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Junos<sup>®</sup> OS

## OpenConfig Feature Guide

Release  
16.2



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Modified: 2017-01-29

Juniper Networks, Inc.  
1133 Innovation Way  
Sunnyvale, California 94089  
USA  
408-745-2000  
[www.juniper.net](http://www.juniper.net)

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*Junos<sup>®</sup> OS OpenConfig Feature Guide*

16.2

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# About the Documentation

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## Documentation and Release Notes

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

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

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## Supported Platforms

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For the features described in this document, the following platforms are supported:

- MX Series
- PTX Series

## Using the Examples in This Manual

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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 ix](#) defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>

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

Convention	Description	Examples
Fixed-width text like this	Represents output that appears on the terminal screen.	<pre>user@host&gt; show chassis alarms</pre> <p>No alarms currently active</p>
<i>Italic text like this</i>	<ul style="list-style-type: none"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies guide names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul>	<ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS CLI User Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	<p>Configure the machine's domain name:</p> <pre>[edit] root@# set system domain-name domain-name</pre>
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"> <li>To configure a stub area, include the <b>stub</b> statement at the <b>[edit protocols ospf area area-id]</b> hierarchy level.</li> <li>The console port is labeled <b>CONSOLE</b>.</li> </ul>
< > (angle brackets)	Encloses optional keywords or variables.	<b>stub &lt;default-metric metric&gt;;</b>
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	<b>broadcast   multicast</b> <b>(string1   string2   string3)</b>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	<b>community name members [ community-ids ]</b>
Indentation and braces ( { } )	Identifies a level in the configuration hierarchy.	<pre>[edit] routing-options {   static {     route default {       nexthop address;       retain;     }   } }</pre>
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
<b>GUI Conventions</b>		
<b>Bold text like this</b>	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul>

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

Convention	Description	Examples
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

## Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can provide feedback by using either of the following methods:

- Online feedback rating system—On any page of the Juniper Networks TechLibrary site at <http://www.juniper.net/techpubs/index.html>, simply click the stars to rate the content, and use the pop-up form to provide us with information about your experience. Alternately, you can use the online feedback form at <http://www.juniper.net/techpubs/feedback/>.
- E-mail—Send your comments to [techpubs-comments@juniper.net](mailto:techpubs-comments@juniper.net). Include the document or topic name, URL or page number, and software version (if applicable).

## Requesting Technical Support

Technical product support is available through the Juniper Networks Technical Assistance Center (JTAC). If you are a customer with an active J-Care or Partner Support Service 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 <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://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

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- Find CSC offerings: <http://www.juniper.net/customers/support/>
- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>

- Download the latest versions of software and review release notes:  
<http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications:  
<http://kb.juniper.net/InfoCenter/>
- Join and participate in the Juniper Networks Community Forum:  
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

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

## Opening a Case with JTAC

You can open a case with JTAC on the Web or by telephone.

- Use the Case Management tool in the CSC at <http://www.juniper.net/cm/>.
- 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 <http://www.juniper.net/support/requesting-support.html>.

## PART 1

# Overview

- [OpenConfig Overview on page 3](#)
- [gRPC Overview on page 7](#)
- [OpenConfig to Junos Mapping on page 19](#)



## CHAPTER 1

# OpenConfig Overview

- [OpenConfig Overview on page 3](#)
- [Installing the OpenConfig Package on page 4](#)

## OpenConfig Overview

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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.

The configuration and operational statements in Junos OS have corresponding path statements in OpenConfig. The following is a list of supported data modules, with information on the mapping between OpenConfig command path statements and Junos OS configuration and operational statements.

- BGP
- Routing policy
- Telemetry
- Local routing
- Interface
- MPLS
- LLDP

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

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

---

## Installing the OpenConfig Package

OpenConfig for Junos OS corresponds to OpenConfig YANG data module releases and contain translation scripts and deviation modules for each supported Junos OS release. Each package includes the following files:

- OpenConfig set of data models written in YANG.
- Translation scripts that translate OpenConfig configuration schemas to Junos OS configuration schemas for each supported Junos OS release.
- Deviation modules that specify the unsupported nodes within the schema for each supported Junos OS release.
- Augmentation modules that specify additions to various OpenConfig specified models.
- Dynamic rendering files that map operational state data for each supported Junos OS release.

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 **request system software add** command, 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
```

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



- *Understanding Junos OS with Upgraded FreeBSD*



## CHAPTER 2

# gRPC Overview

- [Understanding OpenConfig and gRPC on Junos Telemetry Interface on page 7](#)
- [Installing the Network Agent Package \(Junos Telemetry Interface\) on page 10](#)
- [gRPC Service Definition for OpenConfig Telemetry on page 12](#)
- [Guidelines for gRPC Sensors on page 14](#)

## 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 is supported only on MPCs on MX Series and on PTX Series routers.

- [Network Agent Software on page 7](#)
- [Using OpenConfig for Junos OS to Enable Junos Telemetry Interface on page 8](#)
- [Using gRPC to Stream Data on page 8](#)

## 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 10](#).

## 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. For more information see [“Installing the OpenConfig Package” on page 4](#). 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 from for data at the specified path. The device should then send telemetry data back on the same connection as the subscription request.

For an example of how to use gRPC to subscribe to telemetry data, see *Example: gRPC Subscription for Telemetry Data*.

## 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.

See [Table 3 on page 8](#) for a list and descriptions of the RPCs implemented to the support the Junos Telemetry Interface.

**Table 3: Telemetry RPCs**

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

To view the gRPC service definition, see the [“gRPC Service Definition for OpenConfig Telemetry” on page 12](#).

Data streamed through gRPC is formatted in OpenConfig key/value pairs in Google 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 a statistics counters and the state of a resource.

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.

Release History Table	Release	Description
	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.

- Related Documentation
- [Installing the Network Agent Package \(Junos Telemetry Interface\) on page 10](#)
  - [Understanding Junos OS with Upgraded FreeBSD](#)

## Installing the Network Agent Package (Junos Telemetry Interface)

---

Starting with Junos OS Release 16.1R3, the Network Agent software package provides a framework to support OpenConfig and gRPC for the Junos Telemetry Interface. 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 Network Agent package, which runs on the Routing Engine, implements local statistics collection and reports data to active telemetry stream subscribers.

Network Agent is available as a separate package only for Junos OS with Upgraded FreeBSD. For other versions of Junos OS, Network Agent functionality is embedded in the software. For more information about Junos OS with Upgraded FreeBSD, see *Understanding 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. Vales include **32** for 32-bit architectures and **64** for 64-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 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.

---

Examples of valid Network Agent package names including the following:

- **network-agent-x86-64-16.1R3.16-C1.0.tgz**
- **network-agent-x86-32-16.1R4.12-C1.1.tgz**

Before you begin:

- Install Junos OS Release 16.1R3 or later.
- Install the OpenConfig for Junos OS module. For more information, see [“Installing the OpenConfig Package” on page 4](#).
- 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: <http://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-telemetry** 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-telemetry-x86-64-16.1R3.16-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.

Replace **source** with one of the following values:

- **/pathname**—For a software package that is installed from a local directory on the device.
- For software packages that are downloaded and installed from a remote location:
  - **ftp://hostname/pathname**
  - **http://hostname/pathname**

- `scp://hostname/pathname` (available only for Canada and U.S. version)

10. Issue the **show version** command to verify that the Network Agent package was successfully installed.

**Related  
Documentation**

- [Understanding OpenConfig and gRPC on Junos Telemetry Interface on page 7](#)

---

## gRPC Service Definition for OpenConfig Telemetry

Like many RPC systems, gRPC is based on defining a service, specifying the methods that can be called remotely with their parameters and return types. By default, gRPC uses protocol buffers as the Interface Definition Language (IDL) for describing both the service interface and the structure of the payload messages.

Following is the gRPC service definition for the **telemetrySubscribe** RPC:

```
//
// na-openconfig-telemetry.proto
// network-agent-gprc
//   This file defines the telemetry gRPC service implemented by the
//   Network Agent that runs on Juniper devices.
//
syntax = "proto3";
package Telemetry;

service OpenConfigTelemetry {
  // Request an inline subscription for data at the specified path
  rpc telemetrySubscribe(SubscriptionRequest) returns (SubscriptionResponse)
  {}
  // Get the list of current telemetry subscriptions from the
  // target. This command returns a list of existing subscriptions
  // not including those that are established via configuration."
  rpc getTelemetrySubscriptions() returns (SubscriptionResponse) {}
  // Terminates and removes an existing telemetry subscription
  rpc cancelTelemetrySubscription(SubscriptionId) returns ( ) {}
  // Retrieve operational state values of the given OC paths
  rpc getOperational(OpDataRequest) returns (OpDataReply) {}
  // Get the capabilities of the network device
  rpc getCapabilities() returns (capabilities) {}
}

message SubscriptionRequest {
  // List of optional collector endpoints to send data for
  // this subscription, specified as an ip+port combination.
  // If no collector destinations are specified, the collector
  // destination is inferred from requester on the rpc channel
  repeated Collector collectors = 1;
  // The DSCP code point to be set on telemetry messages
  uint32 export_dscp_marking = 2;
  // List of paths for which telemetry is desired
  repeated Resource resources = 3;
}

message Collector {
  // IP address of collector end point
  string ip_address = 1;
  // Transport protocol port number for destination
```



```

    uint32 port = 2;
}

message Resource {
    // Datamodel path of interest
    Path path = 1;

    // Regular expression used to filter out non interesting leaf nodes
    string filter = 2;

    // The interval at which the value of a counter is reported
    int32 sample-frequency = 3;
}

message SubsscriptionResponse {
    SubscriptionId id = 1;
    SubscriptionRequest actualSubscription = 2;
}

message SubscriptionId {
    uint32 id = 1;
}

message OpDataRequest {
    // Request header
    RequestHeader header = 1;

    // List of paths
    repeated Path paths = 2;

    // True if only operational paths need to be retrieved
    unit32 opOnly = 3;
}

message RequestHeader {
    // Request ID
    uint64 reqId = 1;
}

message Path {
    // Name of the Path
    string path = 1;
}

message OpDataReply {
    // Reply header
    ReplyHeader header = 1;
    // Response in path-value format
    repeated OpData keyvalues = 2;
}

message ReplyHeader {
    // Request ID
    uint64 reqId = 1;
    // Response code, success or failure
    uint32 rspCode = 2;
    // Info or error message
    string rspMsg = 3;
}

message OpData {

```

```
// Name of the path
string path = 1;
// Value of the path
string value = 2;
}

message Capabilities {
  // List of the paths
  repeated Capability capabilities = 1;
}

message Capability {
  // The resource path
  Path path = 1;
  // The recommended polling interval
  uint32 polling_interval = 2;
  // Whether this path supports filtering with regular expressions
  string filter_supported = 3;
}
```

**Related Documentation** • [Understanding OpenConfig and gRPC on Junos Telemetry Interface on page 7](#)

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## Guidelines for gRPC Sensors

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. The following sensors are supported with gRPC. 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 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 4 on page 15](#) for a description of supported gRPC sensors and the subscription path you use to provision the sensors.

Table 4: gRPC Sensors

resource path	Description
<code>/junos/services/label-switched-path/usage/</code>	<p>Sensor for LSP statistics. Only ingress LSPs are supported. On MX Series routers only, the following are also supported: bypass LSPs, including those configured as ingress LSPs, and bidirectional LSPs for ultimate-hop popping (UHP).</p> <p><b>NOTE:</b> You can modify <code>/junos/services/label-switched-path/usage/</code> to specify a specific LSP. Add <code>__instance__/lsp-name</code> to the end of the resource path. For example, to monitor and stream data for LSP statistics for an LSP named <code>mirror-to-murano-1</code>, enter the following:  <code>/junos/services/label-switched-path/usage/</code>  <code>__instance__/mirror-to-murano-1</code>. If you do not specify a specific LSP name, the system resource monitors and streams data for all LSPs.</p> <p>When you enable a sensor for LSP statistics only, you must also configure the <code>sensor-based-stats</code> 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 <code>enhanced-ip</code> or the <code>enhanced-ethernet</code> statement at the <code>[edit chassis network-services]</code> hierarchy level.</p>
<code>/junos/npu-memory/</code>	Sensor for network processing unit (NPU) memory, NPU memory utilization, and total memory available for each memory type
<code>/junos/system/linecard/cpu/memory/</code>	Sensor for CPU memory.
<code>/bgp/neighbors/neighbor/</code>	<p>Sensor for BGP peer information.</p> <p><b>NOTE:</b> You can also include the following at the end path:</p> <ul style="list-style-type: none"> <li>• <code>state/session-state/</code></li> <li>• <code>state/messages/sent/update/</code></li> <li>• <code>state/messages/received/update/</code></li> <li>• <code>timers/state/uptime/</code></li> <li>• <code>transport/state/local-address/</code></li> <li>• <code>transport/state/remote-address/</code></li> <li>• <code>state/peer-as/</code></li> <li>• <code>afi-safis-afi/safi/state/prefix-limit/state/max-prefixes/</code></li> <li>• <code>state/session-status</code></li> <li>• <code>state/session-admin-status</code></li> <li>• <code>state/session-established-transitions/</code></li> <li>• <code>state/interface-error/</code></li> <li>• <code>state/prefix-limited/exceeded/</code></li> </ul>
<code>/junos/services/routing/task-memory-utilization/</code>	Sensor for memory utilization for routing protocol task.

Table 4: gRPC Sensors (*continued*)

resource path	Description
<code>/junos/system/linecard/firewall/</code>	<p>Sensor for firewall filter counters and policer counters. Each line card reports counters separately.</p> <p><b>NOTE:</b> Hierarchical policer statistics are collected for MX Series routers only. Traffic-class counter statistics are collected for PTX Series routers only.</p> <p>Firewall counters are exported even if the interface to which the firewall filter is attached is operationally down.</p>
<code>/junos/system/linecard/interface/</code>	<p>Sensor for physical interface traffic.</p> <p><b>NOTE:</b> 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>
<code>/interfaces/interface/subinterfaces/</code>	Sensor for logical interface traffic.
<code>/interfaces/interface[name='interface-name']/subinterfaces/</code>	<b>NOTE:</b> If a logical interface is operationally down, interface statistics continue to be exported.
<code>/junos/system/linecard/optics/</code>	Sensor for various optical interface performance metrics, such as transmit and receive power levels.
<code>/junos/rsvp-interface-information/</code>	<p>Sensor for events and properties for RSVP interfaces.</p> <p><b>NOTE:</b> 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>
<code>/components/</code>	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.
<code>/lACP/</code>	Sensor for operational state of aggregated Ethernet interfaces configured with the Link Aggregation Control Protocol.
<code>/lldp/</code>	Sensor for operational state of Ethernet interfaces enabled with the Link Layer Discovery Protocol.
<code>/arp-information/</code>	Sensor for Address Resolution Protocol (ARP) statistics.

Table 4: gRPC Sensors (*continued*)

resource path	Description
/interfaces/interface[name='interface-name']/	<p>Sensor for Routing Engine internal interfaces.</p> <p><b>NOTE:</b> 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>
/nd6-information/	Sensor for Network Discovery Protocol (NDP) table state.
/ipv6-ra/	Sensor for NDP router-advertisement statistics.

- Related Documentation
- [Understanding OpenConfig and gRPC on Junos Telemetry Interface on page 7](#)
  - [Example: gRPC Subscription for Telemetry Data](#)



## CHAPTER 3

# OpenConfig to Junos Mapping

- [Mapping OpenConfig BGP Commands to Junos Configuration on page 19](#)
- [Mapping OpenConfig Interface Commands to Junos Configuration on page 27](#)
- [Mapping OpenConfig Local Routing Commands to Junos Configuration on page 32](#)
- [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 33](#)

## Mapping OpenConfig BGP Commands to Junos Configuration

Use the following table to map OpenConfig BGP commands with the relevant configuration in Junos.

Table 5: Global BGP Configuration

Command Name	OpenConfig Command Path	Junos Configuration
Command path prefix: <b>/bgp/global</b>		
External-Route-Distance	<b>/default-route-distance/config/external-route-distance</b>	<b>set protocols bgp group <i>name</i> preference</b>
Internal-Route-Distance	<b>/default-route-distance/config/internal-route-distance</b>	<b>set protocols bgp group <i>name</i> preference <i>preference</i></b>
Confederation	<b>/confederation/config/enable</b> <b>/confederation/config/identifier</b> <b>/confederation/config/member-as</b>	<b>set routing-options confederation <i>confederation_as</i></b> <b>set routing-options confederation members <i>value</i></b>
Allow-Multiple-AS	<b>/use-multiple-paths/config/enabled</b> <b>/use-multiple-paths/ebgp/config/allow-multiple-as</b>	<b>set protocols bgp group <i>name</i> multipath multiple-as</b>
EBGP-Maximum-Paths	<b>/use-multiple-paths/config/enabled</b> <b>/use-multiple-paths/ebgp/config/maximum-paths</b>	<b>set chassis maximum-ecmp <i>number-of-next-hops</i></b>
IBGP-Maximum-Paths	<b>/use-multiple-paths/ibgp/config/maximum-paths</b>	<b>set chassis maximum-ecmp <i>number-of-next-hops</i></b>

Table 5: Global BGP Configuration (*continued*)

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 <i>restart -time</i> set protocols bgp graceful-restart stale-routes-time <i>stale- routes -time</i>
------------------	---	---

Table 6: Global AFI-SAFI Configuration

Command Name	OpenConfig Command Path	Junos Configuration
	Command path prefix: /bgp/global/afi-safi/afi-safi	
AFI-SAFI	/config/afi-safi-name /config/enabled	set protocols bgp family <i>family</i>
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 <i>family</i> aigp
Ignore-Next-hop-IGP-Metric	/route-selection-options/config/ignore-next-hop-igp-metric	Not supported
Use-Multiple-Paths	/use-multiple-paths/ebgp/config/ /use-multiple-paths/ibgp/config/	Not supported
Apply-Policy	/apply-policy/	Not supported
IPv4-Unicast: Max-Prefixes	/ipv4-unicast/prefix-limit/config/max-prefixes	set protocols bgp family inet unicast accepted-prefix-limit maximum <i>maximum</i>
IPv4-Unicast: Shutdown-Threshold-PCT	/ipv4-unicast/prefix-limit/config/shutdown-threshold-pct	set protocols bgp family inet unicast accepted-prefix-limit teardown <i>limit-threshold</i>
IPv4-Unicast: Restart-Timer	/ipv4-unicast/prefix-limit/config/restart-timer	set protocols bgp family inet unicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>
IPv4-Unicast: Send-Default-Route	/ipv6-unicast/config/send-default-route	Not supported



Table 6: Global AFI-SAFI Configuration (*continued*)

IPv4-Lbl-Unicast: Max-Prefixes	<code>/ipv6-unicast/prefix-limit/config/max-prefixes</code>	set protocols bgp family inet6 unicast accepted-prefix-limit maximum <i>maximum</i>
IPv4-Lbl-Unicast: Shutdown-Threshold-PCT	<code>/ipv6-unicast/prefix-limit/config/shutdown-threshold-pct</code>	set protocols bgp family inet6 unicast accepted-prefix-limit teardown <i>limit-threshold</i>
IPv4-Lbl-Unicast: Restart-Timer	<code>/ipv6-unicast/prefix-limit/config/restart-timer</code>	set protocols bgp family inet6 unicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>
IPv6-Lbl-Unicast: Max-Prefixes	<code>/ipv6-labelled-unicast/prefix-limit/config/max-prefixes</code>	set protocols bgp family inet6 labeled-unicast accepted-prefix-limit maximum <i>maximum</i>
IPv6-Lbl-Unicast: Shutdown-Threshold-PCT	<code>/ipv6-labelled-unicast/prefix-limit/config/shutdown-threshold-pct</code>	set protocols bgp family inet6 labeled-unicast accepted-prefix-limit teardown <i>limit-threshold</i>
IPv6-Lbl-Unicast: Restart-Timer	<code>/ipv6-labelled-unicast/prefix-limit/config/restart-timer</code>	set protocols bgp family inet6 labeled-unicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>
L3VPN-IPv4-Ucast: Max-Prefixes	<code>/l3vpn-ipv4-unicast/prefix-limit/config/max-prefixes</code>	set protocols bgp family inet-vpn unicast accepted-prefix-limit maximum <i>maximum</i>
L3VPN-IPv4-Ucast: Shutdown-Threshold-PCT	<code>/l3vpn-ipv4-unicast/prefix-limit/config/shutdown-threshold-pct</code>	set protocols bgp family inet-vpn unicast accepted-prefix-limit teardown <i>limit-threshold</i>
L3VPN-IPv4-Ucast: Restart-Timer	<code>/l3vpn-ipv4-unicast/prefix-limit/config/restart-timer</code>	set protocols bgp family inet-vpn unicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>
L3VPN-IPv6-Ucast: Max-Prefixes	<code>/l3vpn-ipv6-unicast/prefix-limit/config/max-prefixes</code>	set protocols bgp family inet6-vpn unicast accepted-prefix-limit maximum <i>maximum</i>

Table 6: Global AFI-SAFI Configuration (*continued*)

L3VPN-IPv6-Ucast: Shutdown-Threshold-PCT	/l3vpn-ipv6-unicast/prefix-limit/config/shutdown-threshold-pct	set protocols bgp family inet6-vpn unicast accepted-prefix-limit teardown <i>limit-threshold</i>
L3VPN-IPv4-Mcast: Restart-Timer	/l3vpn-ipv6-unicast/prefix-limit/config/restart-timer	set protocols bgp family inet6-vpn unicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>
L3VPN-IPv6-Mcast: Max-Prefixes	/l3vpn-ipv6-multicast/prefix-limit/config/max-prefixes	set protocols bgp family inet6-vpn multicast accepted-prefix-limit maximum <i>maximum</i>
L3VPN-IPv6-Mcast: Shutdown-Threshold-PCT	/l3vpn-ipv6-multicast/prefix-limit/config/shutdown-threshold-pct	set protocols bgp family inet6-vpn multicast accepted-prefix-limit teardown <i>limit-threshold</i>
L3VPN-IPv6-Mcast: Restart-Timer	/l3vpn-ipv6-multicast/prefix-limit/config/restart-timer	set protocols bgp family inet6-vpn multicast accepted-prefix-limit teardown idle-timeout <i>timeout</i>
L2VPN-VPLS: Max-Prefixes	/l2vpn-vpls/prefix-limit/config/max-prefixes	set protocols bgp family l2vpn signaling accepted-prefix-limit maximum <i>maximum</i>
L2VPN-VPLS: Shutdown-Threshold-PCT	/l2vpn-vpls/prefix-limit/config/shutdown-threshold-pct	set protocols bgp family l2vpn signaling accepted-prefix-limit teardown <i>limit-threshold</i>
L2VPN-VPLS: Restart-Timer	/l2vpn-vpls/prefix-limit/config/restart-timer	set protocols bgp family l2vpn signaling accepted-prefix-limit teardown idle-timeout <i>timeout</i>
L2VPN-EVPN: Max-Prefixes	/l2vpn-evpn/prefix-limit/config/max-prefixes	set protocols bgp family evpn signaling accepted-prefix-limit maximum <i>maximum</i>
L2VPN-EVPN: Shutdown-Threshold-PCT	/l2vpn-evpn/prefix-limit/config/shutdown-threshold-pct	set protocols bgp family evpn signaling accepted-prefix-limit teardown <i>limit-threshold</i>

Table 6: Global AFI-SAFI Configuration (*continued*)

L2VPN-EVPN: Restart-Timer	/l2vpn-evpn/prefix-limit/config/restart-timer	set protocols bgp family evpn signaling accepted-prefix-limit teardown idle-timeout timeout
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Table 7: Global Apply-Policy Configuration

Command Name	OpenConfig Command Path	Junos Configuration
	Command path prefix: /bgp/global/apply-policy	
Import-Policies	/import-policies	set protocols bgp import value
Default-Import-Policy	/default-import-policy	set protocols bgp import value
Export-Policies	/export-policies	set protocols bgp export value
Default-Export-Policy	/default-export-policy	set protocols bgp export value

Table 8: Peer-Group Configuration

Command Name	OpenConfig Command Path	Junos Configuration
	Command path prefix: /bgp/peer-groups/peer-group	
Peer-Group-Name	/config/peer-group-name	set protocols bgp group group-name
Peer-AS	/config/peer-as	set protocols bgp group group-name peer-as peer-as
Peer-Type	/config/peer-type	set protocols bgp group group-name type <external   internal>
Auth-Password	/config/auth-password	set protocols bgp group group-name authentication-key authentication-key
Remove-Private-AS	/config/remote-private-as	set protocols bgp group group-name remove-private all  set protocols bgp group group-name remove-private all replace

Table 8: Peer-Group Configuration (*continued*)

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>interval</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
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>

Table 8: Peer-Group Configuration (*continued*)

AS-Path-Options: Replace-Peer-AS	/as-path-options/config/replace-peer-as	set protocols bgp group <i>group-name</i> as-override
Add-Paths: Receive	/add-paths/config/receive	set protocols bgp group <i>group-name</i> family <i>family</i> add-path receive
Add-Paths: Send-Max	/add-paths/config/send-max	set protocols bgp group <i>group-name</i> family <i>family</i> add-path send path-count <i>path-count</i>
AFI-SAFI	/afi-safi/afi-safi/	Not supported
Graceful-Restart	/graceful-restart/config/	Not supported
Apply-Policy	/apply-policy/	Not supported

Table 9: Neighbors Configuration

<i>Command Name</i>	<i>OpenConfig Command Path</i>	<i>Junos Configuration</i>
	Command path prefix: /bgp/neighbors/neighbor	
Neighbor-Address	/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</i>   <i>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

Table 9: Neighbors Configuration (*continued*)

Send-Community	<code>/config/send-community</code>	Not supported
Description	<code>/config/description</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>description</code>
Peer-Group	<code>/config/peer-group</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code>
Timers – Connect-Retry	<code>/timers/config/connect-retry</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>connect-retry-interval</code>
Timers – Hold-Time	<code>/timers/config/hold-time</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>hold-time hold-time</code>
Timers - Keepalive-Interval	<code>/timers/config/keepalive-interval</code>	Not supported
Timers – Minimum-Advertisement-Interval	<code>/timers/config/minimum-advertisement-interval</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>out-delay out-delay</code>
Timers - Send-Update-Delay	<code>/timers/config/send-update-delay</code>	Not supported
Transport – TCP-MSS	<code>/transport/config/tcp-mss</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>tcp-mss tcp-mss</code>
Transport – MTU-Discovery	<code>/transport/config/mtu-discovery</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>mtu-discovery</code>
Transport – Passive-Mode	<code>/transport/config/passive-mode</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>passive</code>
Transport – Local-Address	<code>/transport/config/local-address</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>local-address local-address</code>
Error-Handling – Treat-AS-Withdraw	<code>/error-handling/config/treat-as-withdraw</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>bgp-error-tolerance</code>
Logging-Options – Log-Neighbor-State-Changes	<code>/logging-options/config/log-neighbor-state-changes</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>log-updown</code>
EBGP-Multihop – Multihop-TTL	<code>/ebgp-multihop/config/multihop-ttl</code>	<code>set protocols bgp group</code> <code>group-name neighbor address</code> <code>multihop ttl ttl</code>

Table 9: Neighbors Configuration (*continued*)

Route-Reflector – Route-Reflector-Cluster-ID	/route-reflector/config/route-reflector-cluster-id	set protocols bgp group <i>group-name</i> neighbor address cluster <i>cluster</i>
Route-Reflector – Route-Reflector-Client	/route-reflector/config/route-reflector-client	set protocols bgp group <i>group-name</i> neighbor address 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 address 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 address as-override
Add-Paths - Receive	/add-paths/config/receive	set protocols bgp group <i>group-name</i> neighbor address family <i>family</i> add-path receive
AS-Path-Options – Send-Max	/add-paths/config/send-max	set protocols bgp group <i>group-name</i> neighbor address family <i>family</i> add-path send path-count <i>path-count</i>
AFI-SAFI	/afi-safi/afi-safi/	Not supported
Graceful-Restart	/graceful-restart/config/	Not supported
Apply-Policy	/apply-policy/	Not supported

**Related  
Documentation**

- [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 33](#)
- [Mapping OpenConfig Interface Commands to Junos Configuration on page 27](#)
- [Mapping OpenConfig Local Routing Commands to Junos Configuration on page 32](#)

## Mapping OpenConfig Interface Commands to Junos Configuration

Use the following table to map OpenConfig interface commands to the relevant configuration in Junos.

Table 10: VRRP Configuration

Command Name	OpenConfig Command Path	Junos Configuration
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Table 10: VRRP Configuration (*continued*)

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
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



Table 10: VRRP Configuration (*continued*)

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 11: 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 12: 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 13: 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 14: Member Interface Configuration

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

Table 15: Ethernet Configuration

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 16: IFD Configuration

Command Name	OpenConfig Command Path	Junos Configuration
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Table 16: IFD Configuration (*continued*)

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

Table 17: IFL Configuration

<i>Command Name</i>	<i>OpenConfig Command Path</i>	<i>Junos Configuration</i>
Unit Name	<code>/interfaces/interface/subinterfaces/subinterface/config/index</code>	<code>set interfaces <i>interface</i> unit <i>unit</i></code>
Unnumbered Address	<code>/interfaces/interface/config/subinterfaces/subinterface/config/unnumbered</code>	<code>set interfaces <i>interface</i> unit <i>unit</i> family <i>family</i> unnumbered-address source <i>ifl</i></code>
Unit Description	<code>/interfaces/interface/subinterfaces/subinterface/config/description</code>	<code>set interfaces <i>interface</i> unit <i>unit</i> description</code>
Unit Enabled/Disabled	<code>/interfaces/interface/subinterfaces/subinterface/config/enabled</code>	<code>set interfaces <i>interface</i> unit <i>unit</i> enabled</code> <code>set interfaces <i>interface</i> unit <i>unit</i> disabled</code>
Interface Alias	<code>/interfaces/interface/subinterfaces/subinterface/config/name</code>	<code>set interfaces <i>interface</i> alias</code>

**Related Documentation**

- [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 33](#)
- [Mapping OpenConfig BGP Commands to Junos Configuration on page 19](#)
- [Mapping OpenConfig Local Routing Commands to Junos Configuration on page 32](#)

## Mapping OpenConfig Local Routing Commands to Junos Configuration

Use the following table to map OpenConfig local routing commands to the relevant configuration in Junos.

**Table 18: Static Route Configuration**

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

**Table 19: Local Aggregate Configuration**

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

### Related Documentation

- [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 33](#)
- [Mapping OpenConfig BGP Commands to Junos Configuration on page 19](#)
- [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 33](#)

## Mapping OpenConfig Routing Policy Commands to Junos Configuration

Use the following table to map OpenConfig routing policy commands to the relevant configuration in Junos.

**Table 20: Defined Set Configuration**

<i>Command Name</i>	<i>OpenConfig Command Path</i>	<i>Junos Configuration</i>
Prefix Set	<code>/routing-policy/defined-sets/prefix-set</code>	<code>set policy-options prefix-list <i>name</i></code>
Neighbor Set	<code>/routing-policy/defined-sets/neighbor-set</code>	Not supported
Tag Set	<code>/routing-policy/defined-sets/tag-set</code>	Not supported

**Table 21: BGP Defined Set Configuration**

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

**Table 22: Policy Definition Configuration**

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

Table 22: Policy Definition Configuration (*continued*)

Match Neighbor Set	/conditions/match-neighbor-set/match-set-options	Not supported
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)

Table 22: Policy Definition Configuration (*continued*)

BGP AS Path Length	/conditions/bgp-conditions/as-path-length	set policy-options as-path match-number-or-more  set policy-options policy-statement match-number-or-more from as-path match-5-or-more
Accept/Reject	/actions/accept-reject	set policy-options policy-statement example-accept then accept  set policy-options policy-statement example-accept 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>

**Related Documentation**

- [Mapping OpenConfig Routing Policy Commands to Junos Configuration on page 33](#)
- [Mapping OpenConfig Interface Commands to Junos Configuration on page 27](#)
- [Mapping OpenConfig Local Routing Commands to Junos Configuration on page 32](#)





## CHAPTER 4

# Configuration Statements

- [netconf on page 38](#)

## netconf

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