

# Release Notes

Published  
2023-11-23

## Junos OS Evolved Release 22.4R1

---

### Introduction

Use these release notes to find new and updated features, software limitations, and open issues for Junos OS Evolved Release 22.4R1.

For more information on this release of Junos OS Evolved, see [Introducing Junos OS Evolved](#).

# Table of Contents

## Key Features in Junos OS Evolved Release 22.4 | 1

### Junos OS Evolved Release Notes for ACX7024, ACX7100-32C, ACX7100-48L, and ACX7509 Devices

#### What's New | 2

Hardware | 3

Authentication and Access Control | 3

EVPN | 4

Interfaces | 5

Junos Telemetry Interface | 6

MPLS | 6

Multicast | 6

OpenConfig | 7

Routing Protocols | 7

Routing Options | 8

Additional Features | 9

#### What's Changed | 12

#### Known Limitations | 15

#### Open Issues | 16

#### Resolved Issues | 19

### Junos OS Evolved Release Notes for PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016 Devices

#### What's New | 23

Hardware | 24

Authentication and Access Control | 24

Chassis	25
Class of Service	28
Ethernet Switching and Bridging	28
EVPN	28
Interfaces	30
Intrusion Detection and Prevention	30
IP Tunneling	30
Junos Telemetry Interface	30
Layer 2 Features	32
MPLS	33
Network Management and Monitoring	35
OpenConfig	36
Routing Options	36
Routing Policy and Firewall Filters	37
Routing Protocols	38
Source Packet Routing in Networking (SPRING) or Segment Routing	40
Software Installation and Upgrade	40
Additional Features	41

## **What's Changed | 43**

## **Known Limitations | 47**

## **Open Issues | 48**

## **Resolved Issues | 52**

## **Junos OS Evolved Release Notes for QFX5130-32CD, QFX5220, and QFX5700 Devices**

## **What's New | 58**

Authentication and Access Control	59
-----------------------------------	----

EVPN	59
------	----

Junos Telemetry Interface | 61

Routing Protocols | 62

Routing Options | 63

Software Installation and Upgrade | 63

Additional Features | 64

**What's Changed | 65**

**Known Limitations | 69**

**Open Issues | 69**

**Resolved Issues | 71**

**Upgrade Your Junos OS Evolved Software | 72**

**Licensing | 73**

**Finding More Information | 73**

**Requesting Technical Support | 74**

**Revision History | 75**

# Key Features in Junos OS Evolved Release 22.4

Start here to learn about the key features in Junos OS Evolved Release 22.4. For more information about a feature, click the link in the feature description.

- **EVPN-VXLAN to EVPN-VXLAN seamless stitching for EVPN Type 5 routes (ACX7100-32C, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, you can configure EVPN-VXLAN to EVPN-VXLAN seamless stitching with EVPN Type 5 (IP prefix) routes between two interconnected data centers or between two points of delivery (pods) in a data center.

In the EVPN-VXLAN fabric, border leaf or border spine devices act as interconnection gateways. You enable EVPN Type 5 routes in virtual routing and forwarding (VRF) instances on both sides of the interconnection. For each VRF instance, the server leaf devices in the first data center create VXLAN tunnels for Type 5 routes (with corresponding VXLAN network identifiers [VNIs]) toward their local gateway devices. The gateway devices map those VXLAN tunnels to an interconnection tunnel (with a new route distinguisher [RD], route target, and VNI) toward the second data center. The gateway devices in the second data center re-create the Type 5 VXLAN tunnels using their local RD.

We support one-to-one mapping of Type 5 VRF instances across the interconnection.

- **Interfaces support (ACX7509)**— Starting in Junos OS Evolved Release 22.4R1, we support the following features:
  - 50-Gbps speed for ACX7509-FPC-20Y line cards
  - 8x50G DAC, 50G DAC, and 2x100G channelization for ACX7509-FPC-4CD line cards
  - Pic violation alarm is raised if you violate port speed combinations.

[See [Port Speed on ACX7509-FPC-20Y Overview](#) and [Port Speed on ACX7509-FPC-4CD Overview](#).]

# Junos OS Evolved Release Notes for ACX7024, ACX7100-32C, ACX7100-48L, and ACX7509 Devices

## IN THIS SECTION

- [What's New | 2](#)
- [What's Changed | 12](#)
- [Known Limitations | 15](#)
- [Open Issues | 16](#)
- [Resolved Issues | 19](#)

These release notes accompany Junos OS Evolved Release 22.4R2 for ACX7024, ACX7100-32C, ACX7100-48L, and ACX7509 devices. They describe new and changed features, limitations, and known and resolved problems in the hardware and software.

## What's New

## IN THIS SECTION

- [Hardware | 3](#)
- [Authentication and Access Control | 3](#)
- [EVPN | 4](#)
- [Interfaces | 5](#)
- [Junos Telemetry Interface | 6](#)
- [MPLS | 6](#)
- [Multicast | 6](#)
- [OpenConfig | 7](#)

- [Routing Protocols | 7](#)
- [Routing Options | 8](#)
- [Additional Features | 9](#)

Learn about new features introduced in this release for ACX Series routers.

To view features supported on the ACX platforms, view the Feature Explorer using the following links. To see which features were added in Junos OS Evolved Release 22.4R1, click the Group by Release link. You can collapse and expand the list as needed.

- [ACX7024](#)
- [ACX7100-32C](#)
- [ACX7100-48L](#)
- [ACX7509](#)

The following sections highlight the key features in this release.

## Hardware

- **Support for 1G copper SFP-T (ACX7024)**—Starting in Junos OS Evolved Release 22.4R1, the ACX7024 router supports 1G copper SFP-T optics. To view the hardware compatibility matrix for optical interfaces, transceivers, and DACs supported on the ACX7024 router, see the [Hardware Compatibility Tool](#).
- **Support for 1G copper SFP-T (ACX7509)**—Starting in Junos OS Evolved Release 22.4R1, the ACX7509 router supports 1G copper SFP-T optics in the ACX7509-FPC-20Y line card. To view the hardware compatibility matrix for optical interfaces, transceivers, and DACs supported on the ACX7509 router, see the [Hardware Compatibility Tool](#).

## Authentication and Access Control

- **Harden shared secrets in Junos OS Evolved (ACX7100, ACX7509, ACX7024, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130, QFX5700, QFX5220, and QFX5230-64CD)**—Starting in Junos OS Evolved Release 22.4R1, you can configure a system primary password and request to decrypt encrypted secrets, allowing for hardening of shared secrets, such as pre-shared keys and RADIUS passwords.

Setting a primary password enables devices to encrypt passwords so that only devices with knowledge of the primary password can decrypt the encrypted passwords. The following CLI commands are supported:

- request system decrypt password
- set system master-password

[See [Master Password for Configuration Encryption](#).]

- **VRF support for TCP keychains (ACX7100, ACX7509, ACX7024, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, we support virtual routing and forwarding (VRF) for TCP connections with keychain-based authentication. VRF enables you to isolate traffic traversing the network without using multiple devices to segment your network.

[See [authentication-key-chains](#).]

## EVPN

- **EVPN-VXLAN to EVPN-VXLAN seamless stitching for EVPN Type 5 routes (ACX7100-32C, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, you can configure EVPN-VXLAN to EVPN-VXLAN seamless stitching with EVPN Type 5 (IP prefix) routes between two interconnected data centers or between two points of delivery (pods) in a data center.

In the EVPN-VXLAN fabric, border leaf or border spine devices act as interconnection gateways. You enable EVPN Type 5 routes in virtual routing and forwarding (VRF) instances on both sides of the interconnection. For each VRF instance, the server leaf devices in the first data center create VXLAN tunnels for Type 5 routes (with corresponding VXLAN network identifiers [VNIs]) toward their local gateway devices. The gateway devices map those VXLAN tunnels to an interconnection tunnel (with a new route distinguisher [RD], route target, and VNI) toward the second data center. The gateway devices in the second data center re-create the Type 5 VXLAN tunnels using their local RD.

We support one-to-one mapping of Type 5 VRF instances across the interconnection.

- **Overlay and CE-IP ping and traceroute support for EVPN-VXLAN (ACX7100-32C, ACX710048L, PTX10001-36MR, PTX10004, PTX10016, QFX5130-32CD, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, you can perform ping and traceroute operations within an EVPN-VXLAN overlay or to a specific customer edge [CE] device IP address (CE-IP) across an EVPN-VXLAN overlay. You can use ping and traceroute and CE-IP ping and traceroute utilities to detect and isolate faults in overlay networks.

[See [Understanding Overlay ping and traceroute Packet Support](#).]

- **Loop detection for EVPN-VXLAN fabrics (ACX7100-32C, ACX7100-48L)**—Support for configuration of loop detection on the server-facing Layer 2 interfaces of the leaf devices in an EVPN-VXLAN fabric. This feature can detect the following types of Ethernet loops:
  - A loop between two interfaces with different Ethernet segment identifiers (ESIs). This loop is typically caused by miswiring fabric components.



- A loop between two interfaces with the same ESI. This loop is typically caused by miswiring a third-party switch to the fabric.  
[See [EVPN User Guide](#), [loop detect](#), and [show loop-detect enhanced interface](#) command.]
- **Support for Remote Port Mirroring and Analyzer - ERSPAN on ACX7024 Device Platform**—You can configure remote port mirroring with an IP address using GRE encapsulation on an EVPN-VXLAN fabric. The router sends the mirrored traffic output through a GRE tunnel to the remote IP destination address that you specify in the configuration as an analyzer instance.

**NOTE:**

[edit forwarding-options analyzer]

Configuration guidelines include the following:

- The ACX7024 router supports mirroring in the hardware on the physical interface, and not on a logical interface.
- In ingress mirroring, incoming traffic is mirrored at the ingress pipeline. Pruning or filtering at the egress pipeline does not affect the mirroring behavior.
- The input port families are `inet`, `inet6`, `ethernet-switching`, and `bridge`.
- The destination address for mirrored output must be an IPv4 address. [See [Port Mirroring and Analyzers](#).]

## Interfaces

- **Interfaces support (ACX7509)**— Starting in Junos OS Evolved Release 22.4R1, we support the following features:
  - 50-Gbps speed for ACX7509-FPC-20Y line cards
  - 8x50G DAC, 50G DAC, and 2x100G channelization for ACX7509-FPC-4CD line cards
  - Pic violation alarm is raised if you violate port speed combinations.

[See [Port Speed on ACX7509-FPC-20Y Overview](#) and [Port Speed on ACX7509-FPC-4CD Overview](#).]
- **Support for auto-negotiation (ACX7509)**—Starting in Junos OS Evolved Release 22.4R1, we support 1G interfaces for ACX7509-FPC-20Y using fiber optics and copper DAC. We also support auto-negotiation for 400G interfaces for ACX7509-FPC-4CD using copper DAC. Use the existing `auto-negotiation | no-auto-negotiation` statement at the [edit interfaces interface-name gigheter-options] hierarchy level to enable and disable auto-negotiation for 1G and 400G interfaces.

[See [auto-negotiation](#).]

## Junos Telemetry Interface

- **Event-driven streaming of sensor data for MPLS LSP record route objects (ACX7100-32C, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)**—Junos OS Evolved Release 22.4R1 introduces ON\_CHANGE notification for streaming MPLS label-switched path (LSP) record route object statistics. ON\_CHANGE mode sends updates for sensor data only when data values change. Support includes leaf nodes under the resource path `/network-instances/network-instance/mpls/signaling-protocols/rsvp-te/sessions/session/record-route-objects/record-route-object/state/`.

[See [Telemetry Sensor Explorer](#).]

- **OpenConfig OSPF configuration and operational state sensors (ACX7100-32C, ACX7100-48L, ACX7509, ACX7024, PTX10001-36MR, PTX10008, and PTX10016)**—Junos OS Evolved Release 22.4R1 introduces support for OpenConfig OSPF data model `openconfig-ospfv2.yang` (version 0.3.1). Support includes configuration and streaming of operational state data under resource path `/network-instances/network-instance/protocols/protocol/ospfv2/`.

For OpenConfig configuration mappings, see [Mapping OpenConfig OSPF Commands to Junos Configuration](#). For state sensors, see [Telemetry Sensor Explorer](#).

## MPLS

- **Support for LDP Tunneling over SR-TE (ACX7100-32C, ACX7100-48L, PTX10003, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can tunnel LDP label-switched paths (LSPs) over segment routing traffic engineering (SR-TE) in OSPF networks. Tunneling LDP over SR-TE provides consistency and co-existence of both LDP LSPs and SR-TE LSPs.

To configure LDP tunneling over SR-TE, include the `tunnel-source-protocol` configuration statement at the `[edit protocols ospf traffic-engineering]` and the `ldp-tunneling` configuration statement at the `[edit protocols ospf source-packet-routing source-routing-path]` hierarchy levels.

[See [Tunneling LDP over SR-TE](#).]

- 

## Multicast

- **Support for BGP MVPN (ACX7024)**—Starting in Junos OS Evolved Release 22.4R1, ACX7024 routers support BGP/MPLS MVPN (also known as next-generation MVPN) running on multipoint LDP provider tunnels. This support is for instances in which BGP MVPN is the intra-AS; PIM SM and multipoint LDP point-to-multipoint (P2MP) tunnels form the data plane.

[See [Multiprotocol BGP MVPNs Overview](#) and [ACX Support for BGP MVPN](#).]

## OpenConfig

- **OpenConfig OSPF configuration and operational state sensors (ACX7100-32C, ACX7100-48L, ACX7509, ACX7024, PTX10001-36MR, PTX10008, and PTX10016)**—Junos OS Evolved Release 22.4R1 introduces support for OpenConfig OSPF data model `openconfig-ospfv2.yang` (version 0.3.1). Support includes configuration and streaming of operational state data under resource path `/network-instances/network-instance/protocols/protocol/ospfv2/`.

For OpenConfig configuration mappings, see [Mapping OpenConfig OSPF Commands to Junos Configuration](#). For state sensors, see [Telemetry Sensor Explorer](#).

## Routing Protocols

- **BMP local RIB monitoring support for all RIBs with sharding (ACX Series, PTX Series, and QFX Series)**—Starting in Junos OS Evolved Release 22.4R1, you can configure a policy to monitor routing information bases also known as routing table (RIBs) of virtual routers and virtual routing and forwarding instances (VRF). You can specify two separate sets of RIBs in the BGP Monitoring Protocol (BMP), one for monitoring and the other for reporting. With this feature BMP can filter traffic based on the routes and routing-instances.

[See [BGP Monitoring Protocol](#), `loc-rib`, and `rib-list`.]

- **Distributing traffic engineering (TE) policies and state by using BGP link-state (ACX7100-32C, ACX7100-48L, ACX7509, ACX7024, PTX10001-36MR, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we support the distribution of traffic engineering (TE) policies and state by using BGP link-state.

[See [Link-State Distribution Using BGP](#), `source-routing-path`, and `show ted spring-te-policy`.]

- **Keep bypass tunnels operational during configuration changes (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can configure the OS to keep bypass tunnels operational until the tunnels no longer carry local repair traffic, even during configuration changes. Bypass tunnels that carry local repair traffic are in the BackupActive state. When you change the bypass-related configuration on software releases containing this feature, the OS keeps any bypass tunnels that are in BackupActive state up. When the bypass tunnels are no longer in BackupActive state, the operating system tears down the bypass tunnels. This feature ensures that all local repair traffic reaches its destination and prevents traffic loss on label-switched paths (LSPs).

Configure this feature at the `[edit protocols rsvp interface all link-protection]` hierarchy level. Use the `show rsvp session bypass` command to check whether the bypass routes protecting an interface remain operational in BackupActive state after the configuration changes.

[See [link-protection \(RSVP\)](#) and [Link Protection for MPLS LSPs](#).]

- **OSPF FAPM and inter area support (ACX7100-32C, ACX7100-48L, PTX10001-36MR, PTX10003, PTX10008, and PTX10016)**—Starting with Junos OS Evolved Release 22.4R1, the Flexible Algorithm Prefix Metric (FAPM) is defined to allow an optimal end-to-end path for an inter-area prefix. The Area Border Router (ABR) *must* include the FAPM when advertising the prefix between areas that are reachable in that given Flexible Algorithm (flex algo). When a prefix is unreachable, the ABR *must not* include that prefix in the flex algo when advertising between areas. The defined FAPM provides inter-area support.

[See [Understanding OSPF Flexible Algorithm for Segment Routing](#).]

- **TCP-AO and TCP MD5 authentication support prefixes for LDP and BGP (ACX7100-32C, ACX7100-48L, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5220, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, we have extended TCP Authentication Option (TCP-AO) and TCP MD5 to support IP subnets for BGP and LDP sessions. When you configure TCP authentication with a network address and a prefix length, your chosen TCP authentication method authenticates TCP connections to the entire range of addresses under that subnet. This means you can authenticate TCP connections without needing to know the exact IP addresses of the destination devices.

When IP subnets overlap, the authentication method uses the longest prefix match (LPM) to determine the exact authentication key for a specific TCP session.

[See [TCP](#).]

- **TCP-AO and TCP MD5 authentication are VRF aware for LDP and BGP (ACX7100-32C, ACX7100-48L, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5220, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, TCP Authentication Option (TCP-AO) and TCP MD5 authentication are VRF aware in BGP and LDP sessions. You can configure TCP-AO and TCP MD5 under non-default routing instances. The TCP authentication method you configure under a routing instance is only applied to the TCP sessions inside that VRF instance. If a TCP connection in a different VRF instance has the same destination IP address, the TCP authentication method does not get applied to that TCP connection if the VRF instance does not have TCP authentication configured for the peer.

[See [TCP](#).]

- **Flex algo and FAPM leaking across IS-IS multi-instance (ACX7100-32C, ACX7100-48L, PTX10003, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we've added support to readvertise flexible algorithm (flex algo) prefix-segment identifiers (SIDs) and Flexible Algorithm Prefix Metrics (FAPMs) across interior gateway protocol (IGP) instances. We have also added support to readvertise other protocol prefixes and assign flex algo prefix-SIDs via policy to those prefixes.

## Routing Options

- **Support for bootstrapping route-validation database from a local file (ACX7100-32C, ACX7100-48L, ACX7509, PTX10001-36MR, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5700, and**

**QFX5220**)—Starting in Junos OS Evolved Release 22.4R1, we support the ability to read validation records from a local binary file and install the records into specified named route-validation databases within RPD. This feature implements syntactic and semantic checks on the content of the file to ensure that it is a well-specified set of validation records. If the syntactic and semantic checks fail, the entire file is rejected as a source of validation records. Use the `source-file` statement under the `[edit routing-options validation]` hierarchy level to source route-validation records from a local file source. You can use the `show validation source-file` command to display the properties of a local validation source file.

[See [validation](#).]

## Additional Features

We have extended support for the following features to the platforms shown in parentheses:

- **CoS support for EVPN-VXLAN** (ACX7100-32C and ACX7100-48L)

[See [CoS Support on EVPN VXLANs](#).]

- **DSCP Propagation and rewrite feature support for EVPN VXLANs** (ACX7100-48L)

[See [DSCP Propagation and Default CoS on ACX Series Routers](#) and [Applying DSCP and DSCP IPv6 Classifiers on ACX Series Routers](#).]

- **Firewall filtering and policing support on EVPN-VXLAN traffic** (ACX7100-48L)

[See [Firewall Filters Overview](#) and [Understanding EVPN with VXLAN Data Plane Encapsulation](#).]

- **Hierarchical Class of Service (CoS) support for Layer 3 VPN, Layer 2 VPN, Layer 2 Circuit, VPLS, and EVPN services** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [Hierarchical Class of Service in ACX Series Routers](#).]

- **HMAC-SHA-2 authentication support for users of SNMPv3 USM** (ACX7100-32C, ACX7100-48L, ACX7509, ACX7024, PTX1000136MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5700, and QFX5220)—Starting in Junos OS Evolved Release 22.4R1, you can configure HMAC-SHA-2 authentication protocols for users of the SNMPv3 user-based security model (USM) with the following new CLI configuration statements:

- `authentication-sha224`
- `authentication-sha256`

We've introduced these statements for local-engine users at `[edit snmp v3 usm local-engine user username]` and for remote-engine users at `[edit snmp v3 usm remote-engine engine-id user user-name]`.

[See [authentication-sha224](#) and [authentication-sha256](#).]

- **IPv4 and IPv6 filter support for SRv6** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [Firewall Filter Match Conditions and Actions \(ACX Series Routers\)](#).]

- **IRB support for VPLS** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [Configuring VPLS and Integrated Routing and Bridging](#).]

- **Layer 2 control protocol (L2CP) transparent tunnelling** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [Layer 2 Protocol Tunneling](#).]

- **Media Access Control Security (MACsec)** (ACX7100 and ACX7509)

[See [Understanding Media Access control Security \(MACsec\)](#).]

- **Multicast with IGMP or MLD snooping within VLANs for EVPN-MPLS** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [Overview of Multicast Forwarding with IGMP or MLD Snooping in an EVPN-MPLS Environment](#).]

- **NETCONF and shell sessions over enhanced outbound HTTPS** (ACX7100-32C, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5700)

[See [NETCONF and Shell Sessions over Enhanced Outbound HTTPS](#).]

- **OAM ping and traceroute support for segment routing with IPv6 (SRv6) network programming** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [ITU-T Y.1731 Ethernet Service OAM Overview](#) and [How to Enable SRv6 Network Programming in IS-IS Networks](#).]

- **Paragon Active Assurance (PAA) 4.1.0 test agent** (ACX7024)

[See [Install the Paragon Active Assurance \(PAA\) Test Agent](#).]

- **RFC2544 benchmarking test reflector support for L2 services (L2(Bridge), L2CKT, L2VPN, EVPN-VPWS, EVPN-FXC, EVPN-MPLS, and VPLS) and L3 services** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [RFC 2544-Based Benchmarking Tests for ACX Routers Overview](#) .]

- **sFlow ingress support** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [sFlow Monitoring Technology](#).]

- **SRv6 support for locator summarization, anycast locator, service mapping, and multi-instance IS-IS** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [How to Enable SRv6 Network Programming in IS-IS Networks](#) and [How to Configure Multiple Independent IGP Instances of IS-IS.](#)]

- **Support for G.8275.2 profile with PTP over IRB using IPv4 and IPv6 unicast** (ACX7100-32C and ACX7100-48L)

[See [G.8275.2 Enhanced Profile](#) and [Configure PTP Over Integrated Routing and Bridging \(IRB\).](#)]

- **Support for Layer 2 Features - MAC move limit and multiple trunk ports** (ACX7024 and ACX7509)

[See [Understanding MAC Limiting and MAC Move Limiting.](#)]

- **Support for loop-free alternate (LFA) Routes for OSPF and IS-IS** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)—Starting in Junos OS Evolved 22.4R1, we support loop-free alternate routes for OSPF and IS-IS. LFA enables IP fast-reroute capability for OSPF and IS-IS.

[See [Loop-Free Alternate Routes for OSPF Overview](#) and [Understanding Loop-Free Alternate Routes for IS-IS.](#)]

- **Support for MPLS LSP statistics and RSVP-TE auto-bandwidth features** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)—Support includes:

- MPLS LSP statistics for the following LSP types:

- LDP-signaled LSPs
- RSVP-signaled LSPs
- Static LSPs
- Bypass LSPs
- Container LSPs

- RSVP-TE Auto-bandwidth

[See [LSP Overview](#), [LDP Overview](#), [RSVP Overview](#), and [Configuring Optimized Auto-bandwidth Adjustments for MPLS LSPs.](#)]

- **Support for port mirroring with ERSPAN** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [Port Mirroring and Analyzers.](#)]

- **Support for displaying load balancing decision result for L3 unicast traffic** (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)

[See [show forwarding-options load-balance.](#)]

- **Two-Way Active Measurement Protocol (TWAMP) monitoring service (RFC5357) hardware timestamp support** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See the offload-type inline-timestamping option of the [test-session](#) statement.]

- **Unnumbered interfaces support for Segment Routing (SR) with OSPF** (ACX7100-32C, ACX7100-48L, ACX7024, and ACX7509)

[See [Configure Unnumbered Interfaces](#).]

## What's Changed

### IN THIS SECTION

- [EVPN | 12](#)
- [General Routing | 13](#)
- [Juniper Extension Toolkit \(JET\) | 13](#)
- [Junos OS API and Scripting | 13](#)
- [Network Management and Monitoring | 14](#)
- [Platform and Infrastructure | 14](#)
- [System Management | 14](#)
- [User Interface and Configuration | 14](#)

Learn about what changed in this release for ACX Series routers.

## EVPN

- **Support for configuring multi-chassis protection at the global level (ACX7509)**— We've enabled the multi-chassis-protection statement at the edit multi-chassis global hierarchy level for ACX7509 devices. In earlier releases, multi-chassis-protection could only be enabled at the interface level.
- **Flow-label configuration status for EVPN ELAN services**— The output for the show evpn instance extensive command now displays the flow-label and flow-label-static operational status for a device and not for the routing instances. A device with flow-label enabled supports flow-aware transport (FAT) flow labels and advertises its support to its neighbors. A device with flow-label-static enabled supports FAT flow labels but does not advertise its capabilities.



## General Routing

- Prior to this change when route sharding is configured the output of CLI `show route` commands included information about sharding. After the change the use must add the **rib-sharding all** argument to CLI `show route` commands to display sharding information.
- sFlow configuration? sFlow configuration is allowed only on et, xe, and ge interfaces in EVO-based platforms. All other interfaces are blocked for configuring sFlow on EVO platforms. A cli error will be thrown if sFlow is configured on any other interface other than et, xe or ge interface.
- The Ethernet link fault management process (lfmd) runs only when the link-fault-management protocol is configured.
- The traffic rate could display incorrect values in the `show services inline ip-reassembly statistics fpc x pfe-slot y` output.

## Juniper Extension Toolkit (JET)

- **Python 3 is the default and only Python version for executing Juniper Extension Toolkit Python scripts (ACX Series, PTX Series, and QFX Series)**—Junos OS Evolved supports only Python 3 for executing Juniper Extension Toolkit (JET) scripts written in Python. Python 2.7 is no longer supported for executing JET scripts, and we've deprecated the `language python` statement at the `[edit system scripts]` hierarchy level.

[See [Understanding Python Automation Scripts for Junos Devices](#).]

## Junos OS API and Scripting

- **Deprecated functions in the `libpyvrf` Python module (ACX Series, PTX Series, and QFX Series)**—The `libpyvrfPython` module no longer supports the `get_task_vrf()` and `set_task_vrf()` functions.

[See [How to Specify the Routing Instance in Python 3 Applications on Devices Running Junos OS Evolved](#).]

## Network Management and Monitoring

- **Junos YANG modules for RPCs include the `junos:command` extension statement (ACX Series, PTX Series, and QFX Series)**—The Junos YANG modules that define RPCs for operational mode commands include the `junos:command` extension statement in schemas emitted with extensions. The statement defines the CLI command for the corresponding RPC. The Juniper [yang](#) GitHub repository stores the RPC schemas with extensions in the `rpc-with-extensions` directory for the given release and device family. Additionally, when you configure the `emit-extensions` statement at the `[edit system services netconf yang-modules]` hierarchy level and generate the YANG schemas on the local device, the YANG modules for RPCs include the `junos:command` extension statement.

## Platform and Infrastructure

- **Internal Python tools and scripts use Python 3 (ACX7100-32C, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5220)**—Junos OS Evolved uses Python 3 for all internal Python tools and scripts, but there is no change in functionality on the device.

## System Management

- When disk usage for the `run` directory is above 85%, ZooKeeper logs and snapshots in the `/run/zookeeper/conf/default/version-2` directory will be deleted if there are more than 3 files, leaving only the 3 most recent files.

## User Interface and Configuration

- **Changes to the JSON encoding of configuration data for YANG leaf nodes of type `identityref` (ACX Series, PTX Series, and QFX Series)**—If a YANG leaf node is type `identityref`, Junos devices emit the namespace-qualified form of the identity in the JSON encoding of that node. In addition, Junos devices accept both the simple (no namespace) and the namespace-qualified form of an identity in JSON configuration data. In earlier releases, Junos devices only emit and accept the simple form of an identity. Emitting and accepting the namespace-qualified identity ensures that the device can properly resolve the value in the event that the YANG data model defines an identity and a leaf node containing the `identityref` value in different modules.

- The `file copy` command supports only text-formatted output in the CLI (ACX Series, PTX Series, and QFX Series)—The `file copy` command does not emit output when the operation is successful and supports only text-formatted output when an error occurs. The `file copy` command does not support using the `| display xml` filter or the `| display json` filter to display command output in XML or JSON format in any release. We've removed these options from the CLI.

## Known Limitations

### IN THIS SECTION

- [General Routing | 15](#)

Learn about limitations in this release for ACX Series routers.

For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

## General Routing

- The error messages **Supercon-core 0000:xx:xx:x: Supercon scratch** are observed in the boot log of backup Routing Engine. The errors are observed only during booting of backup Routing Engine and do not have any functional impact. These messages should be ignored. [PR1594136](#)
- A portion of the G.8273.2 test for PTP to PTP and PTP to 1PPS noise transfer fails on ACX7100-32C. [PR1611838](#)
- syncE to PTP and syncE to 1pps noise transfer tests fail for frequencies on ACX7100-32C 1. 0.00781 HZ 2. 0.01563 HZ 3. 0.03125 HZ 4. 0.06156 HZ 5. 0.12313 HZ. [PR1611911](#)
- 400G DAC flap might be seen after OIR, FPC restart, device reboot, enabling or disabling interface. [PR1618488](#)
- When the original flow egresses out through an aggregated Ethernet interface, the corresponding sampled sflow frame does not reflect the correct egress port number. This happens only when the flow is egresses out through an aggregated Ethernet interface. For non-aggregated Ethernet egress interface, this works fine and the sflow frame reflects the correct egress port. [PR1647870](#)

- ACX7024: With high scale of L3VPN VRF instances system CPU usage might continue to be high.[PR1655310](#)
- When test agents participating to UDP measurement are close by and time is not well synchronised, reporting results is paused due to measured negative one way delay.[PR1684358](#)
- One lo0 filter entry is added implicitly when inet or /inet6 family is added for each non-zero lo0 logical interfaces (lo0.1, lo0.2 etc). The implicit filter entries also take up shared TCAM banks and can reduce the SnP claimed scale.[PR1691120](#)
- When testing for Class-C performance using channelised 50g interface speed with 100g and 25g as other port, the average cTE marginally exceeds the Class-C mask.[PR1695674](#)

## Open Issues

### IN THIS SECTION

- [General Routing | 16](#)
- [Class of Service \(CoS\) | 18](#)
- [Services Applications | 19](#)
- [User Interface and Configuration | 19](#)

Learn about open issues in this release for ACX Series routers.

For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

## General Routing

- In some corner cases, traffic is not scheduled equally between strict priority queues. This can happen in the following scenario: Priority queue configured and completely utilizes the bandwidth and remaining queues are starved and traffic completely drops on those queues. In this state if we configure a second strict high priority queue, traffic is not scheduled equally between strict priority queues. This is hardware (ACX7509) specific issue. If we have a shaper on priority queue, this issue does not happen. Also if the traffic starts after the configurations no issues are seen.[PR1577035](#)

- The timingd application cannot be successfully restarted on ACX7100 or ACX7024 with G.8275.1 profile configuration. If there are PTP streams configured and there is a timingd restart due to timingd core file generation or requested application restart, the PTP streams might not be restored correctly and changes to the PTP stream configuration after the restart might result in PTP streams that do not forward data packets correctly. It is very likely that a restart always affect the streams.[PR1597120](#)
- G.8275.1- G.8273.2 1PPS cTE performance test might be marginally outside class-C for PTP BC on ACX7100-48L, especially for mixed speed port testing with combinations of 10G / 25G channelized ports and 100G ports. On each reboot, the 1PPS cTE measurement might be within the class-C measurement threshold, or might randomly be out of threshold by a few nanoseconds.[PR1607381](#)
- The syncE to PTP and syncE to 1pps transient response marginally fails. This happens when the servo gets the initial 100ns jump in one measurement window and the next 100ns in the next measurement window adjusting less initially. [PR1611848](#)
- ACX7509: Ungraceful removal (OIR) of FPC or an FPC fault might result in PCIE MAJOR alarm **PCI Uncorrected error on dev 0000:00:03.0** which does not get cleared. [PR1620197](#)
- If system is fully scaled across features and firewall is also scaled, CPU consumption is more for a small window of around 5 seconds after every 18 seconds or so. Evo-pfemand is busy collecting the scaled firewall stats for that 5 second window and any other applications such as **pfe-cli** trying to execute commands might fail during it. [PR1629342](#)
- On all Junos Evolved platform with dual Routing Engines, If FPC is restarted and multiple features such as L3VPN, L2VPN, SR, LDP etc.. are configured with scale, then picd (physical interface card daemon) crash is observed occasionally which brings all FPCs down causing complete traffic blackhole.[PR1650302](#)
- When TCP Main and TCP remaining are attached together on physical interface, it is observed that improper scheduler MAP gets configured on HQoS physical interface while sched params modification and bind are performed on the same commit. This is a sequence issue from CoSD (Routing Engine) which is not guaranteed at Packet Forwarding Engine side and this applicable for all platforms.[PR1664785](#)
- In ACX7509, PTP does not work if we move Layer 2 configuration to Layer 3 configuration.[PR1669128](#)
- HQoS - VoQ stats issue during scaled configuration with congestion. When a system is configured with maximum allowed TCP on logical interfaces across physical interface, and all VoQ traffic is congested. It is expected that VoQ queued counters and dropped counters don't show valid information. Reason : At some point of time, limited or no guaranteed buffer is available to process further packets, Hence, packets are dropped well before reaching VoQ. This works as per hardware design. [PR1674669](#)
- ECMP over MPLS FRR feature is not supported.[PR1676526](#)

- The QSFP28-DD-2X100GBASE-LR4 links go down on multiple FPC restarts or system reboots due to the optics tx loss. [PR1685520](#)
- ACX7509: G.8275.1 FPC Dpll status is incorrectly shown in `timingd gencfg ptp` centralized command. [PR1685675](#)
- In ACX7509, syncE to PTP and 1PPS noise transfer and transient test fails. [PR1685979](#)
- `[interface] [evo_ifd] ACX7100-32C` :: Module temperature is very high at default fan speed and need update to EM policy. [PR1688306](#)
- When using RFC2544 benchmarking within Layer 2 VPN services in routing Instances, the operational CLI to display the RFC2544 test results returns an error when the `routing-instance` value is used. [PR1696146](#)
- When the following command `set routing-options transport-class auto-creates` is configured, `rpd` creates or deletes tables dynamically. There is a flaw in the Delete Flow, which does not delete the table from the kernel, and when the next time `rpd` adds the same table, the operation is stuck with EEXISTS error, as previous delete was never done. Any subsequent commit resolves this issue. [PR1696199](#)
- DTE mask fails for cascaded setup with long run. [PR1697093](#)
- When BFD sessions are scaled upto 4k (2k IPv4 & 2k IPv6), few BFD over IPv6 sessions do not come up (< 10 sessions). The sessions are distributed among 4 different clients: 1k OSPF, 1k IS-ISv4, 1k BGPv6 & 1k Staticv6. The sessions that do not come up are BFD over Staticv6 client, other clients have no issues. [PR1699085](#)
- `Timingd` core file is generated with PTPoIRB configuration. [PR1701122](#)
- On ACX7509, MACsec MKA sessions might not come up after restarting FPC multiple (4-5) times. The only way to recover from this situation is to reboot the chassis. [PR1701941](#)
- MCLAG: IPv6 ping fails between host and one of the MCLAG peer. With this issue on the setup, there is a traffic drop as IPv6 neighborhood does not come up between the `irb` interfaces. With deactivating and activating `irb` interface, IPv6 neighborhood gets resolved. [PR1704177](#)

## Class of Service (CoS)

- Platform dependency-state error is seen on `cosd`. [PR1649388](#)

## Services Applications

- Paragon Active Assurance (PAA) plugins might report incorrect latency results occasionally exceeding 20 ms, the error is larger in transmit direction and is more likely to occur at higher rates. [PR1697270](#)

## User Interface and Configuration

- The system might ask for your password when you try to save the configuration file. [PR1665008](#)

## Resolved Issues

### IN THIS SECTION

- [EVPN | 19](#)
- [General Routing | 20](#)
- [Interfaces and Chassis | 21](#)
- [Platform and Infrastructure | 22](#)
- [Services Applications | 22](#)
- [User Interface and Configuration | 22](#)

Learn about the issues fixed in this release for ACX Series routers.

For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

## EVPN

- EVPN next hops are not correctly synchronised between Routing Engine and Packet Forwarding Engine. [PR1633344](#)

## General Routing

- On all devices running Junos OS Evolved, you cannot clear or reset the disk option specified in the scheduled request `node reboot` command. The node reboots with the disk option last specified. [PR1517596](#)
- In ACX7509, on multiple FPC restart, link does not come up with huge FEC errors. [PR1639666](#)
- The command `show system core-dumps routing-engine both` is broken. To list the core files in the system, use `show system core-dumps` instead of `show system core-dumps routing-engine both`.
- The classification-override functionality does not work for IPv6 traffic. [PR1650622](#)
- The `jdhcpd` process might be stuck at 99% if `traceoptions` is enabled in high DHCP traffic scenario. [PR1658087](#)
- Core file is seen when any invalid range of interfaces is committed in any group under `dhcpv6 dhcp-local-server system services` and the device is booted. For example: `set system services dhcp-local-server group g1 interface ge-0/0/1.3 upto ge-0/0/1.1`. [PR1658327](#)
- The object-info anomalies reported for `picd` relating to `pfeE` while testing switchover. [PR1662411](#)
- System shutdown might be observed for erroneous read for system temperature from the ASIC. [PR1664302](#)
- MVRP enabled trunk ports might go into blocked or designated state on the ACX Series Junos OS Evolved platforms. [PR1666921](#)
- The `hwdre` and `evo-pfemand` applications might crash if `idmd`, `fabtoken` and `hwdre` are restarted immediately after a FEB offline. After crashing, the apps restart automatically and work normally. No workaround is possible for this problem. [PR1669130](#)
- Switchover caused by primary RCB power-fault might cause links to go down. After switchover, the new primary FEB sees a spurious FEB power-fault causing a primary role yield followed by a primary role acquire (because the peer RCB is power faulted). These additional two switchovers lead to the problem. [PR1669162](#)
- Rare traffic stall in scaled scenarios on FEB offline or online. [PR1669211](#)
- `show system alarm` CLI command shows Optics does not support configured speed minor alarm for few 1G optics [PR1671200](#)
- ACX7509 HA: Backup FEB1 links down after primary FEB0 restart. [PR1673274](#)



- Junos OS Evolved- ACX : Fixed classification on aggregated Ethernet interface does not work on system reboot or Packet Forwarding Engine restart.

Workaround- If reboot is triggered with fixed classifier on aggregated Ethernet interface, detach and attach the fixed classifier on AE interface.

[PR1676103](#)

- JDI-RCT: EVPN-VXLAN-ERB: ACX7100-32C: IPv4/IPv6 EP-Type2 intra-vni traffic fails on leaf device after loading Junos OS Evolved BO profile configurations. [PR1680253](#)
- Junos OS Evolved upgrade from 22.3-202207011429.0-EVO to 22.4-202207270552.0-EVO causes commit to fail with **failed to load external entity /var/db/scripts/import/junos.xml**. [PR1680266](#)
- ACX7100-32C port down when configuring speed as 10g at version 22.2R1. [PR1681560](#)
- PTP/TWAMP does not work on PM50 ports ( et-0/0/0 to et-0/0/3 on ACX7024 and all ports on ACX7100-48L) if FEC74 is enabled on that port.

Workaround- Setting fec to fec91 or none resolves the issue. [PR1684770](#)

- On Junos OS Evolved ACX platforms, when making changes to EVPN (Ethernet Virtual Private Network) Routing instances or Bridge-domain or single tagged Layer 3 or IRB (Layer 3/Integrated Routing and Bridging), egress traffic is impacted. [PR1687260](#)
- ACX7509 timing PTP, does not support Routing Engine switchover. [PR1690984](#)
- On all Junos OS Evolved platforms, when executing `clear arp hostname host IP` command, host IP in all the routing instances get cleared (if they exist), as against the expectation that it should be cleared only in default routing instance. If traffic is ongoing, and ARP entry for the host IP gets incorrectly cleared due to this action, some traffic drops are seen till ARP re-learning happens. It is advised to use `clear arp hostname host IP vpn routing-instance / vpn name` command only to obtain expected results. [PR1691524](#)
- LACP and LLDP protocol traffic is not transparently forwarded across the CE devices. [PR1692402](#)

## Interfaces and Chassis

- LLDP packet drop is seen when the physical interface is configured with flexible-vlan-tagging. [PR1689391](#)

## Platform and Infrastructure

- On Junos OS Evolved ACX Series platforms configured with TWAMP, might crash when the TWAMP client tries to create a session with the TWAMP server. [PR1667716](#)

## Services Applications

- ACX7100: Spikes in jitter that are larger than 5 ms for UDP plugin in PAA for high bandwidth or small packet size. [PR1680309](#)

## User Interface and Configuration

- Test configuration might fail even though the configuration file has valid configurations. [PR1671112](#)

# Junos OS Evolved Release Notes for PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016 Devices

### IN THIS SECTION

- [What's New | 23](#)
- [What's Changed | 43](#)
- [Known Limitations | 47](#)
- [Open Issues | 48](#)
- [Resolved Issues | 52](#)

These release notes accompany Junos OS Evolved Release 22.4R1 for PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016 Packet Transport Routers. They describe new and changed features, limitations, and known and resolved problems in the hardware and software.

## What's New

### IN THIS SECTION

- [Hardware | 24](#)
- [Authentication and Access Control | 24](#)
- [Chassis | 25](#)
- [Class of Service | 28](#)
- [Ethernet Switching and Bridging | 28](#)
- [EVPN | 28](#)
- [Interfaces | 30](#)
- [Intrusion Detection and Prevention | 30](#)
- [IP Tunneling | 30](#)
- [Junos Telemetry Interface | 30](#)
- [Layer 2 Features | 32](#)
- [MPLS | 33](#)
- [Network Management and Monitoring | 35](#)
- [OpenConfig | 36](#)
- [Routing Options | 36](#)
- [Routing Policy and Firewall Filters | 37](#)
- [Routing Protocols | 38](#)
- [Source Packet Routing in Networking \(SPRING\) or Segment Routing | 40](#)
- [Software Installation and Upgrade | 40](#)
- [Additional Features | 41](#)

Learn about new features introduced in this release for PTX Series routers.

To view features supported on the PTX platforms, view the Feature Explorer using the following links. To see which features were added in Junos OS Evolved Release 22.4R1, click the Group by Release link. You can collapse and expand the list as needed.

- [PTX10001-36MR](#)
- [PTX10003](#)
- [PTX10004](#)
- [PTX10008](#)
- [PTX10016](#)

The following sections highlight the key features in this release.

## Hardware

- **New routing engines (PTX10008 Packet Transport Routers)**—Starting in Junos OS Evolved Release 22.4R1, we introduce support for the JNP10K-RE2-E128 routing engines for PTX10008 packet transport routers. The new routing engines come with Trusted Platform Module (TPM) 2.0 chip that supports DevID.

DevID is an X.509 cryptographic certificate. It is programmed into the TPM 2.0 chip during manufacturing and contains the serial number of the device. The key benefits of the TPM 2.0 chip are that it:

- Supports Secure Zero Touch Provisioning (sZTP).
- Helps us validate the authenticity of the device.
- Protects device data.

JNP10K-RE2-E128 routing engines replace the JNP10K-RE1-E128 routing engines.

[See [PTX10008 Packet Transport Router Hardware Guide](#).]

## Authentication and Access Control

- **Harden shared secrets in Junos OS Evolved (ACX7100, ACX7509, ACX7024, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130, QFX5700, QFX5220, and QFX5230-64CD)**—Starting in Junos OS Evolved Release 22.4R1, you can configure a system primary password and request to decrypt encrypted secrets, allowing for hardening of shared secrets, such as pre-shared keys and RADIUS passwords.

Setting a primary password enables devices to encrypt passwords so that only devices with knowledge of the primary password can decrypt the encrypted passwords. The following CLI commands are supported:

- request system decrypt password
- set system master-password

[See [Master Password for Configuration Encryption](#).]

- **VRF support for TCP keychains (ACX7100, ACX7509, ACX7024, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, we support virtual routing and forwarding (VRF) for TCP connections with keychain-based authentication. VRF enables you to isolate traffic traversing the network without using multiple devices to segment your network.

[See [authentication-key-chains](#).]

- **OpenSSH certificate support (PTX10008, PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can configure SSH certificate-based authentication for users and hosts. This feature enables you to set up SSH access to a device with password-less login for users and gives the capability to trust hosts without the need to verify key fingerprints.

You can use the following new CLI configuration statements to configure SSH certificate-based authentication:

- [system services ssh trusted-user-ca-key-file *filename*]—Configure the TrustedUserCAKey file at **/etc/ssh/sshd\_config**, which contains the public keys of an SSH certificate.
- [system services ssh host-certificate-file *filename*]—Configure the HostCertificatefile at **/etc/ssh/sshd\_config**, which contains the signed host certificate.
- [system services ssh authorized-principals-file *filename*]—Configure the AuthorizedPrincipalsFile at **/var/etc**, which contains a list of names, one of which must appear in the certificate for it to be accepted for authentication.
- [system services ssh authorized-principals-command *program-path*]—Specify a program to be used for generating the list of allowed certificate principals found in the AuthorizedPrincipalsFile.

[See [Configure SSH Service for Remote Access to the Router or Switch](#).]

## Chassis

- **Support for Forwarding Information Base (FIB) installation and prefix prioritization (PTX10001-36MR, PTX10004, PTX10008, and PTX10016)** that includes:
  - **FIB Prefix Prioritization:** Applied at routing policy level. FIB prefix prioritization is currently supported only for IPv4 & IPv6.
  - **FIB prioritization:** A system-wide configuration, where the user can specify percentage of memory to be reserved for high-priority and medium-priority IP routes at device level. High and medium priority routes are installed using the pre-allocated resource pools with default or user-defined limits. The number of high-priority or medium-priority routes supported depends on memory

available on the FPCs. This feature provides an extra level of assurance that important routes are installed and retained into the FIB.

The list of important routes may include the following:

- Interface and local routes
- Host routes
- IGP routes
- Certain important BGP routes for various infrastructure services or business-critical services
- Static, aggregate, and generated routes

The related CLI commands are as follows:

#### At the device level:

- `fib-prioritization (high-priority-memory-percent <memory_percent> | medium-priority-memory-percent <memory_percent>)`
- Use the `show pfe route summary` command to view the total number of errors per route table per FPC slot.

#### At the routing policy level:

- Configure route installation prioritization based on user-configurable priorities through the forwarding table export policy, using the command `set policy-options policy-statement <policy-name> term <term-name> then fib-install-priority (high | medium)`.
- Use the `show route extensive` command to confirm if the FIB priority flag is set or cleared correctly according to the configuration.

#### Limitations

- Route prioritization is based on user-configurable priorities using forwarding tables. Interface routes bypass the policy evaluation and receive the highest priority unconditionally.
- If a next-hop installation fails, then the addition of any high-priority route can fail.
- If a user adds a static route for the same host that is at a higher priority over a destination host route, the user-defined route is selected as the best route by default.
- You must reboot the device every time the FIB prioritization configuration is changed.

[See [fib-prioritization](#), [show-pfe-route-summary](#), [FIB Install Priority](#) and [FIB Prefix Prioritization](#).]

- **Platform and Forwarding software support for FPC Online (8T, 16T) on PTX10003:** Support to configure individual PFEs as powered off when an FPC is brought online or during runtime. The feature support includes:
  - Logical FPC restart from CLI.
  - Individual PFE restart from CLI.
  - PFE boot-time disable configuration.
  - Restart of forwarding processes that are abnormally terminated.

The feature manages PFE and Platform resiliency for the following aspects:

- RE and FPC FRUs, PIC FRUs, and devices
- MAC security functionality during restart
- Network timing sources
- Local PFE fabric connectivity
- During FPC restart, FPC offline, and online initialization and termination
- PFE offline that occurs in response to the runtime CLI configuration
- PFE boot-time disable configuration

The CLI configuration `set chassis fpc <fpc-slot> pfe <pfe-instance> power-off` is added to retain specific PFE instances in powered-off mode, when an FPC is brought online or to power off a PFE during runtime. [See [request chassis fpc.](#)]

- **Support for JNP10K-RE2-E128 Routing Engines on PTX10008 Packet Transport Routers.** The new routing engines come with a Trusted Platform Module (TPM) 2.0 chip that supports secure device IDs (DevID).

DevID is a device ID with an X.509 cryptographic certificate. DevID uniquely identifies the device and helps Juniper Networks validate device authenticity. It is programmed in to the TPM 2.0 chip during manufacturing and contains the serial number of the device. The key benefits of the TPM 2.0 chip are that:

- It supports Secure Zero Touch Provisioning (sZTP).
- It helps Juniper Networks validate the authenticity of the device.
- It protects device data.

JNP10K-RE2-E128 routing engines replace the JNP10K-RE1-E128 routing engines. The new TPM2.0-based SKU Model names are:

- JNP10K-RE2-E128 (Spare)
- JNP10K-RE2-E128-BB (Bundle)
- JNP10K-RE2-E128-R (Dual RE)

[See [Zero Touch Provisioning](#), [PTX10008 Hardware Guide](#), [Master Password for Configuration Encryption](#) .]

## Class of Service

- **Support for Routing-Instance based CoS Classifiers (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can apply class of service (CoS) classifiers to the routing instance on your PTX devices. This feature is for routing instances with VRF table labels enabled. Supported classifier types include:

- MPLS EXP
- DSCPv4
- DSCPv6

[See: [classifiers \(Routing Instance\)](#).]

- **Support for EXP bit rewrite in Segment Routing Flattened Mode (PTX10008 and PTX10016)**—Starting in Junos OS Release 22.4R1, we support class of service (CoS) EXP bit rewrites in segment routing (SR) flattened mode for PTX10008 and PTX10016 platforms. Applying an EXP rewrite rule to the egress interface on the ingress (provider edge) router of an SR network imposes the rule to all transport labels in the stack. As a result, you don't have to configure rewrite rules for every segment in the network.

[See: [Class of Service: exp](#).]

## Ethernet Switching and Bridging

- **Support for Interface MAC Limit Action (PTX10001-36MR, PTX10004, PTX10008, and PTX10016 Packet Transport Routers)**—Starting in Junos OS Evolved Release 22.4R1, we introduce support for Interface MAC Limit Action (drop | drop-and-log | log | shutdown) on PTX10001-36MR, PTX10004, PTX10008, and PTX10016 packet transport routers.

[See [Configuring MAC Limiting](#) and [packet-action](#).]

## EVPN

- [See [install-nexthop](#).]
- **EVPN-VXLAN to EVPN-VXLAN seamless stitching for EVPN Type 5 routes (ACX7100-32C, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5700)**—Starting in Junos OS Evolved



Release 22.4R1, you can configure EVPN-VXLAN to EVPN-VXLAN seamless stitching with EVPN Type 5 (IP prefix) routes between two interconnected data centers or between two points of delivery (pods) in a data center.

In the EVPN-VXLAN fabric, border leaf or border spine devices act as interconnection gateways. You enable EVPN Type 5 routes in virtual routing and forwarding (VRF) instances on both sides of the interconnection. For each VRF instance, the server leaf devices in the first data center create VXLAN tunnels for Type 5 routes (with corresponding VXLAN network identifiers [VNIs]) toward their local gateway devices. The gateway devices map those VXLAN tunnels to an interconnection tunnel (with a new route distinguisher [RD], route target, and VNI) toward the second data center. The gateway devices in the second data center re-create the Type 5 VXLAN tunnels using their local RD.

We support one-to-one mapping of Type 5 VRF instances across the interconnection.

- **Overlay and CE-IP ping and traceroute support for EVPN-VXLAN (ACX7100-32C, ACX710048L, PTX10001-36MR, PTX10004, PTX10016, QFX5130-32CD, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, you can perform ping and traceroute operations within an EVPN-VXLAN overlay or to a specific customer edge [CE] device IP address (CE-IP) across an EVPN-VXLAN overlay. You can use ping and traceroute and CE-IP ping and traceroute utilities to detect and isolate faults in overlay networks.

[See [Understanding Overlay ping and traceroute Packet Support](#).]

- **Support for control plane transparency for EVPN-VPWS (E-LINE), EVPN-MPLS (E-LAN) and layer2 switching (PTX10001-36MR, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we support Layer 2 Control Protocol (L2CP) transparency as defined by the Metro Ethernet Forum (MEF). MEF defines the rules devices use to transparently forward L2CP frames by using the reserved MAC addresses dedicated to L2CPs. MEF specifies that L2CP frames can be either peered, passed, or discarded. Juniper forwards (passes) L2CP frames that are received at the user network interface of the ingress PE Junos device unless the protocol has been configured on the local physical/logical interface. When you configure the protocol on the interface, the Packet Forwarding Engine further processes the packet (peers). If you wish the device to drop (discard) the frame, you must explicitly configure a filter to drop (discard) the frames that match the destination MAC address.

[See [Layer 2 Control Protocol Transparency for EVPN](#).]

- **Support for Nonstop Routing for EVPN MPLS (PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can configure nonstop active routing (NSR) for the EVPN-MPLS service. The device mirrors bridge domain and routing information on the backup Routing Engine so this information is available to the backup Routing Engine upon switchover.

Support doesn't include GRES or VLAN-aware service.

[See [EVPN User Guide](#).]

## Interfaces

- **Support for interface channelization on 400G-ZR-M (PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we support one 100GbE, three 100GbE, and four 100GbE interfaces channelization on 400G-ZR-M.

[See [Port Speed](#).]

## Intrusion Detection and Prevention

- **Control plane protection / DDoS Support for IMON/Sflow/Jflow (PTX Series)**—Starting in Junos OS Evolved Release 22.4R1, we have introduced a DDoS Policer that ensures that the sampling traffic does not result in the dropping of the other controlled traffic. All the monitoring applications use the same DDoS policer that ensures the sampled traffic from all the monitoring applications is limited to 150Kpps.

[See [ddos-protection \(DDoS\)](#) and [Syntax \(PTX Series Routers for Junos OS Evolved\)](#) .]

## IP Tunneling

- **Supports next-hop-based dynamic tunnels with IPv6 in the underlay network (PTX Series)**—Starting in Junos OS Evolved Release 22.4R1, you can encapsulate IPv4 and IPv6 packets inside the IPv6 packets between two IPv6 nodes. This encapsulation mechanism helps to create next-hop-based dynamic tunnels with IPv6 in the underlay network.

[See [Next-Hop-Based Dynamic Tunnels](#) and [show dynamic-tunnels database](#).]

## Junos Telemetry Interface

- **Chassis management error (cmerror) sensor support (PTX10001-36MR, PTX10004, PTX10008, and PTX10016)**—Junos OS Evolved Release 22.4R1 introduces support for the latest version of the OpenConfig data model `openconfig-platform-pipeline-counters.yang (v.0.2.1)`. The upgrade includes updates to leaves under the state sensor path `/components/component/intergrated-circuit/pipeline-counters/errors/`.

[See [Telemetry Sensor Explorer](#).]

- **Enhanced support for FIB telemetry streaming (PTX10008)**—Junos OS Evolved Release 22.4 introduces enhanced support for forwarding information base (FIB) telemetry streaming based on the OpenConfig Abstract Forwarding Table (AFT) model. Support includes the following sensor paths:

- `/network-instances/network-instance/afts/ipv4-unicast/ipv4-entry/state/origin-protocol`
- `/network-instances/network-instance/afts/ipv6-unicast/ipv6-entry/state/origin-protocol`
- `/network-instances/network-instance/afts/next-hops/next-hop/state/encapsulate-header`

[See [Telemetry Sensor Explorer](#).]

- **Event-driven streaming of sensor data for MPLS LSP record route objects (ACX7100-32C, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)**—Junos OS Evolved Release 22.4R1 introduces ON\_CHANGE notification for streaming MPLS label-switched path (LSP) record route object statistics. ON\_CHANGE mode sends updates for sensor data only when data values change. Support includes leaf nodes under the resource path `/network-instances/network-instance/mpls/signaling-protocols/rsvp-te/sessions/session/record-route-objects/record-route-object/state/`.

[See [Telemetry Sensor Explorer](#).]

- **Fabric block sensors pipeline counters (PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, Junos telemetry interface (JTI) supports data model `openconfig-platform-pipeline-counters.yang`, which specifies a set of statistics and error counters for each subsystem of a data forwarding ASIC [IC]. This feature covers fabric-block sensors for packet, drop and error categories.

[See [Telemetry Sensor Explorer](#).]

- **OpenConfig OSPF configuration and operational state sensors (ACX7100-32C, ACX7100-48L, ACX7509, ACX7024, PTX10001-36MR, PTX10008, and PTX10016)**—Junos OS Evolved Release 22.4R1 introduces support for OpenConfig OSPF data model `openconfig-ospfv2.yang` (version 0.3.1). Support includes configuration and streaming of operational state data under resource path `/network-instances/network-instance/protocols/protocol/ospfv2/`.

For OpenConfig configuration mappings, see [Mapping OpenConfig OSPF Commands to Junos Configuration](#). For state sensors, see [Telemetry Sensor Explorer](#).

- **OpenConfig support for node ID and P4RT implicit filtering (PTX10001-36MR, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, Junos telemetry interface (JTI) supports sensors that export telemetry data associated with each Packet Forwarding Engine ASIC instance within a router's line card, such as `fpc slot:npu instance..` The NPU mentioned is the same as the Packet Forwarding Engine ASIC chip. Telemetry data includes its type (INTEGRATED\_CIRCUIT) and parent FPC slot, all corresponding interface port numbers as `fpc slot:npu instance:port number`, and the `node-id` as an identifier for the specific `fpc slot:npu instance`.

This feature also supports a CLI configuration to set the `node-id`. The `node-id` parameter is an identifier for each PFE ASIC instance across all internal and external routers. Additionally, this feature supports P4Runtime (P4RT) implicit filtering. OpenConfig module `openconfig-p4rt` defines a set parameters for configuration and state, providing extensions that control P4RT service. You can also use these parameters with other OpenConfig data models.

[See [Telemetry Sensor Explorer](#) and [Guidelines for gRPC and gNMI Sensors \(Junos Telemetry Interface\)](#) .]

- **Sensor support for firewall filters (PTX10001-36MR, PTX10003, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, Junos telemetry interface (JTI) supports streaming

OpenConfig firewall filter sensors under the data models `openconfig-acl.yang` (OC-ACL) and `openconfig-network-instances policy-forwarding.yang` (OC-NI-PF).

[See [Telemetry Sensor Explorer](#).]

- **System health reporting sensors over gRPC (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016 routers and QFX5130-32CD and QFX5220 switches)**—Starting in Junos OS Evolved Release 22.4R1, Junos telemetry interface (JTI) supports data model `openconfig-system.yang` using gRPC remote procedure calls (gRPC) and provides new health-monitoring sensors.

[See [Telemetry Sensor Explorer](#).]

- **System health sensors (PTX10003, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, Junos telemetry interface (JTI) introduces new system health sensors that stream system health statistics for the chassis or for a hardware component. When subscribing to a system health resource path, the chassis or component's "health" is returned, such as the status, last unhealthy event, and the unhealthy count.

[See [Telemetry Sensor Explorer](#).]

- **Support for gRPC tunnel sessions (PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5220)**—Starting with Junos OS Evolved Release 22.4R1, you can configure a gRPC remote procedure call (gRPC) tunnel session to establish a connection between an external TCP client and a TCP server. The gRPC tunnel session establishes a reverse connection when a TCP client can't reach the TCP server.

To establish a gRPC tunnel session, include the `grpc-tunnel` configuration statement in the `[edit system services]` hierarchy.

[See [gRPC Tunnels Overview](#).]

## Layer 2 Features

- **Support for IRB in VRF instance (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016 Packet Transport Routers)**—Starting in Junos OS Evolved Release 22.4R1, we introduce support for integrated routing and bridging (IRB) in a virtual routing and forwarding (VRF) instance. This support enables forwarding of Layer 3 (L3) VPN traffic from the IRB interface towards the CE and forwarding of L3 VPN traffic towards the core.

The IRB interface enables routing of L3 traffic between a bridge domain and another routed interface. To set up your IRB interface, use either enterprise-style configuration or service-provider-style configuration.

[See [Configuring a Layer 2 Virtual Switch with a Layer 2 Trunk Port](#) and [show interfaces irb](#).]

- **Support for MAC addresses at chassis level (PTX10001-36MR, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can configure a MAC address for the

entire chassis. To configure a MAC address for the entire chassis, use the `local-station-mac mac-address` configuration statement at the `[edit chassis]` hierarchy level.

[See [Configuring Local Station MAC Address](#) and [local-station-mac](#).]

## MPLS

- **Static Adjacency SID support per AE member link (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we support static adjacency SID for any specific aggregated Ethernet (AE) interface member link.

[See [Configuring Static Adjacency Segment Identifier for Aggregate Ethernet Member Links Using Single-hop Static LSP](#).]

- **Support for Bridge Protocol Data Unit (BPDU) transparency on CCC interfaces (PTX10001-36MR, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we support BPDU transparency on CCC interfaces. All Layer 2 control packets received at a local provider edge (PE) device in a Layer 2 VPN will be tunneled to the remote PE devices, unless you have configured the respective protocol on the local PE device's interface that connects to its CE device. Earlier, you were required to use the `l2circuit-control-passthrough` configuration statement under the `forwarding-options` hierarchy level to allow tunneling to remote PE. This configuration statement is no longer needed and the option is removed from configuration hierarchy. We've implemented this feature per "MEF 6.1.1 Layer 2 Control Protocol Handling Amendment."

[See [Layer 2 Protocol Tunneling](#).]

- **Support for LDP Tunneling over SR-TE (ACX7100-32C, ACX7100-48L, PTX10003, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can tunnel LDP label-switched paths (LSPs) over segment routing traffic engineering (SR-TE) in OSPF networks. Tunneling LDP over SR-TE provides consistency and co-existence of both LDP LSPs and SR-TE LSPs.

To configure LDP tunneling over SR-TE, include the `tunnel-source-protocol` configuration statement at the `[edit protocols ospf traffic-engineering]` and the `ldp-tunneling` configuration statement at the `[edit protocols ospf source-packet-routing source-routing-path]` hierarchy levels.

[See [Tunneling LDP over SR-TE](#).]

- **PCEP multipath support for SR-TE (PTX10008)**—Starting in Junos OS Evolved Release 22.4R1, you can configure the multipath feature (primary or secondary paths) for Path Computation Element Protocol (PCEP) segment routing-traffic engineering (SR-TE) as defined in *draft-ietf-pce-multipath-06*. We support the following multipath capabilities:
  - When the PCEP multipath feature is enabled, you can configure multiple primary or secondary paths in a candidate path that you configure and control using Path Computation Client (PCC). Note that the PCEP multipath feature is enabled by default.

- When the PCEP multipath feature is disabled, you can configure only one primary path in a candidate path. Note that a secondary path configuration is not allowed.

The PCEP multipath feature removes the `compute-profile` restriction of 1 on the maximum number of segment lists (`maximum-computed-segment-lists`

**NOTE:** When PCEP multipath is enabled, PCCD will not send constraints for PCC-controlled candidate paths.

[See [Configuring Multiple Paths for Path Computation Element Protocol SR-TE Overview](#).]

- **Auto Derivation of remote discriminator for S-BFD session in SR-TE (PTX10003, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can use the automatically derived route discriminator for Seamless BFD (S-BFD) sessions on segment routing–traffic engineering (SR-TE) paths. With this feature, you don't need to configure a remote discriminator in the S-FBD configuration on the ingress or transit device. Instead, the egress provider edge device will now accept an IP address as a local discriminator.

To configure this feature, use the `set protocols bfd sbfd local-discriminator-ip` command.

Additionally, you can now use a common sBFD template with the S-FBD configurations on multiple controller-provisioned SR-TE policies. In these sBFD sessions, Junos OS automatically derives the remote discriminator from the tunnel endpoint for matching SR-TE policies.

[See `sbfd` and [Routing Engine-based S-BFD for Segment-Routing Traffic Engineering with First-Hop Label Resolution](#).]

- **Compute traffic-engineered path delays using delay metrics (PTX10001-36MR, PTX10003, PTX10004, and PTX10008)**—Starting in Junos OS Evolved Release 22.4R1, you can use delay-based metrics for a Path Computation Element (PCE) to compute traffic-engineered paths. You can use delay-based metrics to steer packets on the least-latency paths or the least-delay path. To do this, you need to measure the delay on every link and advertise the delay using a suitable routing protocol (IGP or BGP-LS) so that the ingress has the per link delay properties in its TED.

See [ [Computing Delay Optimized Intradomain and Interdomain Segment Routing Paths](#) ] .

- **Support for RSVP delay constraint (PTX10001-36MR, PTX10003, and PTX10008)**—Starting in Junos OS Evolved Release 22.4R1, you can configure RSVP label-switched paths (LSPs) to use a delay metric for computing the path. To configure LSPs in this way, use the new CLI options that we've introduced under the `[edit protocols mpls label-switched-path name]` hierarchy. We've also updated the output of the following show commands:

- `show ted link detail`
- `show ted database extensive`

- `show route protocol bgp table lsdist.0 extensive`
- `show spring-traffic-engineering lsp detail`
- `show express-segments name name detail`
- `show mpls lsp detail`
- **Support for Software driven Wide Area Network (SWAN) ping and traceroute command for PRPD static routes (PTX10008 and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, SWAN ping and traceroute commands verify the PRPD static path by sending the MPLS echo request packet with the entire labelstack along the same data path that carries the data traffic. To forward this echo request, Junos OS follows a similar process it uses to forward any other packet.

[See [ping-mplstraceroute mpls segment-routing static egress-ip](#) and [traceroute mpls segment-routing static egress-ip](#).]

## Network Management and Monitoring

- **sFlow: debugging & traceability support (PTX10001-36MR, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we have implemented ingress and egress sFlow functionalities for transit nodes with PTX10008 and PTX10016 devices. This functionality is supported for IPV4-in-IPV4, IPV6-in-IPV4, and regular IPV4/IPV6 traffic.

In transit-only devices, the IP-in-IP encapsulated packet can transit through the device without any change or may get "decapsulated and forwarded" or "decapsulated and encapsulated" and forwarded based on the NextHop configuration.

Additionally, the packet may traverse through multiple VRFs while getting forwarded. For all those variations, we support ingress and egress sFlow. The functionality caters to sFlow capabilities for ECMP traffic as well.

[See [sFlow Monitoring Technology](#).]

- **SNMP infra enhancements on Junos OS Evolved**—Starting in Junos OS Evolved Release 22.4R1, the `show snmp stats-response-statistics` is made available. This command displays statistics of SNMP responses sent from the Packet Forwarding Engine during the MIB II process (`mib2d`). We've also introduced the MIB objects for managing tunnels of any type over IPv4 and IPv6 networks.

[See [show snmp stats-response-statistics](#) and [Standard MIBs for Junos OS Evolved](#).]

- **Use the gRIBI service to program next hops with MAC addresses (PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we have enhanced the gRPC Routing Information Base Interface (gRIBI) service to allow you to program next hops with MAC addresses instead of IP addresses. This feature is useful in networks where devices cannot use dynamic Address Resolution Protocol (ARP) or Neighbor Discovery Protocol (NDP) to look up the next hop's MAC address.

To program the next hop using the MAC address, include the MAC address and the outgoing logical interface name in the `NextHop AFT` message. To confirm that the route was programmed successfully, use the `show route programmed` command in the CLI.

[See [gRIBI](#).]

- **Support for additional family in port mirroring (PTX10003)**—Starting in Junos OS Evolved Release 22.4R1, you can configure family any (as well as the earlier family options, `inet` and `inet6`) for local port mirroring and remote port mirroring:

Family any (for family any, ccc, ethernet-switching, or mpls)

**NOTE:** You use the family any configuration option to process all four families.

As of Release 22.4R1, you no longer configure port mirroring by using the `[edit forwarding-options port-mirroring analyzer]` hierarchy on the PTX devices. You now use `[edit forwarding-options port-mirroring]` for local port mirroring or `[edit forwarding-options port-mirroring instance instance-name]` for remote port mirroring, with both of those configurations also requiring a firewall filter.

The following configuration statements are no longer part of the port mirroring configuration on PTX: `next-hop` for family any; family vpls; `no-filter-check`; `hosted-service`; and `server-profile`.

[See [port-mirroring](#) .]

## OpenConfig

- **OpenConfig OSPF configuration and operational state sensors (ACX7100-32C, ACX7100-48L, ACX7509, ACX7024, PTX10001-36MR, PTX10008, and PTX10016)**—Junos OS Evolved Release 22.4R1 introduces support for OpenConfig OSPF data model `openconfig-ospfv2.yang` (version 0.3.1). Support includes configuration and streaming of operational state data under resource path `/network-instances/network-instance/protocols/protocol/ospfv2/`.

For OpenConfig configuration mappings, see [Mapping OpenConfig OSPF Commands to Junos Configuration](#). For state sensors, see [Telemetry Sensor Explorer](#).

## Routing Options

- **Support for bootstrapping route-validation database from a local file (ACX7100-32C, ACX7100-48L, ACX7509, PTX10001-36MR, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5700, and QFX5220)**—Starting in Junos OS Evolved Release 22.4R1, we support the ability to read validation records from a local binary file and install the records into specified named route-validation databases within RPD. This feature implements syntactic and semantic checks on the content of the file to ensure that it is a well-specified set of validation records. If the syntactic and semantic checks fail, the entire file is rejected as a source of validation records. Use the `source-file` statement under the `[edit routing-options validation]` hierarchy level to source route-validation records from a local file



source. You can use the `show validation source-file` command to display the properties of a local validation source file.

[See [validation](#).]

- **Support for BGP RIB Sharding and Update Threading features (PTX10001-36MR, PTX10008, and PTX10016)**— Starting in Junos OS Evolved Release 22.4R1, we introduce a new CLI option to override the default sharding and update-threading configuration. Use `no-rib-sharding` and `no-update-threading` under the `[edit system processes routing bgp]` hierarchy level to override any rib-sharding and update-threading configuration that might already be present either through platform defaults or through explicit configuration.

[See [bgp](#).]

- **Support for next-generation MVPN Inter-AS option A and option C (PTX10001-36MR, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, for improved security and scalability Juniper supports Rosen Inter-AS option A and option C for next-generation multicast virtual private networks (MVPNs) and segmented provider tunnels.

[See [inter-as \(Routing Instances\)](#) .]

## Routing Policy and Firewall Filters

- **MPLS Filter Payload Match (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)**— Starting in Junos OS Evolved Release 22.4R1, match conditions for IPv4 and IPv6 payload fields are available for MPLS traffic. Additionally, the following match conditions are available:

- **MPLS header EXP match conditions for MPLS traffic**

`exp0`, `exp1`, `exp0-except`, `exp1-except`. Existing match conditions - `exp` and `exp-except` will be deprecated.

- **MPLS header Label match conditions for MPLS traffic**

`label0`, `label1`, `label0-except`, and `label1-except`. Existing match conditions - `label` and `label-except` will be deprecated.

- **MPLS header TTL match conditions for MPLS traffic**

`ttl0`, `ttl1`, `ttl0-except`, and `ttl1-except`. Existing match conditions `ttl` and `ttl-except` will be deprecated.

- **MPLS header Bottom of Stack match conditions for MPLS traffic**

`bottom-of-stack0` and `bottom-of-stack1`

[See [Firewall Filter Match Conditions for MPLS Traffic](#).]

## Routing Protocols

- **BMP local RIB monitoring support for all RIBs with sharding (ACX Series, PTX Series, and QFX Series)**  
—Starting in Junos OS Evolved Release 22.4R1, you can configure a policy to monitor routing information bases also known as routing table (RIBs) of virtual routers and virtual routing and forwarding instances (VRF). You can specify two separate sets of RIBs in the BGP Monitoring Protocol (BMP), one for monitoring and the other for reporting. With this feature BMP can filter traffic based on the routes and routing-instances.

[See [BGP Monitoring Protocol](#), [loc-rib](#), and [rib-list](#).]

- **DCSPF support for SR-TE with Flex Algo (PTX10001-36MR, PTX10003, PTX10004, and PTX10008)**  
—Starting in Junos OS Evolved Release 22.4R1, we support the flexible algorithm (Flex Algo) as a constraint in the compute profile of a segment routing–traffic engineering (SR-TE) LSP. The computation combines any constraints in the compute profile with the constraints in the flex algo definition to find the resultant path. The computation uses the flex algo segment identifiers (SIDs) in the configuration to compress the resultant path. This algorithm is restricted for use only in local computation of SR-TE LSPs.

We support the feature only for IPv4 SR-MPLS SIDs. You can use SR-TE policy constraints to further fine-tune flex algo constraints.

[See [Enabling Distributed CSPF for Segment Routing LSPs](#).]

- **Distributing traffic engineering (TE) policies and state by using BGP link-state (ACX7100-32C, ACX7100-48L, ACX7509, ACX7024, PTX10001-36MR, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we support the distribution of traffic engineering (TE) policies and state by using BGP link-state.

[See [Link-State Distribution Using BGP](#), [source-routing-path](#), and [show ted spring-te-policy](#).]

- **Keep bypass tunnels operational during configuration changes (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can configure the OS to keep bypass tunnels operational until the tunnels no longer carry local repair traffic, even during configuration changes. Bypass tunnels that carry local repair traffic are in the BackupActive state. When you change the bypass-related configuration on software releases containing this feature, the OS keeps any bypass tunnels that are in BackupActive state up. When the bypass tunnels are no longer in BackupActive state, the operating system tears down the bypass tunnels. This feature ensures that all local repair traffic reaches its destination and prevents traffic loss on label-switched paths (LSPs).

Configure this feature at the [edit protocols rsvp interface all link-protection] hierarchy level. Use the `show rsvp session bypass` command to check whether the bypass routes protecting an interface remain operational in BackupActive state after the configuration changes.

[See [link-protection \(RSVP\)](#) and [Link Protection for MPLS LSPs](#).]

- **MD5 authentication key rotation with overlap for key transition for OSPF (PTX10003, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we support advertising OSPF MD5 authentication with multiple active keys to send packets with a maximum limit of two keys per interface. Using multiple active keys at any one time at the interface enables the smooth transition from one key to another for OSPF. You can delete old keys without any impact on the OSPF session.

[See [Configuring OSPF Authentication authentication](#).]

- **OSPF FAPM and inter area support (ACX7100-32C, ACX7100-48L, PTX10001-36MR, PTX10003, PTX10008, and PTX10016)**—Starting with Junos OS Evolved Release 22.4R1, the Flexible Algorithm Prefix Metric (FAPM) is defined to allow an optimal end-to-end path for an inter-area prefix. The Area Border Router (ABR) *must* include the FAPM when advertising the prefix between areas that are reachable in that given Flexible Algorithm (flex algo). When a prefix is unreachable, the ABR *must not* include that prefix in the flex algo when advertising between areas. The defined FAPM provides inter-area support.

[See [Understanding OSPF Flexible Algorithm for Segment Routing](#).]

- **TCP-AO and TCP MD5 authentication support prefixes for LDP and BGP (ACX7100-32C, ACX7100-48L, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5220, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, we have extended TCP Authentication Option (TCP-AO) and TCP MD5 to support IP subnets for BGP and LDP sessions. When you configure TCP authentication with a network address and a prefix length, your chosen TCP authentication method authenticates TCP connections to the entire range of addresses under that subnet. This means you can authenticate TCP connections without needing to know the exact IP addresses of the destination devices.

When IP subnets overlap, the authentication method uses the longest prefix match (LPM) to determine the exact authentication key for a specific TCP session.

[See [TCP](#).]

- **TCP-AO and TCP MD5 authentication are VRF aware for LDP and BGP (ACX7100-32C, ACX7100-48L, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5220, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, TCP Authentication Option (TCP-AO) and TCP MD5 authentication are VRF aware in BGP and LDP sessions. You can configure TCP-AO and TCP MD5 under non-default routing instances. The TCP authentication method you configure under a routing instance is only applied to the TCP sessions inside that VRF instance. If a TCP connection in a different VRF instance has the same destination IP address, the TCP authentication method does not get applied to that TCP connection if the VRF instance does not have TCP authentication configured for the peer.

[See [TCP](#).]

- **Flex algo and FAPM leaking across IS-IS multi-instance (ACX7100-32C, ACX7100-48L, PTX10003, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, we've added support to

readvertise flexible algorithm (flex algo) prefix-segment identifiers (SIDs) and Flexible Algorithm Prefix Metrics (FAPMs) across interior gateway protocol (IGP) instances. We have also added support to readvertise other protocol prefixes and assign flex algo prefix-SIDs via policy to those prefixes.

- **Supports next-hop-based dynamic tunnels with IPv6 in the underlay network**—Encapsulating IPv4 and IPv6 packets inside the IPv6 packets between two IPv6 nodes is now possible. This mechanism helps to create a next-hop-based dynamic tunnel with IPv6 in the underlay network.

[See [Next-Hop-Based Dynamic Tunnels](#) and [show-dynamic-tunnels](#).]

## Source Packet Routing in Networking (SPRING) or Segment Routing

- **Support for SRv6 Flexible Algorithm in TED and BGP-LS (PTX 10004)**—Starting in Junos OS Evolved Release 22.4R1, we support SRv6 Flexible Algorithms (flex algo) in the traffic engineering database (TED) and BGP Link State (BGP-LS). Flexible Algorithm allows routing protocols such as IS-IS and OSPF to compute paths over a network based on user-defined parameters such as calculation-type, metrics, and constraints. Note that we cannot define flexible algorithms specifically for either SR-MPLS or SRv6. If a node is participating in a specific flex algo, that flex algo would apply to both SR-MPLS and SRv6 nodes.

[See [How to Configure Flexible Algorithms in IS-IS for Segment Routing Traffic Engineering](#).]

- **BGP Classful Transport (CT) support for IPv6 and Segment Routing–Traffic Engineering (SR-TE) color-only support (PTX10001-36MR, PTX10003, and PTX10008)**—Starting in Junos OS Evolved Release 22.4R1, we support BGP-CT with IPv6 and BGP service-routes with a color-only mapping community. We have also enhanced the transport-class configuration statement by enabling shards to provide strict resolution without falling back on best-effort tunnels.

[See [use-transport-class](#).]

## Software Installation and Upgrade

- **Secure Zero-Touch Provisioning (secure ZTP) (PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can use RFC-8572-based secure ZTP to bootstrap your remotely located network devices that are in a factory-default state. Secure ZTP enables mutual authentication between the bootstrap server and the network device before the remote network device is accessed for initiating zero-touch provisioning.

To enable mutual authentication, you need a unique digital voucher, which is generated based on the DevID (Digital Device ID or Cryptographic Digital Identity) of the network device. The DevID is embedded inside the Trusted Platform Module (TPM) 2.0 chip on the network device. Juniper Networks issues a digital voucher to customers for each eligible network device.

[See [Secure Zero Touch Provisioning](#) and [Generate Voucher Certificate](#).]

## Additional Features

We have extended support for the following features to the platforms shown in parentheses:

- **Additional options to automatically derive the ESI (PTX10008)**—You can configure multihomed devices on an EVPN-VXLAN network to automatically generate the ESI from:
  - The system ID and administrative key on the remote customer edge device (partner).
  - The locally configured mac and local discriminator values.

[See [Understanding Automatically Generated ESIs in EVPN Networks.](#)]

- **Break-out port state sensor support (PTX10003 and PTX10008)**

[See [Telemetry Sensor Explorer](#) and [sensor \(Junos Telemetry Interface\).](#)]

- **Fabric, optical, and FPC environment sensor support on Junos telemetry interface (JTI)** (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)

[See [Telemetry Sensor Explorer](#) and [Guidelines for gRPC and gNMI Sensors \(Junos Telemetry Interface\).](#)]

- **HMAC-SHA-2 authentication support for users of SNMPv3 USM (ACX7100-32C, ACX7100-48L, ACX7509, ACX7024, PTX1000136MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5700, and QFX5220)**—Starting in Junos OS Evolved Release 22.4R1, you can configure HMAC-SHA-2 authentication protocols for users of the SNMPv3 user-based security model (USM) with the following new CLI configuration statements:

- authentication-sha224
- authentication-sha256

We've introduced these statements for local-engine users at `[edit snmp v3 usm local-engine user username]` and for remote-engine users at `[edit snmp v3 usm remote-engine engine-id user user-name]`.

[See [authentication-sha224](#) and [authentication-sha256.](#)]

- **Inline Active Flow Monitoring support for configuring the options template ID, template ID, source ID, and observation domain ID** (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)

[See [options-template-id](#), [template-id](#), [source-id](#), and [observation-domain-id.](#)]

- **Inline Monitoring Services support for packet mirroring with metadata** (PTX10001-36MR, PTX10004, PTX10008, and PTX10016)

[See [Inline Monitoring Services Configuration.](#)]

- **Keep bypass tunnels operational during configuration changes** (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)

[See [link-protection \(RSVP\) Link Protection for MPLS LSPs](#).]

- **NETCONF and shell sessions over enhanced outbound HTTPS** (ACX7100-32C, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5700)

[See [NETCONF and Shell Sessions over Enhanced Outbound HTTPS](#).]

- **SNMP MIB support for Real-Time Performance Monitoring (RPM)** (PTX10004)

[See [traps](#).]

- **Static Adjacency SID support per AE member link** (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)—Starting in Junos OS 22.4R1 Evolved Release, we support static adjacency SID for any specific aggregated Ethernet interface member link.

[See [Configuring Static Adjacency Segment Identifier for Aggregate Ethernet Member Links Using Single-hop Static LSP](#).]

- **Support for asynchronous notification for EVPN-VPWS** (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)—Starting in Junos OS Evolved 22.4R1, we've extended support for asynchronous notification (laser-off signal) on the port of the physical interface in the PTX series router. You can configure asynchronous notification for ethernet-ccc, Ethernet-VPLS, and vlan-ccc encapsulation type in an EVPN-VPWS network. This feature is not supported on aggregated Ethernet interfaces.

[See [asynchronous-notification](#).]

- **Support for G.8275.1 Telecom Profile** (PTX10001-36MR)

[See [G.8275.1 Telecom Profile](#).]

- **Support for hybrid mode (Synchronous Ethernet and PTP) over LAG with PTP over Ethernet** (PTX10008 with PTX10K-LC1202-36MR Line Card)

[See [Hybrid Mode](#) and [PTP over Ethernet](#).]

- **Supported transceivers, optical interfaces, and direct attach copper (DAC) cables**—Select your product in the [Hardware Compatibility Tool](#) to view supported transceivers, optical interfaces, and DAC cables for your platform or interface module. We update the HCT and provide the first supported release information when the optic becomes available.

- **Support for automatic ingress LSP Policing in P2MP LSPs** (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)

[See [Configuring Automatic Policers](#).]

- **Support for ANY firewall filter family (PTX10003)**  
[See [family \(Firewall\)](#).]
- **Support for displaying load balancing decision result for L3 unicast traffic (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)**  
[See [show forwarding-options load-balance](#).]
- **Two-Way Active Measurement Protocol (TWAMP) monitoring service (RFC5357) IPv4 address support (PTX10016)**  
[See [Understand Two-Way Active Measurement Protocol](#).]
- **Two-Way Active Measurement Protocol (TWAMP) monitoring service (RFC5357) IPv6 address support (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)**  
[See [Understand Two-Way Active Measurement Protocol](#).]
- **Two-Way Active Measurement Protocol (TWAMP) monitoring service (RFC5357) SNMP support (PTX10016)**  
[See [Understand Two-Way Active Measurement Protocol](#).]

## What's Changed

### IN THIS SECTION

- [EVPN | 44](#)
- [General Routing | 44](#)
- [Juniper Extension Toolkit \(JET\) | 44](#)
- [Junos OS API and Scripting | 45](#)
- [Network Management and Monitoring | 45](#)
- [Platform and Infrastructure | 45](#)
- [Software Installation and Upgrade | 45](#)
- [System Management | 46](#)
- [User Interface and Configuration | 46](#)

Learn about what changed in this release for PTX Series routers.

## EVPN

- **Flow-label configuration status for EVPN ELAN services**—The output for the `show evpn instance extensive` command now displays the flow-label and flow-label-static operational status for a device and not for the routing instances. A device with `flow-label` enabled supports flow-aware transport (FAT) flow labels and advertises its support to its neighbors. A device with `flow-label-static` enabled supports FAT flow labels but does not advertise its capabilities.

## General Routing

- **Change in the `help syslog PFE` command output**—In Junos OS Evolved, the output for `help syslog PFE` command is fixed to be consistent with Junos OS output on PTX10008 device. `ERRMSG` tags in EVO are named as `SFLOWD_` whereas in Junos they are named as `PFE_SFLOW_`.
- For PTX Series devices running Junos OS Evolved, software priority "medium-low" maps to hardware priority "medium" for normal scheduling mode and "low" for strict priority scheduling mode.
- Prior to this change when route sharding is configured the output of CLI `show route` commands included information about sharding. After the change the user must add the **rib-sharding all** argument to CLI `show route` commands to display sharding information.
- sFlow configuration? sFlow configuration is allowed only on `et`, `xe`, and `ge` interfaces in EVO-based platforms. All other interfaces are blocked for configuring sFlow on EVO platforms. A CLI error will be thrown if sFlow is configured on any other interface other than `et`, `xe` or `ge` interface.
- The Ethernet link fault management process (`lfmd`) runs only when the link-fault-management protocol is configured.
- The traffic rate could display incorrect values in the `show services inline ip-reassembly statistics fpc x pfe-slot y` output.

## Juniper Extension Toolkit (JET)

- **Python 3 is the default and only Python version for executing Juniper Extension Toolkit Python scripts (ACX Series, PTX Series, and QFX Series)**—Junos OS Evolved supports only Python 3 for executing Juniper Extension Toolkit (JET) scripts written in Python. Python 2.7 is no longer supported.



for executing JET scripts, and we've deprecated the `language python` statement at the `[edit system scripts]` hierarchy level.

[See [Understanding Python Automation Scripts for Junos Devices](#).]

## Junos OS API and Scripting

- **Deprecated functions in the `libpyvrf` Python module (ACX Series, PTX Series, and QFX Series)**—The `libpyvrfPython` module no longer supports the `get_task_vrf()` and `set_task_vrf()` functions.

[See [How to Specify the Routing Instance in Python 3 Applications on Devices Running Junos OS Evolved](#).]

## Network Management and Monitoring

- **Junos YANG modules for RPCs include the `junos:command` extension statement (ACX Series, PTX Series, and QFX Series)**—The Junos YANG modules that define RPCs for operational mode commands include the `junos:command` extension statement in schemas emitted with extensions. The statement defines the CLI command for the corresponding RPC. The Juniper [yang](#) GitHub repository stores the RPC schemas with extensions in the `rpc-with-extensions` directory for the given release and device family. Additionally, when you configure the `emit-extensions` statement at the `[edit system services netconf yang-modules]` hierarchy level and generate the YANG schemas on the local device, the YANG modules for RPCs include the `junos:command` extension statement.

## Platform and Infrastructure

- **Internal Python tools and scripts use Python 3 (ACX7100-32C, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5220)**—Junos OS Evolved uses Python 3 for all internal Python tools and scripts, but there is no change in functionality on the device.

## Software Installation and Upgrade

- **`request system snapshot` supports specifying the Routing Engine (PTX Series)**—When you issue the `request system snapshot` command, you can specify whether to snapshot the local Routing Engine or

both Routing Engines. Include the `routing-engine local` option, or omit the option, to take a snapshot of only the local Routing Engine. Include the `routing-engine both` option to takes snapshots of both Routing Engines.

## System Management

- When disk usage for the `run` directory is above 85%, ZooKeeper logs and snapshots in the `/run/zookeeper/conf/default/version-2` directory will be deleted if there are more than 3 files, leaving only the 3 most recent files.

## User Interface and Configuration

- **Changes to the JSON encoding of configuration data for YANG leaf nodes of type `identityref` (ACX Series, PTX Series, and QFX Series)**—If a YANG leaf node is type `identityref`, Junos devices emit the namespace-qualified form of the identity in the JSON encoding of that node. In addition, Junos devices accept both the simple (no namespace) and the namespace-qualified form of an identity in JSON configuration data. In earlier releases, Junos devices only emit and accept the simple form of an identity. Emitting and accepting the namespace-qualified identity ensures that the device can properly resolve the value in the event that the YANG data model defines an identity and a leaf node containing the `identityref` value in different modules.
- **Support for temperature sensor (PTX10001-36MR)**—We support the `temperature sensor` statement at the `edit chassis cb` hierarchy level. You can use the `temperature sensor` statement to increase the fan speed and customize the temperature threshold. We recommend certain values for ZR and ZR-M modules to work which helps the temperature to remain within the thresholds.

[See [temperature-sensor](#).]

- **The `file copy` command supports only text-formatted output in the CLI (ACX Series, PTX Series, and QFX Series)**—The `file copy` command does not emit output when the operation is successful and supports only text-formatted output when an error occurs. The `file copy` command does not support using the `| display xml` filter or the `| display json` filter to display command output in XML or JSON format in any release. We've removed these options from the CLI.

## Known Limitations

### IN THIS SECTION

- [General Routing | 47](#)
- [Routing Policy and Firewall Filters | 47](#)
- [Routing Protocols | 48](#)

Learn about limitations in this release for PTX Series routers.

For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

## General Routing

- The gNMI subscriptions to `/interfaces/interface/ethernet/state/port-speed` is not supported. [PR1674791](#)
- Class B performance as per G.8273.2 might be supported only when FEC is enabled on both the primary and backup ports of the T-BC(default option). [PR1682367](#)
- Following commands do not show SNMP MIBS, `show snmp mib walk pimIpMRouteAssertMetric` `show snmp mib walk pimIpMRouteAssertMetricPref` `show snmp mib walk pimIpMRouteAssertRPTBit` `show snmp mib walk pimIpMRouteUpstreamAssertTimer` `show snmp mib walk pimIpMRouteFlags`. [PR1683683](#)
- The `show forwarding-option` output is still matched with packet egress information with incorrect source MAC in CLI. [PR1692377](#)

## Routing Policy and Firewall Filters

- IPv4 unsupported filter match **fragment-flags reserved** must not be used, as it matches `dont fragment` traffic pattern as well. [PR1676517](#)

## Routing Protocols

- When routing-options transport-class fallback none is not configured - do not configure more than 10 transport-classes or advertise more than 10 distinct colors in SRTE or FlexAlgo. [PR1648490](#)
- Only IS-IS instance name supported under default network instance would be DEFAULT. Additionally, logic interface unit is required while giving interface name for IS-IS interface configuration (even if it is default) like set openconfig-network-instance:network-instances network-instance DEFAULT protocols protocol IS-IS DEFAULT isis interfaces interface et-0/0/0.0; note that .0 has to be carried in the interface name. [PR1679429](#)

## Open Issues

### IN THIS SECTION

- [Class of Service \(CoS\) | 48](#)
- [General Routing | 49](#)
- [Interfaces and Chassis | 50](#)
- [MPLS | 50](#)
- [Network Management and Monitoring | 51](#)
- [Routing Protocols | 51](#)
- [User Interface and Configuration | 51](#)

Learn about open issues in this release for PTX Series routers.

For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

## Class of Service (CoS)

- Platform dependency-state error is seen on cosd. [PR1649388](#)

## General Routing

- The issue is 400G-ZR/400G-ZR-M optic transceiver firmware upgrade failure. It is a generic issue faced across all single RU platforms supporting QDD-400G-ZR/QDD-400G-ZR-M. [PR1638284](#)
- The system ID that is exported should be different for UDP and GRPC/GNMI. In the case of UDP, the system name should be appended with the local IP address. [PR1640442](#)
- On all Junos OS Evolved platforms, the license might get out of sync between primary and backup Routing Engine after the addition or deletion of licenses. [PR1658869](#)
- GNOI API SetPackage through remote download is not supported. [PR1665185](#)
- There is no support for leaf level paths for Packet Forwarding Engine sensors in Junos OS Evolved. [PR1671424](#)
- Fragmented packets have an additional NH (frag) that causes the FLT to not match on ICMPv6 headers for lo0 filters. Workaround is to change the loopback MTU size. [PR1675820](#)
- G.8273.2 SyncE to PTP and SyncE to 1PPS transient response test fails. [PR1681527](#)
- Class B performance as per G.8273.2 fails for SyncE to PTP and SyncE to 1pps noise transfer for lower frequencies. [PR1681884](#)
- The sync\_response does not work correctly. [PR1683552](#)
- Class B performance as per G.8273.2 shall be supported only when FEC is enabled on both the primary and secondary ports of the T-BC(default option). [PR1683579](#)
- When a scaled number of interfaces (1000 and more logical interface) are been deleted and then re added with a configuration change. A fibd core might be encountered due a corner case condition. FIB will then restart and will function as normal. Since FIB will restart and recover by itself, no other recovery will be necessary. [PR1685995](#)
- Trigger: Applying Layer 2 configuration with the interface in sp mode + Bd configuration and CFM configuration together in a single commit will result in ifbd creation failures. Impact: IFBD creations fails so the Layer 2 functionalities will not work on the configured interface. Traffic drops will be seen. Layer 2 configuration reference. set interfaces et-0/0/1 flexible-vlan-tagging set interfaces et-0/0/1 encapsulation flexible-ethernet-services set interfaces et-0/0/1 unit 1 encapsulation vlan-bridge set interfaces et-0/0/1 unit 1 vlan-id 1 set vlan v1 vlan-id 1 set vlans v1 interface et-0/0/1.1. [PR1690635](#)
- With sharding enabled, BGP flags like the following are not displayed on Active route in show route extensive output: **Accepted Multipath MultipathContrib MultiNextHop** per shard view, using show route extensive <prefix> rib-sharding <shard-name> will show these flags. [PR1693207](#)

- On PTX10008 Junos OS Evolved platforms, FTC (Fan Tray Controller) FPGA minimum supported firmware version mismatch alarm gets generated upon re-seating FTC because the current firmware version becomes null value after re-insertion. [PR1698209](#)
- 
- This issue is seen during CLI triggered onlining of the Packet Forwarding Engine, that is when request `chassis fpc slot <slot-id> pfe <pfe-id> restart` is executed. Please use the workaround provided. [PR1699323](#)
- Changing decapsulation of only the tunnel destination address configuration after tunnel is up might not work and end up using the previously configured tunnel destination address for the decapsulation. After the system enters this state, any further configuration changes to tunnel configuration cannot be handled. [PR1575724](#)
- Sometimes BGP and RSVP sessions remain down after quickly disabling and enabling `arpd` process. Whenever customer encounters such scenarios, the system can be recovered from erroneous state by executing `restart routing gracefully` in CLI. [PR1665362](#)
- On a PTX Junos OS Evolved platform running EVPN-MPLS and 22.4 software, if a configuration statement like `protocols evpn normalization` is enabled (which is catastrophic to L2 and RPD daemons and involves deleting and adding the Rt instance tables) followed by Routing Engine switchover, RPD could encounter a core due to indirect-next-hop id being zero. The `show krt indirect-next-hop | grep Index` could be zero for one or more NHs, this is a timing issue that seems to affect some routing-instances. [PR1694773](#)

## Interfaces and Chassis

- You must perform `joji` over the interface using `test picd optics fpc_slot <fpc slot> pic_slot <pic slot> port <port num> cmd oir_enable` test picd optics fpc\_slot <fpc slot> pic\_slot <pic slot> port <port num> cmd remove test picd optics fpc\_slot <fpc slot> pic\_slot <pic slot> port <port num> cmd insert test picd optics fpc\_slot <fpc slot> pic\_slot <pic slot> port <port num> cmd oir\_disable command. [PR1646915](#)

## MPLS

- Traceroute in MPLS OAM on SR over IPv6 might fail in ECMP incase PTX box is in topology. This occurs because of Linux kernel in the Junos OS Evolved puts an autoflowlabel on every IPv6 packet. This flow label is transparent to daemon process, which uses a null value for it and calculates the next hop details. Packet Forwarding Engine however takes the flow label into account and calculates the

next hop details. This difference in calculation of next hop details leads to a mismatch in the path the packet takes to the destination and can cause traceroute to fail. [PR1618406](#)

## Network Management and Monitoring

- When you configure the `maximum-password-length` command and tries to configure password whose length exceeds the configured `maximum-password-length`, error message gets generated along with error `'(ok/)'` tag gets emitted. Ideally `'ok/>'` tag should not be emitted in an error scenario and the configuration does not get committed..[PR1585855](#)
- When `jnxCos mib` is polled at a very high rate and if response from FPCs (evo-aftmand) is delayed (takes around 1 minute) then `snmpd-subagent` might generate a core file. [PR1683517](#)
- Interface physical IP address is assigned to SNMP trap source address after chassis restart although source-address lo0 is configured under trap-options. [PR1690850](#)

## Routing Protocols

- This scenario happens when we enable IS-IS authentication key-chain having multiple keys between routers. The IS-IS adjacency is up since both routers have the same key active. When we manually change the system time in such a way that routers have different keys active in the key chain, the IS-IS adjacency must go down. However, that does not happen. [PR1572441](#)
- When `I2cpd` (in the context of xSTP) clears the entries that it has programmed on `ppmd`, that is, when you delete xSTP configurations from the box, there can be a possibility of `ppmd` core file. If `ppmd` is in distributed mode then there will be no service impact, else there can be service impact as packet transmission for various protocols will happen through if `ppmd` is in centralized mode.[PR1660299](#)
- The following IS-IS leaves will not be supported: `/network-instances/network-instance/protocols/protocol/isis/global/config/next` `/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/levels/level/hello-authentication/` `/network-instances/network-instance/protocols/protocol/isis/interfaces/interface/config/hello-padding`. [PR1678300](#)

## User Interface and Configuration

- The system might ask for your password when you are trying to save configuration file. [PR1665008](#)

- Configd-streamer cores during commit of wild-carded groups related configuration. The core is only seen with the wild-carded configuration which is used in the reported fusion test case. [PR1674890](#)

## Resolved Issues

### IN THIS SECTION

- [General Routing | 52](#)
- [EVPN | 56](#)
- [Infrastructure | 56](#)
- [Interfaces and Chassis | 56](#)
- [Juniper Extension Toolkit \(JET\) | 56](#)
- [MPLS | 57](#)
- [Network Management and Monitoring | 57](#)
- [Routing Policy and Firewall Filters | 57](#)
- [Routing Protocols | 57](#)
- [User Interface and Configuration | 58](#)

Learn about the issues fixed in this release for PTX Series routers.

For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

## General Routing

- PTX10003: In scaled Layer 2 network, error logs are printed for MAC Creation, mac-learning works as expected. [PR1491933](#)
- On PTX10008 devices running Junos OS Evolved, L3VPN license warning message generated with commit check. [PR1624592](#)
- MTS-MCAST: [PTX10003] Auto RP base verification fails with multiple RPs with same group range. [PR1634982](#)



- On PTX10004, PTX10008, and PTX10016 Junos OS Evolved platforms, unable to clear learned IPv6 address in IPv6 neighbor table on management interface. [PR1648174](#)
- IPv6 primary-only IP address does not move to the new primary Routing Engine after a switchover. [PR1648371](#)
- The classification-override functionality will not work for IPv6 traffic. [PR1650622](#)
- Sflow cannot populate extended router header or true OIF for packet traversing through ECMP in TEVRF or recovery VRF. [PR1652202](#)
- On PTX10001-36MR devices, the 2x100G link fails to come up after swapping the ZR-M with LR4 DD module. [PR1655180](#)
- The **UEFI BIOS Key synchronization tool - efitools.service failed** error message gets generated after the optics diagnostics test. [PR1655537](#)
- GNOI rpc KillProcess not supported. [PR1655652](#)
- Wrong transmit hardware priority for CLI priority medium-low. [PR1656837](#)
- The rpm-postinst fails on boot. [PR1657278](#)
- Routes in RIB and FIB table might go out of sync on all Junos OS Evolved platforms and causes a traffic impact. [PR1658426](#)
- Soft assertions in RPD will fail during GRES. [PR1660484](#)
- Traffic loss due to long MPLS reroute local convergence time on aggregate Ethernet flap. [PR1660701](#)
- The network-instance name for streaming telemetry to be changed from default to DEFAULT to align with configuration stanza. [PR1662999](#)
- Junos OS Evolved:JDI\_FT\_REGRESSION [PTX10003]: [AFTMAND]: evo-aftmand-zx.re cored during weekend regrerssion at jprds\_encap\_tunnel\_tbl\_cleanup (inst=inst@entry=16) at /b/release/evo/rel\_222-202204270159.0/forwarding/exprplus/toolkits/zx/./jencap/paradise/jprds\_encap\_tunnel.c:1158. [PR1663417](#)
- Post switchover error message is seen during pccd initialization. [PR1664165](#)
- System shutdown might be observed for erroneous read for system temperature from the ASIC. [PR1664302](#)
- The evo-aftmand process crash can be seen on Junos OS Evolved PTX platforms. [PR1665859](#)
- In the SR-TE scenario, sensors are wrongly populated for colored tunnel BSID routes when uncolored tunnels are enabled. [PR1665943](#)

- MVRP enabled trunk ports might go into blocked or designated state on Junos OS Evolved PTX Series platforms. [PR1666921](#)
- PTX10000s running Junos OS Evolved software - SNMP GET is not returning the expected value for FPC MIBs. [PR1668285](#)
- The hwdre and evo-pfemand applications might crash if idmd, fabtoken and hwdre are restarted immediately after a FEB offline. [PR1669130](#)
- The rpd process restarts after generating core file. [PR1669346](#)
- FPC restart and core is generated when re-applying or reactivating the apply-groups configuration to the interface. [PR1669402](#)
- The process fabspoked-pfe crash might be observed while executing CLI commands for fabric statistics. [PR1669435](#)
- PTX10008: show snmp mib walk CLI fails at jnxLED mib if SNMP mib walk is performed with multiple parallel sessions. [PR1669624](#)
- Errors are seen on bringing SIB online. [PR1669713](#)
- Layer 2 filters matching DMAC or Etype takes no effect on Layer 2 SP-style aggregated Ethernet interface. [PR1669718](#)
- Multicast traffic drop might be seen on specific PTX10000 platforms. [PR1669740](#)
- PTX10004:PTX10008:PTX10016 Junos OS Evolved : transmit-rate is not achieved on queue and traffic is dropped in oversubscription mode. [PR1670859](#)
- Fragment frames errors are seen on the 400G interface. [PR1671065](#)
- Default DDOS rate limit for LLDP packets is 20,000 PPS. [PR1671196](#)
- Junos OS Evolved NSR: Do not send unreplicated message to backup during switchover. [PR1671458](#)
- Interface will stay down after removing and reapplying configuration on Junos OS Evolved platforms. [PR1672445](#)
- JDI-RCT:EVO:PTX10004:PTX10008:PTX10016 - evo-aftmand-bt.fpc core file might be seen. [PR1672512](#)
- The new primary Routing Engine might self-reboot after the kernel crashes on an old primary Routing Engine. [PR1673306](#)
- Reporting-interval in show jvision sensor info is stuck at 65,000 when configured reporting rate is changed from 65,000 to 68,000. [PR1673476](#)
- CoS drops seen for priority traffic on some PTX Series platforms. [PR1673738](#)

- The rpd crash might be encountered on Junos OS Evolved platforms. [PR1674310](#)
- Crash is observed when many Packet Forwarding Engines go down at the same time. [PR1674724](#)
- PTX10004 or PTX10008 PTX10016 Junos OS Evolved : LSP Link-protection takes longer time with fix of PR1662467. [PR1675282](#)
- PTX10003 fragment-offset-except firewall match condition does not work for offset-1 value. [PR1675482](#)
- PTX10004 or PTX10008 or PTX10016 Junos OS Evolved : jnxOperatingDRAMSize value displayed in Kilo bytes instead of Bytes. [PR1675811](#)
- GNOI rpc statistics incorrect permission value. [PR1676942](#)
- PTX10008 Junos OS Evolved ZTP : HTTP GET fails in downloading configuration file. [PR1677231](#)
- Unexpected storage media consumption caused by system application log. [PR1677295](#)
- Disk usage monitoring and log clean up does not cover zookeeper log. [PR1678880](#)
- Ondatra: GNMI: `/components/component[name=*/state/oper-status` has duplicate entries for FPC and Routing Engine components. [PR1679823](#)
- The gnoi-system generates core files during ping requests. [PR1680004](#)
- Upgrading from Junos OS Evolved 22.3 to Junos OS Evolved 22.4 causes commit to fail with **failed to load external entity "/var/db/scripts/import/junos.xml**. [PR1680266](#)
- LED status on backup RCB never turns on after reboot. [PR1681609](#)
- Junos OS Evolved PTX devices can reboot in a specific scenario. [PR1682898](#)
- On Junos OS Evolved PTX Series device, application ZTP fails on node Re0 about one day later post system zeroize. [PR1683964](#)
- Evo-aftmand core happens when traffic is sampled with egress Sflow. [PR1685571](#)
- PDT: ONDATRA: Logical components which do not have EEPROM, return empty-string for leaves hardware-version, part-no and ID. [PR1685968](#)
- [CATS]:[JDI\_EVO\_REG]:[COS]:queue-counters-queued-bytes-rate for network-class is not within the range with cos mru 9200 configuration. [PR1691957](#)
- CBC-FPGA and RE-FPGA firmware upgrades fail. [PR1692186](#)
- PTX 10004, PTX10008, PTX10016 Junos OS Evolved: Generic CM Alarm is added for triggering Packet Forwarding Engine chip initial failure. [PR1693710](#)

- Unnumbered BGP sessions are getting flapped. [PR1697099](#)
- PTX10004, PTX10008, PTX10016 Junos OS Evolved: SNMP jnxLEDState mib returns 4(red) value even when BITS LED is unlit/off. [PR1698919](#)
- Traffic loss might be seen when multicast route changes. [PR1669498](#)
- The rpd-agent process might restart post primary-role switchover. [PR1669767](#)

## EVPN

- The rpd crash would be observed when activating or deactivating the EVPN routing-instances. [PR1673157](#)

## Infrastructure

- Traffic drop might be seen due to slow TCP reestablishment after a topology change. [PR1661210](#)
- On Junos OS Evolved platforms, no connectivity between the default routing instance and other routing instance might happen. [PR1671024](#)

## Interfaces and Chassis

- PTX10003 - FPC : FPC wedge while doing FPC events with traffic. [PR1679346](#)
- Unable to configure aggregate Ethernet interfaces more than 256. [PR1681114](#)
- LLDP packet drop is seen when the physical interface (IFD) is configured with flexible-vlan-tagging. [PR1689391](#)

## Juniper Extension Toolkit (JET)

- [Ondatra] [gRIBI] Client's disconnect request using Stream.CloseSend() closing the connections. [PR1667855](#)
- Ondatra: Modify RPC Connection TC failure with disconnect(). [PR1677182](#)

## MPLS

- Premature RSVP Path Error BW-Unavailable originated by PLR. [PR1670638](#)
- The rpd crash might be observed with container LSPs. [PR1672804](#)
- The rpd crashes very rarely when constructing LDP trace message irrespective of enable or disable LDP traceoptions. [PR1676503](#)
- RSVP PathTear is not encapsulated by MPLS header when bypass is used. [PR1685182](#)

## Network Management and Monitoring

- The snmpd core might be observed with filter-duplicates configuration. [PR1669510](#)

## Routing Policy and Firewall Filters

- The lo0 egress filter with next-header option not supported. [PR1672315](#)
- The aftmand process crash might be observed. [PR1683361](#)

## Routing Protocols

- The rpd crashes upon receiving BGP multi-nexthops inetflow route in the 21.4 software release and onward. [PR1670630](#)
- Segment-routing might incorrectly set a pop action for paths using a Strict SPF(1) Algorithm. [PR1674804](#)
- Label traffic will be dropped at the one-hop LSP stitching node if the packet has more than one label. [PR1677567](#)
- RV task replication will be stuck in the **NotStarted** state when routing-options validation is deactivated or activated. [PR1679495](#)

## User Interface and Configuration

- FPC ungracefully restarts when cda-bt process crashes. [PR1655441](#)
- Junos OS Evolved: syslog regex matching backslash and punctuations unable to filter output. [PR1663346](#)
- Upgrade/downgrade/rollback to 22.2R1 will fail if system configuration-database extend-size is configured. [PR1672348](#)

# Junos OS Evolved Release Notes for QFX5130-32CD, QFX5220, and QFX5700 Devices

### IN THIS SECTION

- [What's New | 58](#)
- [What's Changed | 65](#)
- [Known Limitations | 69](#)
- [Open Issues | 69](#)
- [Resolved Issues | 71](#)

These release notes accompany Junos OS Evolved Release 22.4R1 for QFX5130-32CD, QFX5220-32CD, QFX5220-128C, and QFX5700 switches. They describe new and changed features, limitations, and known and resolved problems in the hardware and software.

## What's New

### IN THIS SECTION

- [Authentication and Access Control | 59](#)

- [EVPN | 59](#)
- [Junos Telemetry Interface | 61](#)
- [Routing Protocols | 62](#)
- [Routing Options | 63](#)
- [Software Installation and Upgrade | 63](#)
- [Additional Features | 64](#)

Learn about new features introduced in this release for QFX Series switches.

## Authentication and Access Control

- **Harden shared secrets in Junos OS Evolved (ACX7100, ACX7509, ACX7024, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130, QFX5700, QFX5220, and QFX5230-64CD)**—Starting in Junos OS Evolved Release 22.4R1, you can configure a system primary password and request to decrypt encrypted secrets, allowing for hardening of shared secrets, such as pre-shared keys and RADIUS passwords.

Setting a primary password enables devices to encrypt passwords so that only devices with knowledge of the primary password can decrypt the encrypted passwords. The following CLI commands are supported:

- `request system decrypt password`
- `set system master-password`

[See [Master Password for Configuration Encryption](#).]

- **VRF support for TCP keychains (ACX7100, ACX7509, ACX7024, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, we support virtual routing and forwarding (VRF) for TCP connections with keychain-based authentication. VRF enables you to isolate traffic traversing the network without using multiple devices to segment your network.

[See [authentication-key-chains](#).]

## EVPN

- **Routing protocols on EVPN-VXLAN overlay IRB interfaces in the default routing instance (QFX5130-32CD and QFX5220)**—Starting in Junos OS Evolved Release 22.4R1, to support running routing protocols on Ethernet VPN VXLAN (EVPN-VXLAN) overlay integrated routing and bridging (IRB) interfaces in the IPv4 or IPv6 default routing instance associated with the underlay (default.inet.0 or default.inet6.0), you can set and export a policy with the `install-next-hop except`

overlay-vxlan-interfaces policy qualifier option. The policy configuration prevents routing loops that can happen if the device uses overlay IRB routes for underlay VTEP reachability. To support this use case in releases prior to 22.4R1, you can configure the IRB interface in a routing instance of type vrf instead of in the default routing instance.

[See [install-nexthop](#).]

- **EVPN-VXLAN to EVPN-VXLAN seamless stitching for EVPN Type 5 routes (ACX7100-32C, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, you can configure EVPN-VXLAN to EVPN-VXLAN seamless stitching with EVPN Type 5 (IP prefix) routes between two interconnected data centers or between two points of delivery (pods) in a data center.

In the EVPN-VXLAN fabric, border leaf or border spine devices act as interconnection gateways. You enable EVPN Type 5 routes in virtual routing and forwarding (VRF) instances on both sides of the interconnection. For each VRF instance, the server leaf devices in the first data center create VXLAN tunnels for Type 5 routes (with corresponding VXLAN network identifiers [VNIs]) toward their local gateway devices. The gateway devices map those VXLAN tunnels to an interconnection tunnel (with a new route distinguisher [RD], route target, and VNI) toward the second data center. The gateway devices in the second data center re-create the Type 5 VXLAN tunnels using their local RD.

We support one-to-one mapping of Type 5 VRF instances across the interconnection.

- **Overlay and CE-IP ping and traceroute support for EVPN-VXLAN (ACX7100-32C, ACX710048L, PTX10001-36MR, PTX10004, PTX10016, QFX5130-32CD, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, you can perform ping and traceroute operations within an EVPN-VXLAN overlay or to a specific customer edge [CE] device IP address (CE-IP) across an EVPN-VXLAN overlay. You can use ping and traceroute and CE-IP ping and traceroute utilities to detect and isolate faults in overlay networks.

[See [Understanding Overlay ping and traceroute Packet Support](#).]

- **MAC limit and MAC move limit with EVPN-VXLAN (QFX5130-32CD and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, we support the following Layer 2 port security features in an EVPN-VXLAN overlay network:
  - **MAC limit**—You can limit the number of MAC addresses learned by network (local) interfaces.

**NOTE:** We don't support MAC limits on virtual tunnel endpoint (VTEP) interfaces.

- **MAC move limit**—You can limit the number of times a MAC address is moved to a different interface within 1 second. To configure this feature, you apply a limit to a VLAN. In an EVPN-VXLAN network, a VLAN's members can include network (local) and VTEP interfaces. We support the following MAC move use cases and actions:



- MAC moves between network interfaces—By default, the configured action is applied on the interface to which the MAC address is last moved. If you configured action priority on the interfaces, the action is applied on the interface with the lesser priority.
- MAC moves between network and VTEP interfaces and vice-versa—The action is applied on the network interface.

**NOTE:** Mac move limit action is not applied on VTEP interfaces.

We don't support MAC moves between any interface including VTEP interface and a network interface on which persistent MAC learning and static MAC addresses are configured.

[See [Understanding MAC Limiting and MAC Move Limiting.](#)]

## Junos Telemetry Interface

- **System health reporting sensors over gRPC (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016 routers and QFX5130-32CD and QFX5220 switches)**—Starting in Junos OS Evolved Release 22.4R1, Junos telemetry interface (JTI) supports data model `openconfig-system.yang` using gRPC remote procedure calls (gRPC) and provides new health-monitoring sensors.

[See [Telemetry Sensor Explorer.](#)]

- **Support for gRPC tunnel sessions (PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5220)**—Starting with Junos OS Evolved Release 22.4R1, you can configure a gRPC remote procedure call (gRPC) tunnel session to establish a connection between an external TCP client and a TCP server. The gRPC tunnel session establishes a reverse connection when a TCP client can't reach the TCP server.

To establish a gRPC tunnel session, include the `grpc-tunnel` configuration statement in the `[edit system services]` hierarchy.

[See [gRPC Tunnels Overview.](#)]

- **Telemetry for IPv4/IPv6 traffic statistics (QFX5220)**—Junos OS Evolved Release 22.4R1 introduces support for streaming IPv4 and IPv6 transit statistics using resource path `/junos/system/linecard/interface/traffic`. The following fields will be exported:
  - `if_in_ipv4pkts`
  - `if_out_ipv4pkts`
  - `if_in_ipv6pkts`
  - `if_out_ipv6pkts`

To enable IPv6 transit statistics for the physical port, you must configure IPv6 route accounting.

Support for OpenConfig is available under resource path `/interfaces/interface/`.

[See [Guidelines for gRPC and gNMI Sensors \(Junos Telemetry Interface\)](#).]

## Routing Protocols

- **BMP local RIB monitoring support for all RIBs with sharding (ACX Series, PTX Series, and QFX Series)**  
—Starting in Junos OS Evolved Release 22.4R1, you can configure a policy to monitor routing information bases also known as routing table (RIBs) of virtual routers and virtual routing and forwarding instances (VRF). You can specify two separate sets of RIBs in the BGP Monitoring Protocol (BMP), one for monitoring and the other for reporting. With this feature BMP can filter traffic based on the routes and routing-instances.

[See [BGP Monitoring Protocol](#), [loc-rib](#), and [rib-list](#).]

- **Keep bypass tunnels operational during configuration changes (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)**—Starting in Junos OS Evolved Release 22.4R1, you can configure the OS to keep bypass tunnels operational until the tunnels no longer carry local repair traffic, even during configuration changes. Bypass tunnels that carry local repair traffic are in the BackupActive state. When you change the bypass-related configuration on software releases containing this feature, the OS keeps any bypass tunnels that are in BackupActive state up. When the bypass tunnels are no longer in BackupActive state, the operating system tears down the bypass tunnels. This feature ensures that all local repair traffic reaches its destination and prevents traffic loss on label-switched paths (LSPs).

Configure this feature at the `[edit protocols rsvp interface all link-protection]` hierarchy level. Use the `show rsvp session bypass` command to check whether the bypass routes protecting an interface remain operational in BackupActive state after the configuration changes.

[See [link-protection \(RSVP\)](#) and [Link Protection for MPLS LSPs](#).]

- **OSPF FAPM and inter area support (ACX7100-32C, ACX7100-48L, PTX10001-36MR, PTX10003, PTX10008, and PTX10016)**—Starting with Junos OS Evolved Release 22.4R1, the Flexible Algorithm Prefix Metric (FAPM) is defined to allow an optimal end-to-end path for an inter-area prefix. The Area Border Router (ABR) *must* include the FAPM when advertising the prefix between areas that are reachable in that given Flexible Algorithm (flex algo). When a prefix is unreachable, the ABR *must not* include that prefix in the flex algo when advertising between areas. The defined FAPM provides inter-area support.

[See [Understanding OSPF Flexible Algorithm for Segment Routing](#).]

- **TCP-AO and TCP MD5 authentication support prefixes for LDP and BGP (ACX7100-32C, ACX7100-48L, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5220, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, we have

extended TCP Authentication Option (TCP-AO) and TCP MD5 to support IP subnets for BGP and LDP sessions. When you configure TCP authentication with a network address and a prefix length, your chosen TCP authentication method authenticates TCP connections to the entire range of addresses under that subnet. This means you can authenticate TCP connections without needing to know the exact IP addresses of the destination devices.

When IP subnets overlap, the authentication method uses the longest prefix match (LPM) to determine the exact authentication key for a specific TCP session.

[See [TCP](#).]

- **TCP-AO and TCP MD5 authentication are VRF aware for LDP and BGP (ACX7100-32C, ACX7100-48L, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5220, and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, TCP Authentication Option (TCP-AO) and TCP MD5 authentication are VRF aware in BGP and LDP sessions. You can configure TCP-AO and TCP MD5 under non-default routing instances. The TCP authentication method you configure under a routing instance is only applied to the TCP sessions inside that VRF instance. If a TCP connection in a different VRF instance has the same destination IP address, the TCP authentication method does not get applied to that TCP connection if the VRF instance does not have TCP authentication configured for the peer.

[See [TCP](#).]

## Routing Options

- **Support for bootstrapping route-validation database from a local file (ACX7100-32C, ACX7100-48L, ACX7509, PTX10001-36MR, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5700, and QFX5220)**—Starting in Junos OS Evolved Release 22.4R1, we support the ability to read validation records from a local binary file and install the records into specified named route-validation databases within RPD. This feature implements syntactic and semantic checks on the content of the file to ensure that it is a well-specified set of validation records. If the syntactic and semantic checks fail, the entire file is rejected as a source of validation records. Use the `source-file` statement under the `[edit routing-options validation]` hierarchy level to source route-validation records from a local file source. You can use the `show validation source-file` command to display the properties of a local validation source file.

[See [validation](#).]

## Software Installation and Upgrade

- —Starting in Junos OS Evolved Release 22.4R1, you can use RFC-8572-based secure ZTP to bootstrap your remotely located network devices that are in a factory-default state. Secure ZTP enables mutual authentication between the bootstrap server and the network device before the remote network device is accessed for initiating zero-touch provisioning.

To enable mutual authentication, you need a unique digital voucher, which is generated based on the DevID (Digital Device ID or Cryptographic Digital Identity) of the network device. The DevID is embedded inside the Trusted Platform Module (TPM) 2.0 chip on the network device. Juniper Networks issues a digital voucher to customers for each eligible network device.

[See [Secure Zero Touch Provisioning](#) and [Generate Voucher Certificate](#).]

- **Support for outbound SSH service (QFX5130-32CD and QFX5700)**—Starting in Junos OS Evolved Release 22.4R1, we support the outbound SSH service. You can use the `restart service-deployment` command to restart the Service Deployment System (SDX) process.

[See [outbound-ssh](#).]

- **Phone-home client (QFX5130-32CD and QFX5700)**—Starting with Junos OS Evolved Release 22.4R1, you can use either the legacy DHCP-options-based zero-touch provisioning (ZTP) or the phone-home client (PHC) to provision software for the switch. If the switch boots up and receives DHCP options from the DHCP server for ZTP, ZTP resumes. If DHCP options are not present, PHC is attempted. PHC enables the switch to securely obtain bootstrapping data, such as a configuration or software image, with no user intervention other than having to physically connect the switch to the network. When the switch first boots, PHC connects to the pre-configured Juniper redirect server ([redirect.juniper.net](#)), which will redirect to a phone home server to get the configuration or software image.

To initiate either DHCP-options-based ZTP or PHC, the switch must either be in a factory-default state, or you can issue the `request system zeroize` command. PHC allows these switches to be onboarded onto the Mist dashboard.

[See [Understanding the Phone-Home Client](#).]

## Additional Features

We have extended support for the following features to the platforms shown in parentheses:

- **HMAC-SHA-2 authentication support for users of SNMPv3 USM (ACX7100-32C, ACX7100-48L, ACX7509, ACX7024, PTX1000136MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5700, and QFX5220)**—Starting in Junos OS Evolved Release 22.4R1, you can configure HMAC-SHA-2 authentication protocols for users of the SNMPv3 user-based security model (USM) with the following new CLI configuration statements:

- `authentication-sha224`
- `authentication-sha256`

We've introduced these statements for local-engine users at `[edit snmp v3 usm local-engine user username]` and for remote-engine users at `[edit snmp v3 usm remote-engine engine-id user user-name]`.

[See [authentication-sha224](#) and [authentication-sha256](#).]

- **Inband Flow Analyzer (IFA) 2.0 transit node support** (QFX5130-32CD, QFX5220-32CD, QFX5220-128C, and QFX5700)

[See [Inband Flow Analyzer \(IFA\) 2.0 Probe for Real-Time Flow Monitoring](#).]

- **NETCONF and shell sessions over enhanced outbound HTTPS** (ACX7100-32C, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5700)

[See [NETCONF and Shell Sessions over Enhanced Outbound HTTPS](#).]

- **Real-Time Performance Monitoring (RPM) and Two-Way Active Measurement Protocol (TWAMP) support** (QFX5130-32CD, QFX5220, and QFX5700)

[See [Understanding Using Probes for Real-Time Performance Monitoring](#) and [Understand Two-Way Active Measurement Protocol](#).]

- **Supported transceivers, optical interfaces, and direct attach copper (DAC) cables**—Select your product in the [Hardware Compatibility Tool](#) to view supported transceivers, optical interfaces, and DAC cables for your platform or interface module. We update the HCT and provide the first supported release information when the optic becomes available.

- **Support for displaying load balancing decision result for L3 unicast traffic** (PTX10001-36MR, PTX10003, PTX10004, PTX10008, and PTX10016)

[See [show forwarding-options load-balance](#).]

## What's Changed

### IN THIS SECTION

- [EVPN](#) | 66
- [General Routing](#) | 66
- [Juniper Extension Toolkit \(JET\)](#) | 66
- [Junos OS API and Scripting](#) | 67
- [Platform and Infrastructure](#) | 67
- [Network Management and Monitoring](#) | 67
- [Routing Protocols](#) | 67
- [User Interface and Configuration](#) | 68
- [System Management](#) | 68

Learn about what changed in this release for QFX Series switches.

## EVPN

- Starting in Junos OS Evolved Releases 22.1R3, 22.2R2, and 22.3R1, QFX5130 switches don't copy the Type of Service (ToS) field when encapsulating a VXLAN packet by default. You can enable copying the ToS field upon VXLAN encapsulation using the `vxlan-tos-copy-filter` statement at the `edit forwarding-options` hierarchy. This statement copies both the DSCP and ECN values in the ToS field from the IP header of a packet to the outer IP header of the VXLAN packet.
- Flow-label configuration status for EVPN ELAN services `</userinput>` The output for the `show evpn instance extensive` command now displays the `flow-label` and `flow-label-static` operational status for a device and not for the routing instances. A device with `flow-label` enabled supports flow-aware transport (FAT) flow labels and advertises its support to its neighbors. A device with `flow-label-static` enabled supports FAT flow labels but does not advertise its capabilities.

## General Routing

- Prior to this change when route sharding is configured the output of CLI `show route` commands included information about sharding. After the change the user must add the **rib-sharding all** argument to CLI `show route` commands to display sharding information.
- sFlow configuration? sFlow configuration is allowed only on `et`, `xe`, and `ge` interfaces in EVO-based platforms. All other interfaces are blocked for configuring sFlow on EVO platforms. A cli error will be thrown if sFlow is configured on any other interface other than `et`, `xe` or `ge` interface.
- The Ethernet link fault management process (`lfmd`) runs only when the link-fault-management protocol is configured.
- The traffic rate could display incorrect values in the `show services inline ip-reassembly statistics fpc x pfe-slot y` output.

## Juniper Extension Toolkit (JET)

- **Python 3 is the default and only Python version for executing Juniper Extension Toolkit Python scripts (ACX Series, PTX Series, and QFX Series)**—Junos OS Evolved supports only Python 3 for executing Juniper Extension Toolkit (JET) scripts written in Python. Python 2.7 is no longer supported

for executing JET scripts, and we've deprecated the `language python` statement at the `[edit system scripts]` hierarchy level.

[See [Understanding Python Automation Scripts for Junos Devices](#).]

## Junos OS API and Scripting

- **Deprecated functions in the `libpyvrf` Python module (ACX Series, PTX Series, and QFX Series)**—The `libpyvrfPython` module no longer supports the `get_task_vrf()` and `set_task_vrf()` functions.

[See [How to Specify the Routing Instance in Python 3 Applications on Devices Running Junos OS Evolved](#).]

## Platform and Infrastructure

- **Internal Python tools and scripts use Python 3 (ACX7100-32C, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, and QFX5220)**—Junos OS Evolved uses Python 3 for all internal Python tools and scripts, but there is no change in functionality on the device.

## Network Management and Monitoring

- **Junos YANG modules for RPCs include the `junos:command` extension statement (ACX Series, PTX Series, and QFX Series)**—The Junos YANG modules that define RPCs for operational mode commands include the `junos:command` extension statement in schemas emitted with extensions. The statement defines the CLI command for the corresponding RPC. The Juniper [yang](#) GitHub repository stores the RPC schemas with extensions in the `rpc-with-extensions` directory for the given release and device family. Additionally, when you configure the `emit-extensions` statement at the `[edit system services netconf yang-modules]` hierarchy level and generate the YANG schemas on the local device, the YANG modules for RPCs include the `junos:command` extension statement.

## Routing Protocols

- **AR replicators with OISM install multicast states only on the OISM SBD (QFX5130-32CD and QFX5700)**—In an EVPN-VXLAN ERB fabric with many VLANs, QFX5130-32CD and QFX5700

switches running as assisted replication (AR) replicators with optimized intersubnet multicast (OISM) might have scaling issues when they install multicast (\*,G) states (with IGMPv2) or (S,G) states (with IGMPv3). As a result, these switches only install these multicast states on the OISM supplemental bridge domain (SBD) VLAN. They don't install these states on all OISM revenue bridge domain VLANs. On those devices, you see multicast group routes only on the SBD in show multicast snooping route command output.

[See [OISM and AR Scaling with Many VLANs](#).]

## User Interface and Configuration

- **Changes to the JSON encoding of configuration data for YANG leaf nodes of type identityref (ACX Series, PTX Series, and QFX Series)**—If a YANG leaf node is type identityref, Junos devices emit the namespace-qualified form of the identity in the JSON encoding of that node. In addition, Junos devices accept both the simple (no namespace) and the namespace-qualified form of an identity in JSON configuration data. In earlier releases, Junos devices only emit and accept the simple form of an identity. Emitting and accepting the namespace-qualified identity ensures that the device can properly resolve the value in the event that the YANG data model defines an identity and a leaf node containing the identityref value in different modules.
- **The file copy command supports only text-formatted output in the CLI (ACX Series, PTX Series, and QFX Series)**—The file copy command does not emit output when the operation is successful and supports only text-formatted output when an error occurs. The file copy command does not support using the | display xml filter or the | display json filter to display command output in XML or JSON format in any release. We've removed these options from the CLI.

## System Management

- When disk usage for the run directory is above 85%, ZooKeeper logs and snapshots in the /run/zookeeper/conf/default/version-2 directory will be deleted if there are more than 3 files, leaving only the 3 most recent files.



## Known Limitations

### IN THIS SECTION

- [General Routing | 69](#)

Learn about limitations in this release for QFX Series switches.

For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

## General Routing

- On QFX5700, 400G DAC flap might be seen after OIR, FPC restart, device reboot, enabling or disabling interface. [PR1618488](#)

## Open Issues

### IN THIS SECTION

- [General Routing | 70](#)
- [User Interface and Configuration | 70](#)

Learn about open issues in this release for QFX Series switches.

For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

## General Routing

- On QFX5700, ungraceful removal (OIR) of FPC or an FPC fault might result in PCIE MAJOR alarm **PCI Uncorrected error on dev 0000:00:03.0** which does not get cleared.

**NOTE:** The ungraceful removal of FPCs is not recommended on QFX5700.

Workaround: The PCI uncorrected error alarm gets cleared on a reboot of the device.

[PR1620197](#)

- QFX5130-32CD: 400G DAC link does not come up between two TD4 devices when auto-negotiation is enabled for DAC cables. The vendor shell shows speed as 12.4G instead of 400g. Available workaround for this issue is to configure `set interfaces interface ether-options no-auto-negotiation` command on both side of the links. [PR1618488](#)
- On QFX5220-128C, system reboot from cli, log related to system reboot event might not appear in message log or `cli show log messages | match SYSTEM_REBOOT_EVENT`. Users can see the log in journalctl logs. [PR1696668](#)
- On QFX5220-32CD, evo-pfemand core file is seen after ISSU upgrade through automated script. In this scenario, evo-pfemand restarts and service is resumed. There is impact to traffic until evo-pfemand initialisation completes. [PR1697143](#)
- On QFX5700, MacSec MKA sessions might not come up after restarting FPC multiple (4-5) times. The only way to recover from this situation is to reboot the chassis. [PR1702520](#)
- On QX5700, MKA session establishment might be delayed by up to 15 seconds after the configuration `commit`. [PR1705117](#)

## User Interface and Configuration

- The system may ask for your password when you are thing to save configuration file. [PR1665008](#)

## Resolved Issues

### IN THIS SECTION

- [General Routing | 71](#)
- [User Interface and Configuration | 72](#)

Learn about the issues fixed in this release for QFX Series switches.

For the most complete and latest information about known Junos OS Evolved defects, use the Juniper Networks online [Junos Problem Report Search](#) application.

## General Routing

- Layer 2: In scaled L2 network, error logs are printed for MAC Creation. mac-learning works as expected [PR1491933](#)
- On the QFX5130-32CD platform running Junos OS Evolved, the user shall not be able to clear or reset the disk option specified in the scheduled request node reboot command. The node reboots with the disk option last specified. [PR1517596](#)
- Unified led scheme for QFX5220 or QFX5130. [PR1616209](#)
- QFX5220-128C : MDIO forward download failed after image upgrade. [PR1636181](#)
- QFX5130: Few MACS are missing from show ethernet-switching table. [PR1650329](#)
- TOS(DSCP+ECN) bits do not get copied from the inner Layer 3 header to outer VXLAN header. [PR1658142](#)
- QFX5700: In rare situations traffic flow does not resume after restart of JNP-FPC-20Y. [PR1659566](#)
- QFX Junos OS Evolved : Transit NTP packets are trapped to CPU. [PR1661855](#)
- QFX5130 is sends a flow sample with the wrong value of flow record in sflow sampled packet. [PR1666434](#)
- TPI-101526 :Junos OS Evolved:QFX5700 : 100% Layer 2 multicast traffic is not forwarded to the CE interfaces from the core on QFX5700. [PR1668921](#)

- On QFX5130-32CD and QFX5700 platforms, IPv6 neighborships fail to establish if IPv6 loopback filters are configured. [PR1671730](#)
- Post ZTP, QFX5220 needs a reboot for routes to be seen in mgmt\_junos.inet.0 table. [PR1672097](#)
- The interface does not come back to default port speed when ZTP is aborted. [PR1672101](#)

## User Interface and Configuration

- Show commands might not work after ISSU upgrade. [PR1692409](#)

# Upgrade Your Junos OS Evolved Software

Products impacted: ACX7024, ACX7100-32C, ACX7100-48L, ACX7509, PTX10001-36MR, PTX10003, PTX10004, PTX10008, PTX10016, QFX5130-32CD, QFX5220-32CD, QFX5220-128C, and QFX5700.

Follow these steps to upgrade your Junos OS Evolved software:

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. In the Find a Product box, enter the Junos OS platform for the software that you want to download.
3. Select Junos OS Evolved from the OS drop-down list.
4. Select the relevant release number from the Version drop-down list.
5. In the **Install Package** section, select the software 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. Review and accept the End User License Agreement.
8. Download the software to a local host.
9. Copy the software to the device or to your internal software distribution site.
10. Install the new package on the device.

**NOTE:** We recommend that you upgrade all software packages out of band using the console because in-band connections are lost during the upgrade process.

For more information about software installation and upgrade, see [Software Installation and Upgrade Overview \(Junos OS Evolved\)](#). For more information about EOL releases and to review a list of EOL releases, see <https://support.juniper.net/support/eol/software/junosevo/>.

## Licensing

In 2020, Juniper Networks introduced a new software licensing model. The Juniper Flex Program comprises a framework, a set of policies, and various tools that help unify and thereby simplify the multiple product-driven licensing and packaging approaches that Juniper Networks has developed over the past several years.

The major components of the framework are:

- A focus on customer segments (enterprise, service provider, and cloud) and use cases for Juniper Networks hardware and software products.
- The introduction of a common three-tiered model (standard, advanced, and premium) for all Juniper Networks software products.
- The introduction of subscription licenses and subscription portability for all Juniper Networks products, including Junos OS and Contrail.

For information about the list of supported products, see [Juniper Flex Program](#).

## Finding More Information

- **Feature Explorer**—Juniper Networks Feature Explorer helps you to explore software feature information to find the right software release and product for your network.

<https://apps.juniper.net/feature-explorer/>

- **PR Search Tool**—Keep track of the latest and additional information about Junos OS open defects and issues resolved.

<https://prsearch.juniper.net/InfoCenter/index?page=prsearch>

- **Hardware Compatibility Tool**—Determine optical interfaces and transceivers supported across all platforms.

<https://apps.juniper.net/hct/home>

**NOTE:** To obtain information about the components that are supported on the devices and the special compatibility guidelines with the release, see the Hardware Guide for the product.

- **Juniper Networks Compliance Advisor**—Review regulatory compliance information about [Common Criteria](#), [FIPS](#), [Homologation](#), [RoHS2](#), and [USGv6](#).

<https://pathfinder.juniper.net/compliance/>

## Requesting Technical Support

### IN THIS SECTION

- [Self-Help Online Tools and Resources | 74](#)
- [Creating a Service Request with JTAC | 75](#)

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/>.

## Revision History

23 November 2023—Revision 10, Junos OS Evolved Release 22.4R1

31 August 2023—Revision 9, Junos OS Evolved Release 22.4R1

10 August 2023—Revision 8, Junos OS Evolved Release 22.4R1

20 July 2023—Revision 7, Junos OS Evolved Release 22.4R1

1 June 2023—Revision 6, Junos OS Evolved Release 22.4R1  
25 May 2023—Revision 5, Junos OS Evolved Release 22.4R1  
23 March 2023—Revision 4, Junos OS Evolved Release 22.4R1  
2 February 2023—Revision 3, Junos OS Evolved Release 22.4R1  
2 February 2023—Revision 3, Junos OS Evolved Release 22.4R1  
5 January 2023—Revision 2, Junos OS Evolved Release 22.4R1  
23 December 2022—Revision 1, Junos OS Evolved Release 22.4R1

---

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. Copyright © 2023 Juniper Networks, Inc. All rights reserved.