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Juniper Extension Toolkit API Guide

junos

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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

Table of Contents

About This Guide

Use this guide to learn more about Juniper Extension Toolkit (JET) APIs. For how to develop JET applications, see the Juniper Extension Toolkit Developer Guide. For information about gRPCs that use the JET architecture to run on Junos devices, see the gRPC Network Services User Guide.

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CHAPTER

About JET APIs

IN THIS CHAPTER

Overview of JET APIs

JET provides APIs that extend the functionality of Junos OS and Junos OS Evolved. These APIs fall into three main categories: the notification API, base type APIs, and service APIs. The APIs are defined by proto definition files. You can view these files in multiple ways:

- View the full proto definition files on the JET GitHub repository.

- To use the proto definition files, you will need to download and extract the IDL file for the release you are using. See Set Up the JET VM for instructions.

Notification API

The notification API provides interfaces that allow you to subscribe to events and designate a callback function to receive events when they occur. See "JET Notification API" on page 5 for more information about this API.

Base Type APIs

Table 1: Base Types

RPC	Proto File(s)
JET Common Address Types RPC	jnx_addr.proto jnx_common_addr_types.proto

Table 1: Base Types *(Continued)*

RPC	Proto File(s)
JET Common Base Types RPC	jnx_base_types.proto jnx_common_base_types.proto
JET Routing Base Service RPC	jnx_routing_base_service.proto
JET Routing Base Types RPC	jnx_routing_base_types.proto

Service APIs

Service APIs provide interfaces to access the control plane on the device and a management interface to run operational and configuration commands.

Table 2: Management

RPC	Proto File(s)	Introduced in Release
Authentication Service RPC	authentication_service.proto jnx_authentication_service.proto	Before Junos OS Release 19.4R1
Management Service RPC	management_service.proto jnx_management_service.proto	Before Junos OS Release 19.4R1
Registration Service RPC	registration_service.proto jnx_registration_service.proto	Before Junos OS Release 19.4R1
Versioning Service RPC	jnx_version_service.proto	Junos OS Release Evolved 20.4R1

Table 3: Routing

RPC	Proto File(s)	Introduced in Release
BFD Service RPC	bfd_service.proto	Before Junos OS Release 19.4R1
BGP Route Service RPC	bgp_route_service.proto jnx_routing_bgp_service.proto	Before Junos OS Release 19.4R1
ECMP Tracer Flow Monitoring RPC	jnx_ecmptracer_service.proto	Junos OS Evolved 20.1R1
Flexible Tunnel Profile RPC	flexible_tunnel_profile.proto jnx_routing_flexible_tunnel_profile.proto	Junos OS Release 19.4R1
Flexible Tunnel Service RPC	flexible_tunnel_service.proto jnx_routing_flexible_tunnel_service.proto	Junos OS Release 19.4R1
MPLS Bandwidth Update Service RPC	jnx_routing_mpls_autobw_service.proto	Before Junos OS Release 19.4R1
MPLS Service RPC	mpls_api_service.proto	Before Junos OS Release 19.4R1
PRPD Common RPC	prpd_common.proto	Before Junos OS Release 19.4R1
PRPD Service RPC	prpd_service.proto	Before Junos OS Release 19.4R1
RIB Service RPC	rib_service.proto jnx_routing_rib_service.proto	Before Junos OS Release 19.4R1
Routing Interface Service RPC	routing_interface_service.proto jnx_routing_interface_service.proto	Junos OS Release 19.4R1

Table 4: Other

Type	RPC	Proto File	Introduced in Release
Firewall	Firewall Service RPC	jnx_firewall_service.proto	Before Junos OS Release 19.4R1
Interfaces	DCD Service RPC	dcd_service.proto	Before Junos OS Release 19.4R1
Interfaces	Interfaces Service RPC	jnx_interfaces_service.proto	Before Junos OS Release 19.4R1
Network Address Translation (NAT)	MAP-E Service RPC	mape_service.proto	Junos OS Release 24.2R1

RELATED DOCUMENTATION

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JET Notification API

IN THIS SECTION

The JET Notification API allows you to subscribe to events and designate a callback function to receive events when they occur. These Python interfaces provide an interface to the MQTT notification system that, for languages other than Python, must be handled outside of JET (see "Programming JET

). For details about MQTT and Python, see https://mosquitto.org/ .

JSON Format of JET Notification Messages

JET notification is delivered in JSON format. The JSON message has two parts: the header and the attributes. The header is common for all events. It contains the event ID, hostname, time, severity, and facility of the event. The attributes contain information about the event and vary depending event's topic name.

All kernel rtsock events will have `info` as the severity and `KERNEL` as the facility. For syslog events, the severity and facility will be same as that of the Junos OS syslog messages.

The following is an example event JSON file.

```
"jet-event": {
    "event-id": "KERNEL_EVENT_IFD_ADD"
    "hostname": "mydevice",
    "time": "2016-01-07",
    "severity": "info",
    "facility": "KERNEL",
    "attributes": {
        "name": "ge-0/0/0",
        "snmp-id": 520,
        "flags": 8
    }
}
```

See Package JET Applications for more information about JSON.

Subscribing to Events

Applications developed using JET can subscribe to the events listed in Table 5 on page 7. A *topic* is an endpoint to which the clients connect. A topic acts as the central distribution hub for publishing and subscribing messages. Topics are simple, hierarchical strings, encoded in UTF-8, delimited by a forward slash.

Table 5: Junos Event Topics

Events	Topic	Event Information Returned
Physical Interface (IFD)	/junos/events/kernel/interfaces/ifd/add/*ifdname* /junos/events/kernel/interfaces/ifd/change/*ifdname* /junos/events/kernel/interfaces/ifd/delete/*ifdname*	name, snmp-id, flags
Logical Interface (IFL)	/junos/events/kernel/interfaces/ifl/add/*iflname* /junos/events/kernel/interfaces/ifl/change/*iflname* /junos/events/kernel/interfaces/ifl/delete/*iflname*	name, subunit, snmp-id, flags
Family (IFF)	/junos/events/kernel/interfaces/iff/add/*iflname*/*family-type* /junos/events/kernel/interfaces/iff/change/*iflname*/*family-type* /junos/events/kernel/interfaces/iff/delete/*iflname*/*family-type*	name, subunit, family, table-name, flags
Address	/junos/events/kernel/interfaces/ifa/add/*iflname*/*family-type*/*address* /junos/events/kernel/interfaces/ifa/change/*iflname*/*family-type*/*address* /junos/events/kernel/interfaces/ifa/delete/*iflname*/*family-type*/*address*	name, subunit, family, local-address, destination-address, broadcast-address, flags
Firewall	/junos/events/kernel/firewall/filter/add/*filtername* /junos/events/kernel/firewall/filter/change/*filtername* /junos/events/kernel/firewall/filter/delete/*filtername*	name, version, client-id, filter-type, protocol, interface-name, flags

Table 5: Junos Event Topics *(Continued)*

Events	Topic	Event Information Returned
Route	• /junos/events/kernel/route/add/*family*/*prefix-with-length* • /junos/events/kernel/route/change/*family*/*prefix-with-length* • /junos/events/kernel/route/delete/*family*/*prefix-with-length*	table-name, logical-router-name, address-family, route-type, route-prefix, arrayof(nexthop-address), flags
Route-table	• /junos/events/kernel/route-table/add/*tablename*/*lrname* • /junos/events/kernel/route-table/change/*tablename*/*lrname* • /junos/events/kernel/route-table/delete/*tablename*/*lrname*	name, logical-router-name, address-family, flags
Syslog	/junos/events/syslog/*event-id*	arrayof(attribute-value pairs)

Programming JET Notification for Non-Python Languages

Many of high-level languages have an MQTT library available. A JET application can use the corresponding library to connect to the MQTT broker running on Junos OS and subscribe to events. For example, here is a sample JAVA program connecting to an MQTT broker and subscribing to events: Example MQTT Messaging in Java.

For details on example MQTT libraries for different languages, see .

Table 6: MQTT Libraries by Language

Language Name	License Link
C, Mosquitto	FreeBSD

Table 6: MQTT Libraries by Language *(Continued)*

Language Name	License Link
C++, Mosquitto	FreeBSD
Python, Mosquitto	FreeBSD
Ruby, Ruby-mqtt	MIT License
Java, Eclipse Paho Java	Eclipse Public License
Go, Eclipse Paho Go	Eclipse Public License
C#, MqttDotNet	Custom License

RELATED DOCUMENTATION

Set Up the JET VM