>virtual-router-id</i> preempt
VRRP Preempt Hold Time	ifa/vrrp/vrrp-group/config/preempt-delay	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> vrrp-group <i>virtual-router-id</i> preempt hold-time <i>time</i> set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> vrrp-inet6-group <i>virtual-router-id</i> preempt hold-time <i>time</i>
Accept Data	ifa/vrrp/vrrp-group/config/accept_mode	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> vrrp-group <i>virtual-router-id</i> accept-data set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> vrrp-inet6-group <i>virtual-router-id</i> accept-data

Table 24: VRRP Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Advertise Interval	ifa/vrrp/vrrp-group/config/advertisement_interval	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> vrrp-group <i>virtual-router-id</i> advertise-interval set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> vrrp-inet6-group <i>virtual-router-id</i> inet6-advertise-interval
Track Interface	ifa/vrrp/vrrp-group/interface-tracking/config/track-interface	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> vrrp-group <i>virtual-router-id</i> track interface <i>interface-name</i> set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> vrrp-inet6-group <i>virtual-router-id</i> track interface <i>interface-name</i>
Priority Cost	ifa/vrrp/vrrp-group/interface-tracking/config/priority-decrement	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> vrrp-group <i>virtual-router-id</i> track interface <i>interface-name</i> priority-cost <i>cost</i> set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> vrrp-inet6-group <i>virtual-router-id</i> track interface <i>interface-name</i> priority-cost <i>cost</i>
Virtual Link Local Address	ifa/vrrp/vrrp-group/config/virtual-link-local	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> vrrp-inet6-group <i>virtual-router-id</i> virtual-link-local-address

Table 25: IPv4 and IPv6 Address Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Configuration Address	ipv4/addresses/address/ip ipv4/addresses/address/prefix-length	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i>
Neighbor Address	ipv4/neighbors/neighbor/ip ipv6/neighbors/neighbor/ip	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> arp <i>address</i> set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> ndp <i>address</i>
Link Layer Address	ip4/neighbors/neighbor/ip/link-layer-address ip6/neighbors/neighbor/ip/link-layer-address	set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet address <i>address</i> arp <i>address</i> mac <i>address</i> set interfaces <i>interface-name</i> unit <i>unit-number</i> family inet6 address <i>address</i> ndp <i>address</i> mac <i>address</i>

Table 26: Interface AE Configuration

Command Name	OpenConfig Command Path	Junos Configuration
LAG Type	/aggregation/config/lag-type/lacp /aggregation/config/lag-type/static	set interfaces <i>ae-name</i> aggregated-ether-options lacp
Minimum Links	/aggregation/config/min-links	set interfaces <i>ae-name</i> aggregated-ether-options minimum-links

Table 27: LACP Configuration

Command Name	OpenConfig Command Path	Junos Configuration
LACP Interval	/lacp/interfaces/interface/config/interval	set interfaces <i>ae-name</i> aggregated-ether-options lacp periodic fast set interfaces <i>ae-name</i> aggregated-ether-options lacp periodic slow
LACP Mode	/lacp/interfaces/interface/config/lacp-mode	set interfaces <i>ae-name</i> aggregated-ether-options lacp active set interfaces <i>ae-name</i> aggregated-ether-options lacp passive
System ID	/lacp/interfaces/interface/config/system-id-mac	set interfaces <i>ae-name</i> aggregated-ether-options lacp system-id <i>address</i>
System Priority	/lacp/interfaces/interface/config/system-priority	set interfaces <i>ae-name</i> aggregated-ether-options lacp system-priority <i>system-priority</i>
Ethernet Options	/lacp/interfaces/interface/members/member	set interface <i>interface</i> gigether-options 802.3ad set interface <i>interface</i> fastether-options 802.3ad set interface <i>interface</i> ether-options 802.3ad

Table 28: Member Interface Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Aggregate ID	/interface/aggregate-id	set interface <i>interface</i> gigether-options 802.3ad <i>aggregate-id</i> set interface <i>interface</i> fastether-options 802.3ad <i>aggregate-id</i> set interface <i>interface</i> ether-options 802.3ad <i>aggregate-id</i>

Table 29: Ethernet Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Auto-negotiate	/ethernet/config/auto-negotiate	set interfaces <i>interface</i> gigether-options auto-negotiation/no-auto-negotiation

Table 29: Ethernet Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
MAC Address	/ethernet/config/mac-address	set interfaces <i>interface</i> mac
Duplex Mode	/ethernet/config/duplex-mode	set interfaces <i>interface</i> link-mode
Port Speed	/ethernet/config/port-speed	set interface <i>interface</i> speed
Flow Control	/ethernet/config/enable-flow-control	set interface <i>interface</i> gigether-options flow-control

Table 30: IFD Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Interface Type	/interfaces/ <i>interface</i> /config/type	Not supported. Type is derived from the interface name.
Interface MTU	/interfaces/ <i>interface</i> /config/mtu	set interface <i>interface</i> mtu
Interface Name	/interfaces/ <i>interface</i> /config/name	set interface <i>interface</i>
Interface Description	/interfaces/ <i>interface</i> /config/description	set interface <i>interface</i> description
Interface Enabled/Disabled	/interfaces/ <i>interface</i> /config/enabled	set interface <i>interface</i> disabled set interface <i>interface</i> enabled
Hold Time Up	/interfaces/ <i>interface</i> /config/hold-time/config/up	set interface <i>interface</i> hold-time up
Hold Time Down	/interfaces/ <i>interface</i> /config/hold-time/config/down	set interface <i>interface</i> hold-time down

Table 31: IFL Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Unit Name	/interfaces/ <i>interface</i> /subinterfaces/subinterface/config/index	set interfaces <i>interface</i> unit <i>unit</i>
Unnumbered Address	/interfaces/ <i>interface</i> /config/subinterfaces/subinterface/config/unnumbered	set interfaces <i>interface</i> unit <i>unit</i> family <i>family</i> unnumbered-address source <i>ifl</i>
Unit Description	/interfaces/ <i>interface</i> /subinterfaces/subinterface/config/description	set interfaces <i>interface</i> unit <i>unit</i> description

Table 31: IFL Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Unit Enabled/Disabled	/interfaces/interface/subinterfaces/subinterface/config/enabled	set interfaces <i>interface</i> unit <i>unit</i> enabled set interfaces <i>interface</i> unit <i>unit</i> disabled
Interface Alias	/interfaces/interface/subinterfaces/subinterface/config/name	set interfaces <i>interface</i> alias

- Related Documentation**
- [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 188](#)
 - [Mapping OpenConfig BGP Commands to Junos Configuration on page 155](#)
 - [Mapping OpenConfig LLDP Commands to Junos Configuration on page 175](#)
 - [Mapping OpenConfig Local Routing Commands to Junos Configuration on page 176](#)
 - [Mapping OpenConfig MPLS Commands to Junos Configuration on page 177](#)

Mapping OpenConfig LLDP Commands to Junos Configuration



NOTE: See “[OpenConfig Data Model Version](#)” on [page 14](#) topic to understand the data models supported version and its Junos OS release for Juniper Networks MX Series and PTX Series.

[Table 32 on page 175](#) and [Table 33 on page 176](#) show the mapping of OpenConfig LLDP commands with the relevant configuration in Junos.

Table 32: Global LLDP Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Enable	/lldp/config/enabled	set protocols lldp <i>enable/disable</i>
Hello time	/lldp/config/hello-timer	set protocols lldp advertisement-interval <i>advertisement-interval</i>
System Information	/lldp/config/suppress-tlv-advertisement /lldp/config/system-name /lldp/config/system-description /lldp/config/chassis-id /lldp/config/chassis-id-type	Not supported

Table 33: Interface Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Interface Config	/lldp/interfaces/interface/config/name /lldp/interfaces/interface/config/enabled	set protocols lldp interface <i>interface-name</i> enable

Related Documentation

- [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 188](#)
- [Mapping OpenConfig Interface Commands to Junos Configuration on page 170](#)
- [Mapping OpenConfig Local Routing Commands to Junos Configuration on page 176](#)
- [Mapping OpenConfig BGP Commands to Junos Configuration on page 155](#)
- [Mapping OpenConfig MPLS Commands to Junos Configuration on page 177](#)

Mapping OpenConfig Local Routing Commands to Junos Configuration



NOTE: See “[OpenConfig Data Model Version](#)” on [page 14](#) topic to understand the data models supported version and its Junos OS release for Juniper Networks MX Series, PTX Series, and QFX Series.

[Table 34 on page 176](#) and [Table 35 on page 177](#) show the mapping of OpenConfig local routing commands to the relevant configuration in Junos.

Table 34: Static Route Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: /local-routes/static-routes		
Local Static Prefix	/static/config/prefix	set routing-options static route <i>prefix</i>
Local Static Next Hop	/static/config/prefix	set routing-options static route <i>prefix</i>
	/static/config/next-hop/ip-address	next-hop (<i>address</i> <i>interface</i>)
	/static/config/next-hop/local-defined-next-hop	set routing-options static route <i>prefix</i>
	/static/config/next-hop/string	discard
Local Static Tag	/static/config/prefix	set routing-options static route <i>prefix</i> tag
	/static/config/set-tag	<i>tag</i>

Table 35: Local Aggregate Configuration

Command Name	OpenConfig Command Path	Junos Configuration
	Command path prefix: /local-routes/local-aggregates	
Local Aggregate Prefix	/aggregate/config/prefix	set routing-options aggregate route <i>prefix</i>
Local Aggregate Discard	/aggregate/config/prefix /aggregate/config/discard	set routing-options aggregate route <i>prefix</i> discard
Local Aggregate Tag	/aggregate/config/prefix /aggregate/config/set-tag	set routing-options aggregate route <i>prefix</i> tag <i>tag</i>

Related Documentation

- [Mapping OpenConfig BGP Commands to Junos Configuration on page 155](#)
- [Mapping OpenConfig Interface Commands to Junos Configuration on page 170](#)
- [Mapping OpenConfig LLDP Commands to Junos Configuration on page 175](#)
- [Mapping OpenConfig MPLS Commands to Junos Configuration on page 177](#)
- [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 188](#)

Mapping OpenConfig MPLS Commands to Junos Configuration



NOTE: See “[OpenConfig Data Model Version](#)” on [page 14](#) topic to understand the data models supported version and its Junos OS release for Juniper Networks MX Series, PTX Series, and QFX Series.

[Table 36 on page 177](#) to [Table 41 on page 183](#) show the mapping of OpenConfig MPLS commands with the relevant configuration in Junos.

Table 36: Global MPLS Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Explicit Null	/mpls/global/config/null-label/explicit /mpls/global/config/null-label/implicit	set protocols mpls explicit-null
Interface	/mpls/global/interface-attributes/interface/config/interface-id /mpls/global/interface-attributes/interface/config/mpls-enabled /mpls/global/interface-attributes/interface/interface-ref/config/interface /mpls/global/interface-attributes/interface/interface-ref/config/subinterface	set protocols mpls interface <i>interface</i> set protocols mpls interface <i>interface</i> disable

Table 37: TE Global Attributes

Command Name	OpenConfig Command Path	Junos Configuration
SRLGs	/mpls/te-global-attributes/srlg/srlg/config/name	Flooded: set routing-options srlg <i>name</i> Static: set routing-options fate-sharing group <i>name</i>
SRLG Value	/mpls/te-global-attributes/srlg/srlg/config/value	set routing-options fate-sharing group <i>name</i> srlg-value <i>value</i>
SRLG Cost	/mpls/te-global-attributes/srlg/srlg/config/cost	Flooded: set routing-options srlg <i>name</i> srlg-cost <i>cost</i> Static: set routing-options fate-sharing group <i>name</i> cost <i>cost</i>
Address	/mpls/te-global-attributes/srlg/srlg/static-srlg-members/members-list/config/from-address /mpls/te-global-attributes/srlg/srlg/static-srlg-members/members-list/config/to-address	set routing-options fate-sharing group <i>name</i> from <i>address</i> to <i>address</i>
Admin Groups	/mpls/te-global-attributes/mpls-admin-groups/admin-group/config/admin-group-name /mpls/te-global-attributes/mpls-admin-groups/admin-group/config/bit-position	Bit position (group-value) 0-31: set protocols mpls admin-groups <i>group-name</i> <i>group-value</i> Bit position (group-value) 32-4294967295: set routing-options admin-groups-extended <i>group-name</i> <i>group-value</i> <i>group-value</i>
Delay	/mpls/te-global-attributes/te-lsp-timers/config/install-delay /mpls/te-global-attributes/te-lsp-timers/config/cleanup-delay /mpls/te-global-attributes/te-lsp-timers/config/reoptimize-timer	set protocols mpls optimize-switchover-delay <i>delay</i> set protocols mpls optimize-hold-dead-delay <i>delay</i> set protocols mpls optimize-timer <i>timer</i>

Table 38: TE Interface Attributes

Command Name	OpenConfig Command Path	Junos Configuration
TE Interface	/mpls/te-interface-attributes/interface/config/interface-id	set protocols ospf area <i>id</i> interface <i>interface</i>
	/mpls/te-interface-attributes/interface/interface-ref/config/interface	
	/mpls/te-interface-attributes/interface/interface-ref/config/subinterface	
TE Metric	/mpls/te-interface-attributes/interface/config/te-metric	set protocols ospf area <i>id</i> interface <i>interface</i> te-metric <i>te-metric</i>
		set protocols isis interface <i>interface</i> level level <i>level</i> te-metric <i>te-metric</i>
SRLG Membership	/mpls/te-interface-attributes/interface/config/srlg-membership	set protocols mpls interface <i>name</i> srlg <i>name</i>
Admin Groups	/mpls/te-interface-attributes/interface/config/admin-group	If protocols mpls admin-groups <i>name</i> is configured:
		set protocols mpls interface <i>name</i> admin-group <i>name</i>
		If routing-options admin-groups-extended <i>name</i> is configured: set protocols mpls interface <i>name</i> admin-group-extended <i>name</i>
IGP Flooding Bandwidth	/mpls/te-interface-attributes/interface/igp-flooding-bandwidth/config/threshold-type	set protocols rsvp interface <i>name</i> update-threshold <i>threshold</i>
	/mpls/te-interface-attributes/interface/igp-flooding-bandwidth/config/delta-percentage	
	/mpls/te-interface-attributes/interface/igp-flooding-bandwidth/config/threshold-specification	Not supported
	/mpls/te-interface-attributes/interface/igp-flooding-bandwidth/config/up-thresholds	
	/mpls/te-interface-attributes/interface/igp-flooding-bandwidth/config/down-thresholds	
	/mpls/te-interface-attributes/interface/igp-flooding-bandwidth/config/up-down-thresholds	

Table 39: RSVP Signaling Protocols

Command Name	OpenConfig Command Path	Junos Configuration
Graceful Restart	/mpls/signaling-protocols/rsvp-te/global/graceful-restart/config/enable	set protocols rsvp graceful-restart enable
	/mpls/signaling-protocols/rsvp-te/global/graceful-restart/config/restart-time	set protocols rsvp graceful-restart maximum-helper-recovery-time <i>time</i>
	/mpls/signaling-protocols/rsvp-te/global/graceful-restart/config/recovery-time	set protocols rsvp graceful-restart maximum-helper-restart-time <i>time</i>
Cleanup Timer	/mpls/signaling-protocols/rsvp-te/global/soft-preemption/config/enable	set protocols rsvp preemption soft-preemption cleanup-timer <i>timer</i>
	/mpls/signaling-protocols/rsvp-te/global/soft-preemption/config/soft-preemption-timeout	
Hello Interval (All Interfaces)	/mpls/signaling-protocols/rsvp-te/global/hellos/config/hello-interval	set protocols rsvp interface all hello-interval <i>interval</i>
	/mpls/signaling-protocols/rsvp-te/global/hellos/config/refresh-reduction	set protocols rsvp interface all no-reliable
Hello Interval (Single Interface)	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/config/interface-id	set protocols rsvp interface <i>name</i> hello-interval <i>interval</i>
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/interface-ref/config/interface	set protocols rsvp interface <i>name</i> no-reliable
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/config/interface-name	
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/hellos/config/hello-interval	
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/hellos/config/refresh-reduction	
Authentication Key	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/config/interface-id	set protocols rsvp interface <i>name</i> authentication-key <i>key</i>
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/interface-ref/config/interface	
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/interface-ref/config/subinterface	
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/authentication/config/enable	
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/authentication/config/authentication-key	

Table 39: RSVP Signaling Protocols (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Subscription	/mpls/signaling-protocols/rsvp-te/interface-attributes/ interface/config/interface-id	set protocols rsvp interface <i>name</i> subscription <i>subscription</i>
	/mpls/signaling-protocols/rsvp-te/interface-attributes/ interface/interface-ref/config/interface	
	/mpls/signaling-protocols/rsvp-te/interface-attributes/ interface/interface-ref/config/subinterface	
	/mpls/signaling-protocols/rsvp-te/interface-attributes/ interface/subscription/config/subscription	
Link Protection	/mpls/signaling-protocols/rsvp-te/interface-attributes/ interface/config/interface-id	set protocols rsvp interface <i>name</i> link-protection
	/mpls/signaling-protocols/rsvp-te/interface-attributes/ interface/interface-ref/config/interface	To disable node-protection:
	/mpls/signaling-protocols/rsvp-te/interface-attributes/ interface/interface-ref/config/subinterface	set protocols rsvp interface <i>name</i> link-protection no-node-protection
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/ protection/config/link-protection-style-requested/unprotected	set protocols rsvp interface <i>name</i> link-protection optimize-timer <i>timer</i>
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/protection/ config/link-protection-style-requested/link-protection-requested	
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/protection/ config/link-protection-style-requested/link-node-protection-requested	
	/mpls/signaling-protocols/rsvp-te/interface-attributes/interface/protection/ config/bypass-optimize-interval	

Table 40: Label Switched Paths

Command Name	OpenConfig Command Path	Junos Configuration
Path	/mpls/lsp/constrained-path/named-explicit-paths/config/name	set protocols mpls path <i>name</i> <i>address</i>
	/mpls/lsp/constrained-path/named-explicit-paths/explicit-route-objects/ config/address	<i>hop-type</i>
	/mpls/lsp/constrained-path/named-explicit-paths/explicit-route-objects/ config/hop-type	
	/mpls/lsp/constrained-path/named-explicit-paths/explicit-route-objects/ config/index	
Name	/mpls/lsp/constrained-path/tunnel/config/name	set protocols mpls label-switched-path <i>name</i>
	/mpls/lsp/constrained-path/tunnel/config/type/P2P	
	/mpls/lsp/constrained-path/tunnel/config/ signaling-protocol/path-setup-rsvp	

Table 40: Label Switched Paths (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Description	/mpls/lsp/constrained-path/tunnel/config/description	set protocols mpls label-switched-path <i>name</i> description <i>description</i>
Admin-Status	/mpls/lsp/constrained-path/tunnel/config/admin-status	set protocols mpls label-switched-path <i>name</i> disable
Preference	/mpls/lsp/constrained-path/tunnel/config/preference	set protocols mpls label-switched-path <i>name</i> preference <i>preference</i>
Metric	/mpls/lsp/constrained-path/tunnels/tunnel/config/metric-type /mpls/lsp/constrained-path/tunnels/tunnel/config/shortcut-eligible /mpls/lsp/constrained-path/tunnel/config/metric	set protocols mpls label-switched-path <i>name</i> metric <i>metric</i>
Link Protection	/mpls/lsp/constrained-path/tunnel/config/ protection-style-requested/unprotected /mpls/lsp/constrained-path/tunnel/config/ protection-style-requested/link-protection-requested /mpls/lsp/constrained-path/tunnel/config/ protection-style-requested/link-node-protection-requested	set protocols mpls label-switched-path <i>name</i> link-protection set protocols mpls label-switched-path <i>name</i> node-link-protection
Optimize Timer	/mpls/lsp/constrained-path/tunnel/config/reoptimize-timer	set protocols mpls label-switched-path <i>name</i> optimize-timer <i>timer</i>
Source	/mpls/lsp/constrained-path/tunnel/config/source	set protocols mpls label-switched-path <i>name</i> from <i>from</i>
Soft Preemption	/mpls/lsp/constrained-path/tunnel/config/soft-preemption	set protocols mpls label-switched-path <i>name</i> soft-preemption
Priority	/mpls/lsp/constrained-path/tunnel/config/setup-priority /mpls/lsp/constrained-path/tunnel/config/hold-priority	set protocols mpls label-switched-path <i>name</i> priority <i>setup reservation</i>
Bandwidth	/mpls/lsp/constrained-path/tunnel/bandwidth/config/ specification-type/specified /mpls/lsp/constrained-path/tunnel/bandwidth/config/set-bandwidth	set protocols mpls label-switched-path <i>name</i> bandwidth <i>bandwidth</i>

Table 40: Label Switched Paths (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Min/Max Bandwidth	/mpls/lsp/constrained-path/tunnel/bandwidth/config/specification-type/auto	set protocols mpls label-switched-path <i>name</i> minimum-bandwidth <i>minimum</i>
	/mpls/lsp/constrained-path/tunnel/bandwidth/auto-bandwidth/config/enabled	set protocols mpls label-switched-path <i>name</i> maximum-bandwidth <i>maximum</i>
	/mpls/lsp/constrained-path/tunnel/bandwidth/auto-bandwidth/config/min-bw	set protocols mpls label-switched-path <i>name</i> adjust-interval <i>interval</i>
	/mpls/lsp/constrained-path/tunnel/bandwidth/auto-bandwidth/config/max-bw	set protocols mpls label-switched-path <i>name</i> adjust-threshold <i>threshold</i>
	/mpls/lsp/constrained-path/tunnel/bandwidth/auto-bandwidth/config/adjust-interval	
	/mpls/lsp/constrained-path/tunnel/bandwidth/auto-bandwidth/config/adjust-threshold	
Overflow Bandwidth	/mpls/lsp/constrained-path/tunnel/bandwidth/config/specification-type/auto	set protocols mpls label-switched-path <i>name</i> auto-bandwidth adjust-threshold-overflow-limit
	/mpls/lsp/constrained-path/tunnel/auto-bandwidth/overflow/config/enabled	
	/mpls/lsp/constrained-path/tunnel/bandwidth/auto-bandwidth/overflow/config/overflow-threshold	
	/mpls/lsp/constrained-path/tunnel/bandwidth/auto-bandwidth/overflow/config/trigger-event-count	
Underflow Bandwidth	/mpls/lsp/constrained-path/tunnel/bandwidth/config/specification-type/auto	set protocols mpls label-switched-path <i>name</i> auto-bandwidth adjust-threshold-underflow-limit
	/mpls/lsp/constrained-path/tunnel/auto-bandwidth/underflow/config/enabled	
	/mpls/lsp/constrained-path/tunnel/bandwidth/auto-bandwidth/underflow/config/underflow-threshold	
	/mpls/lsp/constrained-path/tunnel/bandwidth/auto-bandwidth/underflow/config/trigger-event-count	

Table 41: RSVP P2P Tunnel

Command Name	OpenConfig Command Path	Junos Configuration
Destination	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/config/destination	set protocols mpls label-switched-path <i>name</i> to <i>to</i>
Primary Path	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-primary-paths/config/name	set protocols mpls label-switched-path <i>name</i>

Table 41: RSVP P2P Tunnel (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Primary Path - Locally-Computed	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/config/path-computation-method/ locally-computed	set protocols mpls label-switched-path <i>name</i> no-cspf
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/config/use-cspf	set protocols mpls label-switched-path <i>name</i> random
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/config/cspf-tiebreaker/random	set protocols mpls label-switched-path <i>name</i> least-fill
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/config/cspf-tiebreaker/least-fill	set protocols mpls label-switched-path <i>name</i> most-fill
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/config/cspf-tiebreaker/most-fill	
Primary Path - Externally Queried	/mpls/lsp/constrained-path/tunnel/ p2p-tunnel-attributes/p2p-primary-paths/config/ path-computation-method/externally-queried	set protocols mpls label-switched-path <i>name</i> lsp-external-controller pccd
		set protocols pcep pce <i>name</i> destination-ipv4-address <i>address</i>
		set protocols pcep pce <i>name</i> destination-port 4189
Primary Path - Explicitly Defined	/mpls/lsp/constrained-path/tunnel/ p2p-tunnel-attributes/p2p-primary-paths/config/ path-computation-method/explicitly-defined	set protocols mpls label-switched-path <i>name</i> primary <i>path</i>
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/config/explicit-path-name	
Primary Path - Preference	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/config/preference	set protocols mpls label-switched-path <i>name</i> primary <i>path</i> preference <i>preference</i>
Primary Path - Priorities	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/config/setup-priority	set protocols mpls label-switched-path <i>name</i> primary <i>path</i> priority <i>setup reservation</i>
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/config/hold-priority	
Primary Path - Retry Timer	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/config/retry-timer	set protocols mpls label-switched-path <i>name</i> retry-timer
Primary Path - Candidate Secondary Paths	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/ p2p-primary-paths/candidate-secondary-paths	Not supported

Table 41: RSVP P2P Tunnel (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Primary Path – Admin-Groups	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-primary-paths/admin-groups/config/exclude-group	set protocols mpls label-switched-path <i>name</i> primary path admin-group exclude <i>group</i>
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-primary-paths/admin-groups/config/include-all-group	set protocols mpls label-switched-path <i>name</i> primary path admin-group exclude <i>group</i>
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-primary-paths/admin-groups/config/include-any-group	set protocols mpls label-switched-path <i>name</i> primary path admin-group include-any group
Secondary Path	/mpls/lsp/constrained-path/tunnel/config/name	set protocols mpls label-switched-path <i>name</i>
	/mpls/lsp/constrained-path/tunnel/config/type/P2P	
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/name	
Secondary Path - Locally-Computed	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/path-computation-method/locally-computed	set protocols mpls label-switched-path <i>name</i> secondary path <i>name</i> no-cspf
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/use-cspf	
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/cspf-tiebreaker/random	
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/cspf-tiebreaker/least-fill	
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/cspf-tiebreaker/most-fill	
Secondary Path - Externally Queried	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/path-computation-method/externally-queried	Not supported
Secondary Path - Explicitly Defined	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/path-computation-method/explicitly-defined	set protocols mpls label-switched-path <i>name</i> secondary path
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/explicit-path-name	
Secondary Path - Preference	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/preference	set protocols mpls label-switched-path <i>name</i> secondary path preference preference

Table 41: RSVP P2P Tunnel (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Secondary Path - Priorities	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/setup-priority	set protocols mpls label-switched-path <i>name</i> secondary <i>path</i> priority <i>setup</i>
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/hold-priority	<i>reservation</i>
Secondary Path - Retry Timer	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/config/retry-timer	set protocols mpls label-switched-path <i>name</i> secondary <i>path</i> retry-timer
Secondary Path - Admin-Groups	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/admin-groups/config/exclude-group	set protocols mpls label-switched-path <i>name</i> secondary <i>path</i> admin-group <i>exclude</i> <i>group</i>
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/admin-groups/config/include-all-group	set protocols mpls label-switched-path <i>name</i> secondary <i>path</i> admin-group <i>include-all</i> <i>group</i>
	/mpls/lsp/constrained-path/tunnel/p2p-tunnel-attributes/p2p-secondary-paths/admin-groups/config/include-any-group	set protocols mpls label-switched-path <i>name</i> secondary <i>path</i> admin-group <i>include-any</i> <i>group</i>
		set protocols mpls label-switched-path <i>name</i> secondary <i>path</i> admin-group <i>include-any</i> <i>group</i>

- Related Documentation**
- [Mapping OpenConfig BGP Commands to Junos Configuration on page 155](#)
 - [Mapping OpenConfig Interface Commands to Junos Configuration on page 170](#)
 - [Mapping OpenConfig LLDP Commands to Junos Configuration on page 175](#)
 - [Mapping OpenConfig Local Routing Commands to Junos Configuration on page 176](#)
 - [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 188](#)

Mapping OpenConfig Network Instance Commands to Junos Operation



NOTE: See “[OpenConfig Data Model Version](#)” on [page 14](#) topic to understand the data models supported version and its Junos OS release for Juniper Networks MX Series, PTX Series, and QFX Series.

Network instance models a generic virtual forwarding table on a device. This supports a Layer 3 forwarding construct such as a virtual routing and forwarding (VRF) instance, or a Layer 2 instance such as a virtual switch instance. A mixed Layer 2 and Layer 3 instances are also supported.

Starting with Junos OS Release 17.4R1, network instance based BGP configuration is supported. After the network instance is configured, you will be prompted with options for BGP configuration such as global bgp, neighbor bgp, and so on.



NOTE: There is no change in the existing BGP configuration, you can configure BGP in a specific network instance.

Table 42 on page 187 details the network instance commands.

Table 42: Network Instance

Resource Path	Description
/network-instances/network-instance/config/name	<p>An assigned unique name for the forwarding instance.</p> <p>In Junos, you need to provide a name because you do not run different BGP in the same routing instance.</p>
/network-instances/network-instance/config/name/description	Description of the network instance.
/network-instances/network-instance/config/type	<p>Type of network instance:</p> <ul style="list-style-type: none"> • default_instance • l3vrf • l2vsi • l2p2p • l2l3 <p>NOTE: Only default_instance and l3vrf instances are supported.</p>
/network-instances/network-instance/config/enabled	<p>Whether the network instance should be configured to be active on the network element: <i>True</i> or <i>False</i>.</p> <p>By default, the value is <i>True</i>.</p>
/network-instances/network-instance/config/router-id	An identifier for the local network instance.
/network-instances/network-instance/config/route-distinguisher	The route distinguisher that should be used for the local VRF instance when it is signalled through BGP.
/network-instances/network-instance/interfaces/config/interface	Name of interfaces belonging to this routing instance.

Table 42: Network Instance (continued)

Resource Path	Description
/network-instances/network-instance/protocols/protocol/config/identifier	Type of identifier: <ul style="list-style-type: none"> • BGP • ISIS • OSPF • OSPF3 • STATIC • DIRECTLY_CONNECTED • LOCAL_AGGREGATE <p>NOTE: Only BGP is supported.</p>
/network-instances/network-instance/protocols/protocol/config/name	A unique name for the protocol instance. This is not a mandatory field.
<ul style="list-style-type: none"> • /network-instances/network-instance/protocols/protocol/config/name/enable • /network-instances/network-instance/protocols/protocol/config/name/target-table • /network-instances/network-instance/inter-instance-policies/apply-policy/config/ • /network-instances/network-instance/table-connections/table-connection/config/src-table • /network-instances/network-instance/table-connections/table-connection/config/dst-table • /network-instances/network-instance/table-connections/table-connection/config/tables 	Not supported.

Release History Table

Release	Description
17.4R1	Starting with Junos OS Release 17.4R1, network instance based BGP configuration is supported.

Related Documentation

- [Mapping OpenConfig BGP Commands to Junos Configuration on page 155](#)
- [Mapping OpenConfig Interface Commands to Junos Configuration on page 170](#)

Mapping OpenConfig Routing Policy Commands to Junos Configuration



NOTE: See “[OpenConfig Data Model Version](#)” on [page 14](#) topic to understand the data models supported version and its Junos OS release for Juniper Networks MX Series, PTX Series, and QFX Series.

[Table 43 on page 189](#) to [Table 45 on page 189](#) show the mapping of OpenConfig routing policy commands to the relevant configuration in Junos.

Table 43: Defined Set Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Prefix Set	/routing-policy/defined-sets/prefix-set	set policy-options prefix-list <i>name</i>
Neighbor Set	/routing-policy/defined-sets/neighbor-set	set policy-options neighbor-list <i>name</i>
Tag Set	/routing-policy/defined-sets/tag-set	set policy-options tag-list <i>name</i> tag-set <i>value</i>

Table 44: BGP Defined Set Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Community Set	/routing-policy/defined-sets/bgp-defined-sets/community-set	set policy-options community <i>name</i> members <i>value</i>
AS Path Set	/routing-policy/defined-sets/bgp-defined-sets/as-path-set	Not supported
Ext Community Set	/routing-policy/defined-sets/bgp-defined-sets/ext-community-set	set policy-options community <i>name</i> members <i>value</i>

Table 45: Policy Definition Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: /routing-policy/policy-definition/statement		
Call Policy	/conditions/call-policy	set policy-options policy-statement <i>name</i> from policy <i>value</i>
Prefix Set	/conditions/match-prefix-set/prefix-set	set policy-options policy-statement <i>name</i> from prefix-list <i>name</i> set policy-options policy-statement <i>name</i> from route-filter <i>address</i> prefix-length-range <i>range</i>
Match Set Options	/conditions/match-prefix-set/match-set-options	Not supported
Neighbor Set	/conditions/match-neighbor-set/neighbor-set	set policy-options policy-statement <i>name</i> from neighbor <i>address</i>
Match Neighbor Set	/conditions/match-neighbor-set/match-set-options	Not supported

Table 45: Policy Definition Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Tag Set	/conditions/match-tag-set/tag-set	set policy-options policy-statement <i>name</i> from tag <i>tag</i>
Match Tag Set	/conditions/match-tag-set/match-set-options	Not supported
Install Protocol EQ	/conditions/install-protocol-eq	set policy-options policy-statement <i>name</i> from protocol <i>protocol</i>
IGP Conditions	/conditions/igp-conditions	Not supported
BGP Match Community Set	/conditions/bgp-conditions/match-community-set/community-set	set policy-options policy-statement <i>name</i> from community <i>name</i>
BGP Match Ext Community Set	/conditions/bgp-conditions/match-ext-community-set	set policy-options policy-statement <i>name</i> from community <i>name</i>
BGP Match Ext Community Set Options	/conditions/bgp-conditions/match-ext-community-set/match-set-options	Not supported
BGP Match AS Path Set	/conditions/bgp-conditions/match-as-path-set	Not supported
BGP MED EQ	/conditions/bgp-conditions/med-eq	set policy-options policy-statement <i>name</i> from metric <i>metric</i>
BGP Origin EQ	/conditions/bgp-conditions/origin-eq	set policy-options policy-statement <i>name</i> from origin (egp igp incomplete)
BGP Next Hop	/conditions/bgp-conditions/next-hop-in	set policy-options policy-statement <i>name</i> from next-hop <i>address</i>
BGP Local Preference EQ	/conditions/bgp-conditions/local-pref-eq	set policy-options policy-statement <i>name</i> from local-preference <i>preference</i>
BGP Community Count	/conditions/bgp-conditions/community-count	set policy-options policy-statement <i>name</i> from community-count <i>count</i> (equal orhigher orlower)
BGP AS Path Length	/conditions/bgp-conditions/as-path-length	Not supported

Table 45: Policy Definition Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Accept-Route	/actions/config/accept-route	set policy-options policy-statement example-accept then accept
Reject-Route	/actions/config/reject-route	set policy-options policy-statement example-reject then reject
IGP Actions	/actions/igp-actions/set-tag	set policy-options policy-statement <i>name</i> then tag <i>tag</i>
BGP Actions Set AS Path Prepend	/actions/bgp-actions/set-as-path-prepend	Not supported
BGP Actions Set Community	/actions/bgp-actions/set-community	set policy-options policy-statement <i>name</i> then community (set replace add) <i>name</i>
BGP Actions Set Ext Community	/actions/bgp-actions/set-ext-community	set policy-options policy-statement <i>name</i> then community (set replace add) <i>name</i>
BGP Actions Set Route Origin	/actions/bgp-actions/set-route-origin	set policy-options policy-statement <i>name</i> then origin (egp igp incomplete)
BGP Actions Set Local Preferences	/actions/bgp-actions/set-local-pref	set policy-options policy-statement <i>name</i> then local-preference <i>preference</i>
BGP Actions Set Next Hop	/actions/bgp-actions/set-next-hop	set policy-options policy-statement <i>name</i> then next-hop <i>address</i>
BGP Actions Set Med	/actions/bgp-actions/set-med	set policy-options policy-statement <i>name</i> then metric <i>metric</i>
BGP Actions As-Path-Prepend	/actions/bgp-actions/config/set-as-path-prepend/asn	set policy-options policy-statement <i>name</i> then as-path-prepend <i>as-path</i>

- Related Documentation**
- [Mapping OpenConfig BGP Commands to Junos Configuration on page 155](#)
 - [Mapping OpenConfig Interface Commands to Junos Configuration on page 170](#)
 - [Mapping OpenConfig LLDP Commands to Junos Configuration on page 175](#)

- [Mapping OpenConfig Local Routing Commands to Junos Configuration on page 176](#)
- [Mapping OpenConfig MPLS Commands to Junos Configuration on page 177](#)

Mapping OpenConfig VLAN Commands to Junos Configuration



NOTE: See “[OpenConfig Data Model Version](#)” on [page 14](#) topic to understand the data models supported version and its Junos OS release for Juniper Networks EX Series and QFX Series.

[Table 8 on page 155](#) to [Table 49 on page 193](#) show the mapping of OpenConfig VLAN commands with the relevant configuration in Junos.

Table 46: Top Level Group VLAN Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Interface VLAN ID	vlangs/vlan/vlan-id	set vlangs <i>vlan-name</i> vlan-id <i>vid</i>
Interface VLAN Name	vlangs/vlan/name	
VLAN Admin State	vlangs/vlan/status	deactivate vlangs <i>vlan-name</i>

Table 47: VLAN Tagged IFL Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: /ocif:interfaces/ocif:interface/ocif:subinterfaces/ocif:subinterface/vlan		
VLAN ID	/config/vlan-id	set interfaces <i>interface</i> unit <i>subinterface index</i> vlan-id <i>vid</i> set interfaces <i>interface</i> vlan-tagging

Table 48: VLAN Membership Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: /oc-if:interfaces/oc-if:interface/oc-eth:ethernet/switched-vlan		
Interface Mode	/config/interface-mode	set interfaces ge-0/0/0 unit 0 family ethernet-switching interface-mode trunk (l2ng)

Table 48: VLAN Membership Configuration (continued)

Command Name	OpenConfig Command Path	Junos Configuration
Native VLAN	/config/native-vlan	set interfaces ge-0/0/0 native-vlan-id <i>vid</i> (for a trunk port) set interface ge-0/0/0 unit 0 family ethernet-switching interface-mode trunk
Trunk VLANs	/config/trunk-vlans	set interfaces ge-0/0/0 unit 0 family ethernet-switching vlan members 600 set interfaces ge-0/0/0 unit 0 family ethernet-switching vlan members [10-200] Interface-mode = TRUNK
Access VLAN	/config/access-vlan	set interfaces ge-0/0/0 unit 0 family ethernet-switching vlan members 600 Interface-mode = ACCESS

Table 49: Routed VLAN Interfaces Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: /oc-if:interfaces/oc-if:interface/routed-vlan		
VLAN	/config/vlan	Set vlans <i>vlan-name</i> l3-interface <i>irb.vid</i> <i>NOTE:</i> To create IRB IFL, configure IPv4/IPv6 under routed VLAN hierarchy.

- Related Documentation**
- [Mapping OpenConfig Interface Commands to Junos Configuration on page 170](#)
 - [Mapping OpenConfig Local Routing Commands to Junos Configuration on page 176](#)
 - [Mapping OpenConfig Network Instance Commands to Junos Operation on page 186](#)
 - [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 188](#)

CHAPTER 4

Configuration Statements

- [netconf](#) on page 196
- [schema](#) on page 197
- [track-igp-metric \(LSP\)](#) on page 198

netconf

Syntax	<pre> netconf { rfc-compliant; ssh { connection-limit <i>limit</i>; port <i>port</i>; rate-limit <i>limit</i>; } traceoptions { file <filename> <files number> <match regular-expression> <size size> <world-readable no-world-readable>; flag <i>flag</i>; no-remote-trace; on-demand; } yang-compliant; yang-modules { device-specific; emit-extensions; } } </pre>
Hierarchy Level	[edit system services]
Release Information	Statement introduced in Junos OS Release 7.5.
Description	<p>Configure the NETCONF XML management protocol.</p> <p>The remaining statements are explained separately. See CLI Explorer.</p>
Default	If you do not include the netconf statement, NETCONF connections are not permitted.
Required Privilege Level	<p>system—To view this statement in the configuration.</p> <p>system-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • <i>connection-limit</i> • <i>port (NETCONF)</i> • <i>rate-limit</i> • <i>ssh (NETCONF)</i> • <i>traceoptions (NETCONF and Junos XML Protocol)</i>

schema

Syntax	<pre>schema { openconfig { unhide; } }</pre>
Hierarchy Level	[edit system]
Release Information	Statement introduced in Junos OS Release 18.3R1.
Description	Specify whether OpenConfig statements are available and viewable in the CLI.
Options	<p>openconfig unhide—Unhide the OpenConfig statements in the CLI. By default, the OpenConfig schema is not available through the CLI. To rehide the OpenConfig statements, use the following command:</p> <pre>delete system schema openconfig unhide</pre>
Required Privilege Level	<p>admin—To view this statement in the configuration.</p> <p>admin-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Installing the OpenConfig Package on page 18

track-igp-metric (LSP)

Syntax	<code>track-igp-metric <install-v4-prefixes> <install-v6-prefixes>;</code>
Hierarchy Level	<p>The hierarchy level for track-igp-metric globally enabled for all LSPs:</p> <pre>[edit protocols mpls]</pre> <p>The hierarchy level for track-igp-metric at the per LSP level:</p> <pre>[edit protocols mpls label-switched-path <i>pathname</i>],</pre>
Release Information	Statement introduced in Junos OS Release 18.4R1.
Description	Track IGP metric for LSP install prefixes
Options	<p>install-v4-prefixes—Track IGP metric for IPV4 prefixes.</p> <p>install-v6-prefixes—Track IGP metric for IPV6 prefixes.</p>
Required Privilege Level	routing
Related Documentation	<i>Install Prefix IGP Overview</i>